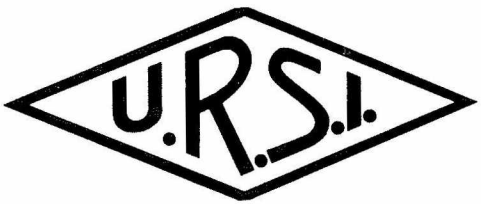
UNION RADIO-SCIENTIFIQUE INTERNATIONALE
INTERNATIONAL UNION OF RADIO SCIENCE



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XXIIe Assemblée Générale
XXII General Assembly

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INTRODUCTION

ACKNOWLEDGEMENT

The XXII General Assembly of URSI was held at the Hilton Hotel and Palace Hotel in Tel Aviv, Israel, from 25 August to 2 September 1987. In introducing this account of the proceedings, it seems appropriate to offer the warmest thanks of the Union to:

- the Israel Committee for Radio Science, under the auspices of the Israel Academy of Sciences and Humanities,
- the Israeli Organizing Committee who was responsible for the detailed planning and local arrangements in Tel Aviv,
- the Chairman and the members of the Steering Group for the overall coordination of the scientific programme of the General Assembly,
- to the Chairmen and Vice-Chairmen of URSI Commissions who planned the scientific sessions, and to the session chairmen and the speakers,
- to the organizers of the Open Symposia which attracted many participants,
- to the following organizations which provided funds in support of the URSI Young Scientists Programme: ICSU, COSTED, UNESCO, the Royal Society of London and the URSI Member Committee in Israel,
- to the international scientific Unions and organizations which sent representatives to the Assembly.

OUTLINE OF THE ASSEMBLY

The URSI Council, which is composed of the official representatives of the Member Committees, met in Tel Aviv on six occasions between 23 August and 3 September 1987. The Resolutions and Recommendations adopted by the Council and by the URSI Commissions are reproduced at the end of this volume. Summary accounts of the business transacted by the Council and the Commissions are given elsewhere.

In addition to the scientific sessions arranged by the nine scientific Commissions, three Open Symposia were organized on the following topics:

- Computer-Aided Design in Radio Science with Emphasis on Microelectronics;
- Inverse Scattering and Image Theory;
- Millimeter-Wave Techniques in Telecommunications, Remote Sensing and Radio Astronomy.

Three General Lectures of interest to all participants were given on the following subjects:

- New Communication Networks;
- Digital Optical Techniques in Computing and Switching;
- The Encounters with Comet Halley, March 1986.

For the XXII General Assembly, each Commission had been asked to provide a Tutorial Lecture in its own sphere of interest. The titles of these Lectures were as follows:

- Laser Measurements 1968-1987 and Beyond;
- Waves and Spectra: A Modern Perspective;
- Queuing and Coding in Multi-User Communications: Ideas, Techniques, Theory;
- Coherent Optical Fiber Communications
- Recent Research on Lightning;
- Present and Future Research on Wave Propagation;
- Aspects of Ionospheric Physics Relevant to Radio Propagation;
- Present and Future Trends in Research in Waves in Plasmas;
- Radio Astronomy - New Horizons.

Two special sessions were arranged for the young scientists who attended the General Assembly under the Young Scientists Programme in order to give them an opportunity to describe their research work.

List of URSI Officers and Officers of Member Committees

Following the elections at the XXII General Assembly in Tel Aviv, Israel, the Officers of the Union and the URSI representatives on other organizations 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.

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Commission F - Wave Propagation and Remote Sensing

Chairman: Prof. R.K. Crane (USA)
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Commission G - Ionospheric Radio and Propagation

Chairman: Dr. H. Rishbeth (UK)
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Chairman: Prof. H. Matsumoto (Japan)
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Commission J - Radio Astronomy

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Vice-Chairman: Dr. T. Sarkar (USA)

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International Space Year

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

Environmental Consequences of Nuclear War

Chairman: Mr. M. Wik (Sweden)

Scientific Programme for XXIII URSI General Assembly

Coordinator: Dr. P. Bauer (France)
Associate Coordinator: Prof. J. Bach Andersen (Denmark)

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IUCAF (Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science):

Dr. J.W. Findlay (USA) and Dr. B. Robinson (Australia)

ICSU (International Council of Scientific Unions):

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FAGS (Federation of Astronomical and Geophysical Services):

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SCOSTEP (Scientific Committee on Solar-Terrestrial Physics):

Dr. R. Woodman (Peru)

SCAR (Scientific Committee on Antarctic Research):

Dr. G. Pillet (France)

SCOR (Scientific Committee on Oceanic Research):

Dr. G. Valenzuela (USA)

COSTED (Committee on Science and Technology in Developing Countries):

Prof. Feng Shizhang (China, CIE)

IUWDS Steering Committee (International Ursigram and World Days Service):

Dr. B.M. Reddy (India)

MAP Steering Committee (Middle Atmosphere Programme):

Dr. R.A. Vincent (Australia) and Dr. T.E. Van Zandt (USA)

WITS (World Ionosphere/Thermosphere Study):

Dr. A.P. Mitra (India)

CPEM (Conference on Precision Electromagnetic Measurements):

The Chairman of Commission A ex officio.

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Assistant Secretary General:	Prof. P. Delogne
Executive Secretary:	Mrs Y. Stevanovitch

OPENING MEETING

Tuesday, 25 August 1987

The Opening Meeting was held at the Hilton Hotel, in Tel Aviv, in the presence of about 800 participants and guests.

The first part of the programme was chaired by Dr. J. Shapira, President of the Israeli URSI Member Committee and Chairman of the Organizing Committee, who introduced Prof. J. Ziv, representing the Israel Academy of Sciences and Humanities.

After a brief reply by the President of URSI to the welcoming remarks made by these speakers, there was a musical interlude. The President of the Union then took the chair and invited the Secretary General, Prof. J. Van Bladel, to present his Report.Dr. R. Strużak delivered a message from Mr. R.C. Kirby, Director of CCIR, who had been unable to attend the General Assembly. Dr. A.P. Mitra concluded the second part of the meeting by delivering his presidential address

The third part of the Opening Meeting was chaired by Prof. S. Okamura, Vice-President of URSI and Chairman of the Awards Advisory Panel; The URSI awards for distinguished work during the period 1980-1986 were handed over to the four laureates as follows:

Balth. van der Pol Gold Medal: Dr. T. Hagfors (Norway)

J.H. Dellinger Gold Medal: Dr. R. Gendrin (France)

Appleton Prize: Dr. S. Kato (Japan)

Issac Koga Gold Medal: Dr. D.M. Pozar (USA).

WELCOME

by Dr. J. Shapira
Chairman, Israeli Organizing Committee

Mr. President, honorary and acting officers of URSI, ladies and gentlemen,

As Chairman of the Israeli Organizing Committee, I am pleased and honoured to welcome you at this XXIInd General Assembly of URSI in Tel Aviv.

Radio Science is a long-time resident in this country. The Bible is the most famous textbook on communication, people-to-people and God-to-people. Communication in the Bible, which is the story of this country, is described vividly, almost technically. Our prophets claimed to being vision (or video) telecommunicators. The word electricity originates in a prophecy scene of Ezekial, relating to either a physical or a tele-imaged heavenly flight vehicle. At a later time, in the period of the Second Temple, a comprehensive telecommunication network was established throughout the Middle East in order to maintain the full cultural and religious life between Israel and its diaspora. A network of mountain-top fire signals was laid over

hundreds of kilometers, connecting Israel via Iraq, Syria and others.

We have here a deep sense of tying this cultural command with the evergrowing scientific and cultural interaction across the world. Our scientific and related industrial activities encompass six universities, some research institutes and a dynamic electronic industry, where 37,000 employees are engaged in high technology research, development and production. The R & D extent in the electronics industry in Israel reaches 16 percent and has brought us recognition in many areas, e.g. medical diagnosis, picture and graphics processing, automatic inspection, radars, communication, electro-optics, software and others. We are proud to host the XXIInd General Assembly and hope it will further strengthen our interaction with the international scientific community.

URSI is unique among the organizations and societies relating themselves to the broad area of communication and sensing - unique in its global coverage of the field and in its commitment to promote science through international collaboration, and not only express achievements of the individual members. The Israel Committee for Radio Science is nominated, chartered and operates accordingly. At present it consists of 35 members. The Committee discusses and consults to different ministries on national scientific issues, holds symposia and represents Israel in the URSI forum.

I am pleased to report the attendance of 699 participants in this Assembly from 34 countries, including 124 participants from Israel.

A special welcome is reserved to the delegations of the Member Committees of the Chinese Institute of Electronics, Beijing, and of Thailand, for whom this Assembly is the first as full fledged members, and to the Egyptian delegation, for whom we have special warm greetings.

We are pleased to acknowledge the support our Organizing Committee received from government ministries and institutes, universities and industry. These are listed in our publication. Thanks are due to the URSI Council for accepting our invitation in 1984, to the URSI Secretariat and to the URSI Steering Committee. My own thanks are extended to my colleagues in Israel who volunteered to the Organizing Committee.

I wish us all a fruitful and an enjoyable General Assembly.

Thank you.

WELCOME ADDRESS

by Professor J. Ziv
representing the Israeli Academy of Sciences

Members of the podium, ladies and gentlemen,

On behalf of the Israeli Academy of Sciences, I would like to welcome all participants in the XXIInd General Assembly of URSI, which is being held in Israel for the first time, thus joining a long list of important scientific meetings.

We are deeply honoured by the URSI Council which accepted our long standing invitation.

The Israeli community of scientists and engineers who are active in Radio Science is perhaps the largest among the various scientific communities in Israel, and I am proud to count myself among the members of this group, and among the members of the Israeli Commission C, in particular.

Communication via electromagnetic waves is deeply rooted in the history of this part of the world.

Fire signals from one hill top to the other all the way from here to Mesopothamia were used about two thousand years ago, to announce the beginning of a new lunar month, in order to re-synchronize calendars.

I sincerely hope that you will have enough free time to tour our country. While doing so you will be able to notice the numerous archeological diggings all around. It should be noted that not a single piece of copper wire was found through all these diggings, and some people take this as a strong evidence of the fact that wireless communication was utilized here thousands of years ago...

I wish you all very useful deliberations and a pleasant stay in Israel.

Thank you.

REPLY BY THE PRESIDENT OF URSI

Dr. A.P. Mitra

Professor Jacob Ziv of the Israeli Academy of Sciences and Humanities,
Dr. Shapira, Chairman of the National Organizing Committee,
Distinguished Delegates and Invitees,

May I at the outset, on behalf of the URSI and on my behalf, say how delighted we are to be here in this land of the Bible with its thousands of years of history and its more recent remarkable efforts in science and technology. It is a nation at once very old and very young. Its old history relating to communication mentioned earlier will be of interest to many participants. This is the first time URSI is being held in this part of the world.

The URSI is a body of distinguished scientists - nongovernmental, interdisciplinary, global - , scientists working in different areas of radio science, on telecommunications, on radio probing of the land, oceans, atmosphere, on bodies outside the Earth and its solar system, sharing in the excitement of information and communication revolution. It is a scientific community with 39 Member Committees. It believes in sharing of knowledge across national and geographical borders; it believes that science is universal and that today's young scientists will be tomorrow's leaders and must have all the encouragement. It believes that the benefits of its knowledge must extend to countries that are called 'developing' for, otherwise, it cannot remain global, and that as Tagore in my country said, he who gives also receives.

This General Assembly will address itself to a wide variety of topics, some basic, some at the cutting edge of knowledge, in areas as widely different as the encounters with comet Halley, remote sensing, present and future trends in radio communication, digital optical techniques, computing and switching, and many others. Scientists have been gathered from all over the world, old and young, from developing and developed world; new results will be presented. New ideas will emerge. And this is how it should be.

And while we do science, I hope the ladies and other accompanying persons, will take all the opportunities of savouring the pleasures and excitement of this beautiful place. As I look out from the verandah of my hotel room, I regret that my wife is not accompanying me.

Dr. Shapira and his colleagues, and the many young ladies who are trying to make this conference useful and our stay memorable, deserve our most sincere thanks. I hope his broken arm has not resulted from his URSI efforts - for we would hate to think we have caused him so much discomfort. We are very grateful to him and his group for taking care of our young scientist awardees who are our pride.

Ladies and Gentlemen, let us thank our hosts for this XXIInd

General Assembly of the URSI which, I am sure, will leave an unforgettable impression on all of us.

REPORT OF THE SECRETARY GENERAL

Prof. J. Van Bladel

It is the duty of the Secretariat to present a short report on the scientific activities, the finances, and the administrative situation of the Union in the past triennium. This Report is traditionally given partly in English and partly in French, the two official languages of URSI.

A survey of our activities in the last three years shows that they have followed the same pattern as in 1981-1984. This is true, in particular, of the scientific meetings. URSI has sponsored, in the three available modes, a total of 66 meetings, 24 of which were URSI-generated, the rest organized by external Societies. To the latter our Union contributes its good will and cooperation, and possibly a modest financial support, mainly earmarked to increase the participation of Young Scientists. The Young Scientists Programme, which brings some 45 young people, belonging to 25 nations, to Tel Aviv, is one of the main concerns of our Union, as it is in perfect harmony with our international vocation. President Mitra will speak at greater length about this programme, which has been the responsibility of Prof. Cullen during the last triennium.

The whole mechanism of sponsorship of meetings will be under discussion at this Assembly. It has been remarked that the number of URSI-generated meetings is not very high, and should be increased. Some of our Commissions do not generate their own meetings at all, and only three of them, B, E, F, have recurrent efforts, to wit: the triennial EM Theory Symposia, the conferences on Wave Propagation and Remote Sensing and the meetings on Microwave Signatures in Remote Sensing. There is also the annual Electromagnetic Compatibility Symposium, held alternately in Zurich and Wrocław. A new effort will be made to convince each Commission to hold at least one important recurrent meeting between General Assemblies, a strategy on which our Union wishes to concentrate its available financial resources. Proposals will be made to increase the role of the Commission Chairmen in the sponsoring effort, and possibly to modify the rules for sponsorship.

The Programme of the present Assembly has been elaborated under the guidance of a Steering Group under the expert guidance of Dr. Pierre Bauer. The menu is very abundant, and reflects our traditional strength, which is to bring together scientists belonging to all the disciplines encompassed by the Radio and Telecommunication Sciences. To increase this cross-fertilization effort, the programme contains, in addition to the now traditional three general lectures, nine non-overlapping tutorials, one per Commission, These tutorials are designed to give, for the benefit of those who are not particularly

familiar with the work of a given Commission, an idea of the most important scientific problems - present and future - in the area of the Commission in question. This increased focus on the inter-disciplinary character of our Assembly has been catalyzed by the questionnaire which was distributed at our previous General Assembly in Florence. Such a questionnaire has again been included in the registration papers. May we urge the participants to complete this document, a very simple task indeed, and to drop it in one of the two available ballot boxes, one at the Hilton and one at the Palace. These documents are important for the success of the 1990 Assembly.

Un problème qui se pose depuis des années, et qui est revenu à l'ordre du jour lors des journées de méditation de Corsendonk, sur lesquelles le Président Mitra s'étendra plus longuement, est celui des publications. Jusqu'à quel point l'URSI doit-elle s'engager dans ce domaine? Nos publications principales sont le Bulletin, à caractère administratif, les Comptes Rendus des Assemblées générales, et la Revue Radioscientifique triennale. Cette année-ci s'y ajoute un volume contenant les trois conférences générales et les neuf exposés synthétiques des Commissions. Ce volume, élaboré sous la direction du Prof. Cullen, sera distribué aux participants à l'Assemblée générale, mais sera en plus diffusé ultérieurement par les soins des Presses de l'ICSU. Quant à la Revue Radioscientifique, composée cette année sous la direction de M. Hyde, elle comporte comme d'habitude une mine d'informations de premier ordre, glanées par des dizaines de collaborateurs bénévoles. De nombreuses voix se sont élevées pour demander que la distribution de ce document impressionnant soit fortement augmentée, afin que les efforts de ses innombrables pères spirituels jouissent du rayonnement qu'ils méritent. Il a également été suggéré que le nombre de pages de la Revue soit sensiblement augmenté, permettant ainsi de citer de nombreux articles de valeur que les restrictions actuelles doivent malheureusement éliminer. Ce problème sera examiné en profondeur à la présente Assemblée, ainsi que la possibilité de publier une Lettre trimestrielle, voire même un périodique scientifique propre à l'URSI. Ces initiatives sont hautement désirables, mais leur réalisation nécessite des efforts considérables, que le Secrétariat ne pourrait fournir sans une extension que nos moyens financiers actuels ne permettent pas. Il faudra donc trouver de nombreuses bonnes volontés, et des organismes disposés à financer cet effort accru, qu'ils soient commerciaux ou sans but lucratif, comme les Presses de l'ICSU ou l'UNESCO, qui a patronné la publication du "Manuel de Propagation dans les Pays Tropicaux", volume qui vient de sortir sous l'égide de notre Union.

I already mentioned that the activities of URSI followed a fairly unchanging pattern during the 1984-1987 period. It is felt by many that this period of stable operation must come to an end, and that a reexamination in depth of the goals and modi operandi of URSI is overdue. Several worthwhile suggestions were made in Corsendonk. They all require a healthy financial structure. In the last triennium, our activities could be maintained within the pale of a constant unit contribution. This was made possible by the low rate of inflation, and the high rate of exchange of the dollar in 1984 and 1985. The present drastic drop in this rate is a source

of constant concern for our Treasurer, Dr. Albrecht, and for the Finance Committee, which must submit a healthy budget for the 1987-1990 period to the Council. The root of the problem is that roughly half the expenses of URSI are incurred in non-dollar currencies, mostly West European, while the unit contribution is expressed in dollars. These difficulties are common to many Scientific Unions. A situation of the same nature developed in the late seventies, at a time when URSI made ambitious plans to strengthen its commitment to Telecommunications. These plans were endangered by a drastic fall in the value of the dollar, which resulted in an important weakening of the Secretariat, and a parallel loss of efficiency. One of the ways to increase the strength of our Union would be by modifying its membership structure, including formal individual membership, and an affiliate membership open to industrial firms. Proposals to that effect will be put before the Council. They should result in a renewed vitality for URSI, a process in which the present General Assembly will hopefully play an important role.

PERSPECTIVE ON RADIO SCIENCE FOR INTERNATIONAL TELECOMMUNICATIONS

Message addressed by Mr. R.C. Kirby, Director, CCIR

and delivered by Dr. R. Strużak, Councellor, CCIR

International telecommunications require a range of common understanding of technical elements for inter-working of systems or networks, and for compatible use of the radio-frequency spectrum. Regulatory and administrative arrangements, and development of standards, are carried out in the framework of the International Telecommunication Union.

The ITU's Consultative Committees, the CCITT and the CCIR, study technical and operating questions and issue recommendations. The CCITT guides overall network matters for public telecommunications and tariff questions. The CCIR studies radio communications without limit of frequency range. Both develop recommendations on system characteristics. The CCIR recommends technical aspects of spectrum utilization, and prepares technical bases for administrative radio conferences which regulate and plan uses of the frequency spectrum.

Specific engineering research is devoted to the CCI process in laboratories of government, industry, and telecommunications organizations. The scientific bases - communication theory, techniques, devices and measurement - come from ongoing research in universities, government and industry. From the earliest years, URSI has served to couple radio science to communications, beginning with radio wave propagation.

For two decades, the mainstream of science for communication development has been in communication theory - signals and systems - microwave and optical devices, and in electromagnetic noise and

interference. URSI has fostered these sciences at the international level.

Trends in technology and services

Today, most telecommunication systems are analogue, but transition to digital networks is the most significant feature of development. Fuelled by computer technology, the economies of digital hardware, the power of digital processing, and the quality and reliability of digital systems using both cable and radio media, accommodate a variety of services sharing the same transmission and switching facilities. The Integrated Services Digital Network is the theme of public telecommunication planning worldwide. ISDNs are being introduced gradually in a number of countries. Accompanying digital technology is a revolution in transmission technologies to accommodate the much greater bandwidth requirements. What used to be a 4 kHz voice channel is now nominally a 64 kbit/s digital stream; television involves source rates up to 216 Mbit/s, or 1 064 Mbit/s for high definition. Wide band transmission media, such as optical fibres and radio systems using high-level modulation, are required to obtain such high capacities.

Optical fibre cables are planned to carry a sharply increasing share of fixed national network and transoceanic trunk communications. The first trans-Atlantic cable, with a capacity of 560 Mbit/s, is to be operational in 1988, while two fibre-optic submarine cables will span the Pacific by mid-1989. The development of coherent optical transmission will increase again significantly the sensitivity and capacity of light-wave communication systems. Progress of the tunable monolithic semiconductor laser diode and the optical amplifier will greatly expand the future of optical communication systems.

Continued importance is foreseen for terrestrial microwave radio-relay systems which today supply about half the long-distance message capacity in North America, Europe and Japan. Evidently the North American high capacity digital network of the early 1990s will use about half microwave on long-haul routes between service nodes, as well as light-wave and digital coaxial cable transmission. In Japan, microwave radio relay in bands from 2 to 20 GHz is used for about half of all telephone circuits and most television programmes, with the entire radio-relay network to be digital by the year 2000. International trunk connections in Africa and South America will depend on both microwave radio relay and satellites. Network planning in the Asia-Oceania region includes a large portion, in some cases more than half, of microwave radio relay for main trunks in national networks, and many international trunk links. CCIR's work in radio relay is concentrated on standards for digital systems, including channelling and multiplexing arrangements, and the use of higher frequency bands, i.e. 18 GHz and above.

Satellite links are increasingly used with small earth stations for domestic networks for data, television, point-to-multipoint services. Small-aperture, low-powered terminals are being installed by the thousands for business applications. Small satellite terminal

concentrators are seen as an economical contribution to rural communications in developing countries. Two developments impact significantly on the future for satellites in public telecommunication networks. The first is optical fibre cable networks, and the second is integrated services digital networks. Optical fibre cables will carry an increasing proportion of public network trunk traffic in international national services. But satellites remain a cost-competitive alternative to transoceanic cables, and important for point-to-multipoint services, and routes where the traffic density is more economically carried by satellite. Growth of satellite capacity continues, and the Second Session of a World Conference on planning the use of the geostationary-satellite orbit will be held in 1988. CCIR's continuing studies concern efficient utilization of the spectrum in the geostationary-satellite orbit, and standards for digital satellite systems which can assure fully compatible performance in ISDN networks. Multi-beam satellites, and the use of higher frequencies (20 and 30 GHz) are stressed in present research. For the 1990's, new services may be possible using smaller earth stations, 30 and 20 GHz bands, and hopping spot beam techniques.

Mobile services are the most rapidly growing element of telecommunications, and their future is digital as well. There is increasing focus on integration with the terrestrial network to facilitate movement over wide areas and international operation. Cellular mobile radio systems are being installed rapidly in many areas, with continuous need to increase capacity and coverage. The concept of future universal portable or mobile communications is a natural complement to wideband fixed networks, with cellular radio or "cordless" extensions in local areas.

Radio and television broadcasting is at a crossroad, especially in industrialized countries in this multi-media era of video cassettes, cable systems and satellite distribution. But development of the technology has been rich, and the trend to digital sound and television studio production, recording and network exchange, and high-definition images equivalent to wide screen cinema, will enhance future broadcasting. International standards have been adopted for digital colour television to provide a common denominator for digital exchange in component form. The recommendation provides for broadcast in any of the world's standards, NTSC, PAL or SECAM. The standard provides for a family of digital hierarchies which can range from high-television definition at bit rates of greater than 1 Gbit/s, to compressed transmission of 34 to 70 Mbit/s for today's image standards and electronic news gathering applications. With production now widely available, a number of production centres starting to use HDTV, studies are shifting to transmission and distribution systems to the home viewer. Television is a rich field for the science of signal processing and information compression. Eventually, digital transmission to the viewer should be feasible, permitting new services and high quality images.

Review of trends in communication development would not be complete without attention to the role and special problems of developing countries, where communications may be far from adequate and resources are limited for their improvement. Confidence in

planning and coordination requires good knowledge of system performance and alternatives. This requires local technical data and expertise, not only in traffic and equipment, but in radio system planning. Terrain data may be obtainable, but propagation in local meteorological environments may not be well known.

Radio Science for the 1990s

International development of telecommunications is essentially an economic and political matter. We have seen, however, that a range of common understanding on technical matters is essential for interworking and compatibility.

Radio spectrum congestion remains a fundamental problem, threatening the usefulness of some services such as short-wave broadcasting, and impeding the development of new ones such as mobile communication and high-definition television. Information and bandwidth capacities of communication links of all types may expand ten to a hundred fold in the 1990's. To increase communication capacity in the radio-frequency spectrum remains a fundamental goal. Management of the spectrum resource needs to be re-examined scientifically, particularly the traditional concept of allocation of frequency bands to different services.

Radio propagation data and prediction methods for tropical regions remain important to planning, considering not only rainfall attenuation but significant occurrences of super-refraction. URSI encouragement and assistance to scientists in developing countries are positive contributions.

Throughout its life, URSI has broadened the horizons of radio science. It is significant today that signals and systems studies in URSI embrace much of information science. URSI studies of electronic and optical devices treat the significant component development for communications and information technology. The central feature of communications technical development is the convergence of computer science, information processing and communication technology. URSI has recognized and contributed to these trends, and may be expected to continue significant contributions to telecommunication in coming years.

PRESIDENTIAL ADDRESS

Dr. A.P. Mitra

URSI is very happy to hold its XXIInd General Assembly in this part of the world. I do hope you will enjoy your stay here and benefit greatly from the scientific deliberations.

Between the last General Assembly and this, the single most important event has been URSI's own soul-searching. It was increasingly being felt that URSI's goals needed to be reassessed and clearly defined, its links with professional societies revitalized, its internal organization restructured, its horizons broadened to include especially the developing countries, and that the role of young scientists should gradually increase. There was a need to identify its missions. To debate on these questions, a get-together was held at Corsendonk near Brussels in March this year, in line with ICSU's Ringberg Conference. Apart from the URSI Officers and the Commission Chairmen, representatives from outside organizations like CCIR, CCITT, TWAS, ESTEC, IEEE, etc. attended the meeting.

The main recommendations that emerged are that the future activities of URSI should be oriented towards two broad goals, namely

(i) Geophysics and probing of land, oceans, atmosphere, biological systems, and extra terrestrial objects using radio waves, and

(ii) Communications.

In communication, the contributions from URSI Commissions C and D are going to be vital in years to come in addition to Commissions F and G. It was clear that since URSI draws its sustenance from the scientific activities of the Commissions, these will have to lead the way. URSI must build on what are its unique features: its interdisciplinarity, its global nature, its strength in fundamental science, and its ability to provide a forum for newly emerging areas that will provide tomorrow's technology (as in room temperature superconductors). In this connection, it is imperative that the symbiotic relationship between science organizations like URSI and technological organizations and professional bodies be restored. In particular, links with CCIR and CCITT must be reinvigorated. Apart from these operational links, other relations must be fostered to raise URSI's stature further as a global body. It is somewhat incongruous that despite telecommunication and remote sensing being of critical interest to all developing countries, only 9 such countries are presently represented in URSI. A major recommendation of the Corsendonk meeting was that URSI should play an increasing role towards developing countries. One approach is the suggested introduction of several new categories of membership, for example, the "associate members" without voting rights for committees considering membership. URSI can also establish contacts with developing countries through the programmes of the Third World

Academy of Sciences and the International Centre for Theoretical Physics at Trieste. For instance the URSI community could contribute significantly to its programme by providing books, journals and spare parts of equipment to the Third World countries.

Another important concern related to the title of the Union. It was felt that, while the logo should not be changed, the explanatory title could include "electronics", "information science" and/or "communications".

Lastly the role of young scientists in URSI activities must gradually increase.

Regarding two of the recommendations of the Corsendonk Conference, namely support for Young Scientists and developing countries, URSI already has fairly vigorous programmes.

The Young Scientists programme of URSI was initiated in 1969 at the Ottawa General Assembly, but became a major regular programme only in 1981, when 25 Young Scientists attended the Washington Assembly, 12 of them from developing countries. Since then it has become an integral part of the URSI General Assemblies. In Florence, in 1984, 43 Young Scientists attended, coming from as many as 33 different countries. A special session was organized on 3 September 1984 for presentation of papers by Young Scientists. After the General Assembly, a number of these Young Scientists attended a Workshop in Trieste on Troposphere, Stratosphere and Mesosphere,which was organized by URSI with the support of the ICTP. At the present General Assembly, 47 Young Scientists from 23 different countries, including two Booker Fellows and a Royal Society scholar, have been invited; 15 of them from developing countries. May I request all these young awardees to stand up and let us applaude them? One important point about this programme is that many of the young scientists come from countries which are not affiliated with URSI. Further they are selected from both developing and developed countries, in roughly equal proportion, and are put up together so that they can develop friendship. After the General Assembly, they receive the "Review of Radio Science" and certificates of awards. In addition to the General Assemblies, Young Scientists are also given financial assistance to attend URSI-sponsored Symposia. In the period between 1985-1987, 41 Young Scientists were thus helped, 20 of them being from developing countries.

The URSI Programme for developing countries is carried out through its Committee for the Developing Countries. The programme involves supporting Young Scientists from developing countries as already mentioned, holding symposia and training courses either for or in the developing countries, and publication of documents of interest and their free distribution. A number of such symposia were held between 1984 and 1987. The Workshop on Troposphere, Stratosphere and Mesosphere was held in Trieste in 1984, jointly with ICTP. About 80 participants attended the workshop. In 1985, the International Antenna Symposium was held in Beijing, China, between 26 and 28 August, while the Asia Pacific Metrology Conference was held in New Delhi between 2 and 13 December. The latter was attended by scientists from 15 developing countries, and some of the key

lecturers were provided by URSI. Once again in 1986, New Delhi was the venue for the Asia Pacific Microwave Conference on Semiconductor Technology on 19-20 October. This year (1-4 April), Buenos Aires was the venue for the Biregional Latin American/African Workshop on Radio Propagation and Spectrum Management.

Some of URSI publications related to developing countries are:

1. "Directory of Radio Scientists in Developing Countries": an informal version was brought out in 1985, and the revised version is now being prepared with the financial assistance of TWAS.
2. "Handbook of Radio Propagation in Tropical and Subtropical Countries": a draft version has already been printed and distributed in 1985, and the final version has just been brought out with the financial assistance of UNESCO (through IPDC) and ICSU.
3. "Directory of Calibration Facilities in the Asia-Pacific Region": now under preparation.

I would like to convey to the Committee for Developing Countries URSI's appreciation for these very major efforts.

URSI has a long tradition of participating in global collaborative scientific programmes, several of which initiated by the International Council of Scientific Unions to which URSI belongs. Presently the most crucial of such programmes are:

1. ICSU Geosphere-Biosphere Programme, or the Programme on Global Change where URSI can contribute through its expertise in radio science techniques for remote sensing of the atmosphere in the broadest sense, including the ionosphere and magnetosphere, the ground, the sea surface, and the subsurface medium, thus involving a number of URSI Commissions.

2. ICSU Study on Environmental Effects of Nuclear War, in which URSI was requested to provide information on the electromagnetic pulse resulting from a possible nuclear warfare scenario. The report prepared by the URSI ad hoc Group under the chairmanship of Mr. M.Wik was an important input and was appreciated by the world community.

3. The International Space Year, scheduled for 1992. URSI has already indicated its interest in participating in this programme. Here URSI can contribute through its expertise in remote sensing of land and oceans, VLBI techniques in radio astronomy and geodesy, solar-terrestrial physics and world-wide telecommunications.

There are a number of other collaborative ventures of potential interest to URSI. The continuation of the Middle Atmosphere Programme (MAC) as well as the newly introduced programme: World Ionosphere - Thermosphere Study (WITS), both initiated by SCOSTEP, will lead to the Solar-Terrestrial Energy Programme (STEP). In turn STEP relates to many aspects of the Global Change Programme.

URSI has in the past had many joint symposia with COSPAR, and expects to have several in 1988.

URSI maintains useful relations with a number of external organizations. It has a strong bond with UNESCO, particularly with the

Directorate of Science (Dr. Kaddoura). Through Dr. Kaddoura, financial support has been obtained for the attendance of young scientists at the General Assemblies in Florence and Tel Aviv. Further, UNESCO helps to identify young scientists from outside the URSI Member Committees. Of late, a highly promising relationship is emerging between the UNESCO International Programme for the Development of Communication (IPDC) and URSI. The basic purpose of IPDC is to create infrastructures, both technical and human, in developing countries. As already mentioned, IPDC is contributing significantly to the "URSI Handbook of Radio Propagation for Tropical and Subtropical Countries".

I would also like to say a few words about our relations with the International Radio Consultative Committee (CCIR), as relations with such technical organizations must improve in years to come, as emphasized at the Corsendonk Meeting. I take this opportunity to welcome Dr. R. Struzak, who represents CCIR at this Assembly.

As of now the links with CCIR and CCITT have already largely depended upon the interests and dynamism of a few URSI scientists, most of whom were or are involved in both organizations. These links should now be improved in a number of ways. The "URSI Handbook on Radio Propagation for Tropical and Subtropical Countries" is of considerable interest to the CCIR and may provide a catalytic role. Joint meetings of URSI and CCIR should be considered where focus is on specific CCIR study questions.

URSI welcomes the following representatives of other organizations at our General Assembly: Prof. W.E. Gordon for the International Council of Scientific Unions (ICSU); Prof. G. Swarup for the International Astronomical Union (IAU); Dr. P. Bauer for the International Association of Geomagnetism and Aeronomy (IAGA); Mr. F. Delahaye for the Bureau International des Poids et Mesures (BIPM); Mr. P.O. Lundbom for the International Electrotechnical Commission (IEC); Dr. Y.M. Timnat for the International Astronautical Federation (IAF); Prof. S. Bowhill and Prof. W.I. Axford for the ICSU Committee on Space Research (COSPAR); Dr. G. Pillet for the ICSU Committee on Antarctic Research (SCAR); Prof. C.H. Liu for the ICSU Committee on Solar-Terrestrial Physics (SCOSTEP); Dr. J.W. Findlay for the Inter-Union Commission on Frequency Allocation for Radio Astronomy and Space Science (IUCAF).

Of the five Honorary Presidents of URSI, only Prof.W.N. Christiansen has been able to come. We welcome him. We will miss the others: Sir Granville Beynon, Prof. H.G. Booker, Prof. W. Dieminger and Mr. J.A. Ratcliffe. We are also sorry that Prof. J. Bach Andersen, Chairman of Commission B, and Prof. J.A. Gledhill, Chairman of INAG, are unable to attend the Assembly.

We are grateful for the messages sent by the Third World Academy of Sciences and the ICSU Committee on Oceanic Research.

The organization of the present conferences owes much to the Coordinating Committee and to Dr. P. Bauer, who chaired the Steering Group for the Scientific Programme. I would like to thank him and his colleagues. We owe a debt of gratitude to Dr. G. Hyde, who shouldered the very difficult task of editing and bringing out the

"Review of Radio Science 1984-1986" - a feat I did not believe possible given several constraints. Prof. Van Bladel, Secretary General, and Prof Delogne, Assistant Secretary General, have been the nerve centres and sometimes the testing boards for our efforts and ideas. Professor Gordon was the spirit behind the Corsendonk Conference. URSI owes much to him. And finally, to Mme Stevanovitch, may I express my thanks, my admiration and my affection for all she has done.

I now have the sad duty of paying homage to the memory of a number of distinguished URSI scientists who left us between the last General Assembly and now.

Dr. Francis Hugh Campbell Morgan Minnis, the Secretary General of URSI between 1967 and 1979, passed away on 25 December 1985. He will be remembered by many of us as a very warm personality, a respected scientist and a scientific administrator of the highest calibre. Few were better equipped than him to become Secretary General, first of the IQSY and then of URSI. Dr. Minnis organized four General Assemblies of URSI: Ottawa 1969, Warsaw 1972, Lima 1975, and Helsinki 1978. He retired after the 1978 General Assembly. On his retirement, URSI awarded him the title of Secretary General Emeritus.

Prof. Janusz Groszkowski, Vice-President of URSI from 1966 to 1972, passed away on 3 August 1984. He had been associated with URSI for a long time, as President of the Polish URSI Committee from 1959 to 1972. Prof. Groszkowski trained many generations of prominent Polish engineers and scientists and was also the President of the Polish Academy of Sciences from 1963 to 1972.

Sir Martin Ryle passed away on 14 October 1984. He was the first recipient of the Balth. Van der Pol Gold Medal. Through this award, URSI recognized his genius as early as 1963. He was knighted in 1966 and later received the Nobel Prize for Physics in 1974, jointly with Prof. Anthony Hewish. His most spectacular achievement was his conception and the ultimate successful development of the synthetic aperture technique in radio astronomy.

Prof. Ernst-August Lauter, a pioneer of radio science research in the German Democratic Republic, passed away on 21 October 1984. He was a member of the URSI Committee in the GDR and a member of the former URSI Committee for Solar-Terrestrial Physics. He was one of the first to promote, in the early seventies, the idea of an international cooperative programme for the study of the stratosphere, the mesophere and the lower ionosphere, which later took shape in the present Middle Atmosphere Programme, MAP.

Prof. K.R. Ramanathan, the doyen of geophysical sciences in India, died on 31 December 1984. He was the Chairman of the Radio Research Committee which was then the URSI Committee in India, from 1963 to 1973. Prof. Ramanathan, along with Sir K.S. Krishnan, were the personalities behind the remarkable succes of the Indian programme for the IGY and the IQSY. He received many awards both in India and abroad, and was elected President of the International Union of Geodesy and Geophysics (IUGG) in 1957.

Prof. Ivo Ranzi, the Italian Official Member of URSI Commission III (now "G") from 1938 to 1968, passed away on 14 August 1985. He had been one of the pioneers of experimental research in ionospheric physics. He was President of CCIR Study Group IV from 1959 to 1978.

Dr. F.W. Chapman died on 20 December 1985. Dr. Chapman attended the General Assemblies of URSI in 1950, 1952 and 1954, and participated in the activities of the Commission on Radio Noise of Terrestrial Origin.

Mme Yvonne Herbays, the widow of Colonel Herbays, the Secretary General of URSI from 1948 to 1967, passed away on 16 August 1985. As the constant companion of her husband, she was known everywhere in URSI circles; her cheerful disposition was always appreciated by those with whom she came into contact. She maintained contacts with URSI until her death.

Prof. Haruo Tanaka, President of the URSI Committee in Japan, passed away on 27 October 1985. He contributed to URSI Commission J as Vice-Chairman from 1975 to 1978, and then as Chairman from 1978 to 1981. He made important contributions, in Solar Radio Astronomy, on precision measurements of the solar radio noise and on the location of radio noise sources on the sun at microwaves.

Prof. Walter Ernst Gerber, President of the Swiss URSI Committee from 1960 to 1979, passed away on 29 November 1986. He was a well known figure in the field of Radio Science in Switzerland, and maintained a keen interest in the activities of the Swiss Committee even after his retirement from it.

Dr. Geza Bognar, President of the Hungarian URSI Committee from 1966, died on 7 February 1987. In the course of his professional life, he was many times awarded the highest decorations, and he will be remembered with affection by the URSI family.

Prof. J. Figanier, member of the Portuguese URSI Committee, died on 7 April 1987.

Prof. Giorgio Barzilai, President of the Italian URSI Committee for many years and a candidate for Vice-President of URSI, died recently.

May I request you to stand in silence for one minute in memory of these departed distinguished URSI scientists.

Ladies and Gentlemen, may I again welcome all the distinguished participants in this Assembly and wish it success.

Note: The report on the Awards Ceremony appears on page 29.

CLOSING MEETING

Wednesday, 2 September 1987

The Closing Meeting of the General Assembly was held at the Tel Aviv Hilton Hotel at 6 pm on 2 September 1987.

CLOSING REMARKS BY THE SECRETARY GENERAL

At the request of the President, the Secretary General announced the results of the elections for the Board of Officers, Chairmen and Vice-Chairmen of Commissions for the period 1987-1990. He also made the following remarks:

"I have been given the task of leading the Secretariat for another three years. This was not planned, and I would not have accepted this responsibility if Mrs Stevanovitch had not agreed to stay on as Executive Secretary. At the opening ceremony, Dr. Mitra recognized the merits of Mrs Stevanovitch. At the end of this General Assembly, during which she worked so often deep into the night to prepare the following day's documents, while answering a never ending flow of questions during the normal working hours, I have an opportunity to express my own admiration for her unfailing good spirits and sense of humour, and my thanks for the soundness of the advices she gives to one and all, together with the depth of her concern for the future of our Union".

The Secretary General then concluded by making a few additional announcements concerning decisions made by the Council.

(a) The Council accepted the invitation of the Member Committee in Czechoslovakia to organize the next General Assembly. The venue will be Prague, in August 1990.

(b) The Council decided to create a Standing Publications Committee, in line with URSI's desire to expand its publishing effort, including the start of a Newsletter, initially attached to the Bulletin, and the continuing publication of "Handbooks on Radio Propagation" in the form of a series. Consideration is being given to sponsorship of a periodical on Signals, Systems and Electronics, carrying the URSI logo.

(c) The Council decided to create a new class of membership, the Associate Member Committees, allowing participation in URSI activities without financial contribution, for a limited period of time. Affiliate membership and individual membership are still under discussion.

CLOSING REMARKS BY THE PRESIDENT

All good things must come to an end, and so does this Assembly. Looking back, we have reasons to be pleased. The participation in this Assembly has been better than expected, although unexpected absences have sometimes caused problems, this is nothing new. The scientific qualities of the sessions, joint or individual, have been unquestionably good. The tutorials, so carefully organized for each Commission, and for the first time made available in advance in the form of the volume "Modern Radio Science" have been much appreciated. The General Lectures, of course, have been, as we would expect from such distinguished speakers, of the highest quality. I would like to take this opportunity to thank, on behalf of the URSI, the three distinguished speakers - Dr. Seguin, Prof. Midwinter and Prof. Axford - for these outstanding lectures and also for forgiving us for some inconveniences. Such lectures bring together scientists from all Commissions and underline the multidisciplinarity aspect of the URSI.

We are also glad that the Corsendonk Meeting has generated new dialogues, a good deal of debate and introspection within the Commissions, in Board and Council meetings, and over coffee. There are several concrete results: revision and, in some cases, ab initio formulation of terms of reference of Commissions; introduction of a new category of membership; two new publications - "Modern Radio Science" and the "Handbook of Radio Propagation" - which, we believe, will increase URSI's visibility; additional flexibility of operation of the Commissions; and a search for a new title for URSI (keeping the logo unchanged) to underline the dominant function of telecommunications. These are no meager achievements.

The Young Scientists Programme has been particularly good. The two technical sessions separately assigned for the young scientists and chaired by Professors Cullen and Okamura were unusually good and the only element of regret was the shortage of time and not of quality.

The Committee for Developing Countries has produced some particularly commendable work. The "Handbook of Radio Propagation in Tropical and Subtropical Countries", the first major outcome of its activities, written by scientists from developing countries and with data generated in large part within these countries and by them, has been widely appreciated and promises to be a major reference document for use within these countries and organizations like CCIR and many professional and operational bodies. It is a good beginning and we expect to produce a family of such Handbooks.

To the incoming Board, may I wish a fruitful and active triennium; to Professor Cullen, the incoming President, my gratitude for all the help and advice that I have received during my presidency; to the new Vice-Presidents and the Chairmen and Vice-Chairmen of Commissions, a warning that URSI will demand a lot of their time and devotion; to Professor Van Bladel and Professor Delogne a deept debt

of gratitude, and to Mrs Stevanovitch, my warmest appreciation.

Finally, Ladies and Gentlemen, may I request you to join with me in thanking the members of the Israeli Organizing Committee and its Chairman, Dr. Shapira, for making this General Assembly so very exciting; in thanking Dr.Baal-Schem,in particular, for shouldering much of the operational responsibilities and for the very successful computer and video arrangements; the Israeli Academy of Sciences for its support and hospitality; Dean Levanon of the Tel Aviv University for the excellent hospitality in the evening party for the Young Scientists; our appreciation for Kenes and Mrs Isis Rivlin and her team of nice young girls, who have given us liberally their time and their smiles. Let us thank them.

And now, Ladies and Gentlemen, the new President - Professor Cullen.

ADDRESS BY THE INCOMING PRESIDENT

Mr. President, Ladies and Gentlemen:

I must begin by thanking the Council of URSI for the very great honour it has done me in electing me as President.

My task does not formally begin until after the final meeting of the Council at this XXII General Assembly; this will take place tomorrow. From that point onwards I will do my best to uphold the high tradition set by my predecessors in the office of President. I know that will be difficult, but I also know that I shall have the help of an exceedingly able Board of Officers in this great responsibility.

URSI is proud of its traditions, but the most important of these is a readiness to face the future, and to be adaptable enough to take a leading role in the vital new developments in Radio Science.

Facing the future without the superb support of our Secretary General, Prof. Van Bladel, and our Executive Secretary, Mrs Stevanovitch, seems to me quite unimaginable. Fortunately for me, I shall have that support during my three years as President, but the next General Assembly will be their last, and before that takes place, the Board of Officers will have the major task of making new arrangements for the future.

Through the energetic leadership of Prof. Gordon and Dr. Mitra, we had a most valuable meeting at Corsendonk at which possible future strategies were explored. As modified and developed by the Council, new guidelines for the Board of Officers are emerging. In particular, the increasing importance of the communications element in the work of URSI may well find expression in triennial symposia in this area, analogous to the highly successful Electromagnetic Wave Symposia organized by Commission B for many years. Such new developments must not detract from the scientific component of URSI. I personally see it as a major strength of URSI that it brings together pure

scientists and engineers, and all shades in between in a way that no other international body can do - and URSI is genuinely international.

We have had a highly successful General Assembly; I warmly endorse the President's remarks in this respect, and add my own very sincere thanks to Dr. Shapira and the Israeli Organizing Committee for their excellent work on our behalf. I know that my good friend, Prof. Zima, and his colleagues will spare no effort to make the XXIII General Assembly in Prague equally successful, and I look forward to meeting you again there in 1990.

FAREWELL BY Dr. SHAPIRA

My dear Colleagues and Friends,

We have spent almost two weeks together talking, listening, deliberating and, hopefully, enjoying ourselves.

For the Organizing Committee, and for myself, it was a great satisfaction. The Assembly brought the focus of Radio Science research to Israel, and brought us to that focus.

Fruits of these interactions are many, and we hope that they will be long lasting, and bread even more. One of these is the exciting cooperation we are launching with Egyptian scientists on radio astronomy. We hope other ventures will follow, and lead us all through the scientific cooperation to a peaceful communicative world.

I bid you all farewell, and a safe trip back home.

I hope the winds of the new ideas discussed will carry URSI along to the next, XXIII General Assembly in Prague.

AWARDS CEREMONY

The Awards Ceremony took place on Tuesday, 25 August 1987, just after the Opening Meeting of the General Assembly. The Ceremony was chaired by Prof. S. Okamura, Vice-President of URSI and Chairman of the Awards Advisory Panel.

PRESENTATION OF THE BALTH. VAN DER POL GOLD MEDAL

by Professor J.B.H. Peek, President of the URSI Committee in the Netherlands

It is a pleasure and an honour for me to present today, on this occasion, to Professor Tor Hagfors, the Balthasar van der Pol Gold Medal.

Van der Pol was a pioneer in the radio sciences. His most creative period as a scientist was during the time he stayed at the Philips Research Laboratories in Eindhoven. Each morning, when I go to this laboratory, I can still look at his picture which hangs on the wall of the entrance hall. This picture, Professor Hagfors, you will also find reproduced on the first page of a book on van der Pol which will be given to you with the Medal. Moreover another picture of van der Pol is engraved on one side of the gold medal. Thus you won't easily forget how he looked like. It would be impossible to mention here all contributions van der Pol made to the field of radio science,but let me name just a few. He explained the phenomenon of relaxation oscillations and considered the behaviour of an oscillator, that is known today as the van der Pol's oscillator. This oscillator is described by a non-linear differential equation, and has a very interesting behaviour. With Bremmer, he studied the propagation of electromagnetic waves round the Earth. This was a problem of great practical importance in those early days of wireless communications. He treated this as a diffraction problem of waves produced by a dipole near the surface of a sphere, dielectric and conducting, but he did not introduce the ionosphere into the problem. He broadened and continued this work later.

In all his work he made original and extensive use of the method of operational calculus. The work on operational calculus finally resulted in a classical book, written with Bremmer, on this subject. In general he had a profound interest in mathematics. Thus he wrote interesting papers on, for example, number theory.

After his death, his wife had the idea to keep alive the memory of her husband in the URSI by founding a Gold Medal award. This idea got immediate support from the Board of Officers of URSI.

Professor Hagfors told me that van der Pol stayed a year before he died at Cornell University, the same place where you, Professor Hagfors, joined the Faculty of Electrical Engineering since 1982.

Now let us turn our attention to Professor Hagfors who has had

a distinguished career both in science and in scientific administration and made major contributions in the fields of radar engineering, plasma physics and in geophysics. He has from the earliest days of the technique been a leading figure in the field of incoherent scatter studies of the ionosphere and, in 1961, he wrote one of the original pioneering papers on the theory and application of incoherent scatter. In the past twenty years he has the unique record of having been a major driving force at no fewer than four of the world's incoherent scatter systems - Millstone Hill, Jicamarca, Arecibo and EISCAT. In a paper published in 1981 in the Journal of Geophysical Research he pioneered a new and potentially very accurate method of measuring electron temperature by observing the plasma line simultaneously at two different frequencies or at two different scattering angles.

Experimental confirmation of the proposed method was provided later in some joint work with the French incoherent scatter facility.

A second and perhaps more significant contribution to plasma line observations was his development of a plasma line 'chirp' technique in which the transmitted radar frequency is changed so as to match the rate of change of the plasma frequency. This has the effect of 'sharpening' the plasma line frequency spectrum since it receives most of the spreading caused by the variation of electron density in the scattering volume. The development of this chirp techniques has a brilliance which reflects Hagfors' ability as a radar engineer, as a plasma physicist and as a geophysicist.

The technique is particularly useful not only for electron temperature measurements but for heating experiment diagnostics and for studies of rapid electron density measurements. With the Arecibo equipment the technique has been successfully used to measure the plasma frequency to better than 1 part in 1000 in less than half a second. The use of this technique during heating experiments has shown the presence of plasma 'cavitons' (depletions in density) - an observation which could not have been obtained in any other way. Recently (1986) this chirp technique has been installed and successfully used by Hagfors in the EISCAT system.

Finally I would like to mention some daily facts from the life of Tor Hagfors.

Tor Hagfors was born in Oslo, Norway on 18 December 1930, and he graduated from the Technical University of Norway in 1955. He received his Ph.D. from the University of Oslo in 1959.

From 1955 to 1959 and from 1961 to 1963 he was a scientist at the Norwegian Defence Research Establishment. During the period 1959 to 1960 he was a Research Associate at Stanford University, California. From 1963 to 1967 and from 1969 to 1971 he was a staff member at the MIT Lincoln Laboratory, Massachusetts.

During 1967 to 1969 he was the Director of the Jicamarca Radio Observatory, Lima, Peru and during 1971 to 1973 he was the Director of the Arecibo Observatory, Puerto Rico. From 1973 to 1982 he was Professor of Electrical Engineering at the University of Trondheim. From 1976 he was also Director of the European Incoherent Scatter

Association (EISCAT).

In 1982 he was appointed Director of the National Astronomy and Ionosphere Centre and joined the Faculty of the School of Electrical Engineering and Department of Astronomy of Cornell University.

Reply by Dr. Tor Hagfors

I am greatly honoured and deeply moved by the award by URSI of the Van der Pol Gold Medal. When the word came that I was to be awarded this prize during the General Assembly, I found a copy of the collected works of Balthasar Van der Pol in the library. I have never had the good fortune to meet Professor Van der Pol, and only had fragmentary knowledge of his several contributions to radio wave propagation and to the understanding of nonlinear phenomena in oscillators. I was amazed to discover the breadth of Professor Van der Pol's scientific work, ranging from circuit theory to the modelling of the operation of the heart, number theory and many other topics. Professor Van der Pol was as close to a true polyhistor as it is possible to be these days. All the previous awardees must have felt very humble at receiving an award named after such an illustrious scientist. This feeling of humility is certainly true for this award recipient.

Curiously, in reading the collected works of Van der Pol I discovered that, shortly before his death, he spent several months as a visitor at Cornell University and that his last scientific report, on nonlinear oscillations, was a report from the Electrical Engineering Department I now belong to!

Professor Peek has explained to you the nature of the work which lead the selection committee to its conclusion and I shall not repeat any of that. It all sounded much more impressive in Prof. Peek's words than it really is. Above all it was not emphasized that the work described is not only the result of my personal effort, but is rather the fruit of the work of the many excellent and devoted members of scientific groups I have had the good chance to belong to, at Cornell University and the Arecibo Observatory, within the EISCAT community and at the University of Trondheim, at MIT, the Jicamarca Observatory and Stanford. If I should mention individuals who have helped and inspired me during my scientific career, my thoughts immediately go to my thesis advisor, Professor Leiv Harang and to a more recent collaborator, Professor Sir Granville Beynon. To all those who have contributed: my sincerest thanks for the invaluable help toward my selection for this great award.

PRESENTATION OF THE JOHN HOWARD DELLINGER GOLD MEDAL

by Professor R.K. Crane, President of the URSI Committee in the United States

It is a pleasant duty to be asked to present the John Howard Dellinger Gold Medal on behalf of the URSI Committee in the United States. This award was established in 1966 to honour the memory of a most eminent radio scientist whose activities both on the national and international level were to mark the development of radio science and of URSI.

Dr. Dellinger was born in Cleveland, Ohio, in 1886 and graduated from the George Washington University in Washington in 1908. In 1913 he earned the Doctor of Philosophy degree in Physics at Princeton University.

Like many of us, Dr. Dellinger combined his interest in radio science with an interest in radio engineering. His engineering research led to the medium-frequency radio beacon for air navigation which was widely adopted throughout the world. His scientific acuity led to an explanation of the sudden ionospheric disturbances. He compared this phenomenon with solar observations and found a direct correlation with solar flares.

For many years, Dr. Dellinger had been the ultimate authority in the affairs of the US URSI Committee. In 1961 he was nominated to be the first lifetime honorary member of that Committee by the US Academy of Sciences. He was one of the pioneers of the establishment of the journal "Radio Science".

Dr. Dellinger was a Vice-President of URSI from 1934 to 1952 and an Honorary President from 1952 until his death ten years later. He was Chairman of the Commission on Radio Wave Propagation and of the Commission on Radio Measurements and Standards. For many years he was Chairman of the Publications Committee and, from 1954 he served as Chairman of the URSI Committee for CCIR, which was constituted according to a proposal by him.

And now it is my privilege to present the Dellinger Gold Medal to Dr. Roger Gendrin for his outstanding achievements during the last six years.

Dr. Gendrin was born in Colmar, France in 1932, and graduated from the Ecole Normale Supérieure in 1956 with an "agrégation" in physical sciences.

Dr. Gendrin's first scientific activity was related to nuclear magnetic resonance. During his military service he came into contact with space physics through the localization of satellites via Doppler and Faraday techniques. He then shifted towards geophysics. He now holds the post of Director of the Centre de Recherches en Physique de l'Environnement at the Centre National d'Etudes des Télécommunications.

His first research in the field of wave propagation was made

through a very sensitive ULF fluxmeter which was put in operation in France and in Northern Scandinavia to study the Schumann resonances. In 1964 the same equipment was installed in Kerguelen Island (Indian Ocean) and in Sogra (USSR) and a fruitful cooperation began between Soviet and French scientists on the study of conjugate points phenomena. Many results were obtained on the propagation and occurrence characteristics of both ULF and VLF waves by using this set of data.

In 1968 Dr. Gendrin took the leadership of the definition and realization of the first rocket experiment to be performed in Kerguelen Islands. At the same time he was deeply involved in the definition of a scientific mission to be performed on a European basis with a geostationary spacecraft, and played a major role in the coordination of all wave experiments on this IMS devoted spacecraft. The large amount of original results obtained with the two GEOS spacecraft owes much to his constant and competent effort in this truly international venture.

Dr. Gendrin is presently co-investigator on different spacecraft experiments (the Swedish auroral satellite VIKING; the NASA Jupiter orbiter GALILEO; the ESA out-of-ecliptic spacecraft ISPM).

Starting as an experimentalist in electronics, Dr. Gendrin soon became a geophysicist. He led a large number of ground campaigns in such inhospitable regions as the Indian Ocean Islands, the Northern USSR and Iceland. His constant motivation towards the understanding, and not merely the compilation, of geophysical phenomena led him to make important theoretical contributions both in the fields of plasma physics and signal analysis.

Between 1960 and 1985, Dr. Gendrin has authored 44 papers and co-authored 88 papers.

His constant interest in the international organization of science in general, and in the development of radio science, in particular, has led him to accept important responsibilities in international bodies of the ICSU family. He has been Chairman of URSI Commission H on Waves in Plasmas from 1975 to 1978 and has just been elected a few weeks ago as President of the International Association of Geomagnetism and Aeronomy of IUGG. As an officer in both URSI and IAGA, he has always worked to enhance the scientific links between the two organizations, in full respect of their respective fields of interest.

Dr. Gendrin is convinced that progress in science can be achieved only by letting young people be educated in the field of advanced research. He is one of the organizers of the series of International Schools on simulation in space plasmas. In 1983 he implemented at the Paris University a new course for post-graduate students on "Physical Methods in Remote Sensing", aiming at mastering the use of radio wave techniques for remote sensing purposes in fundamental and applied research, in both developed and developing countries.

Dr. Gendrin has made outstanding contributions in the field of wave propagation in natural plasmas from both a theoretical and an experimental point of view. In addition, the two permanent

motivations of this exceptionally talented and fully mature scientist remain an improved exchange of scientific ideas between countries as well as between disciplines, and a wider cooperation in the field of experimental work.

Reply by Dr. Roger Gendrin

It is a great honour, not only to myself, but to my country, to my laboratory and to my colleagues to receive the 8th Dellinger Gold Medal. This award was established by the URSI Committee in the United States of America to commemorate the prominent role which Dr. Dellinger played, between 1907 and 1962, in the study of radio wave propagation and in the development of our Union at both international and national levels. I have not done, neither for Science nor for URSI, what he has done but I am honoured that, on this occasion his memory is revived.

The work for which the URSI Board of Officers has awarded me this Medal is the result of a large cooperation with scientists from various countries, and they deserve my gratitude. These are, first of all, my Laboratory colleagues, male and female, scientists and technicians, who have worked with me during so many years or with whom I had so many stimulating discussions in the field of geophysics, plasma physics or of simple electronics. These are also my Soviet and Scandinavian colleagues with whom I performed so many ground observations in adverse areas. And finally all those in Europe and the United States with whom I performed my first in situ measurements in space or my first numerical simulations on computers.

I must also gratefully acknowledge the role of the Union per se in the development of my research. URSI is the place where one can meet people who are aware of the most recent technical developments (in antennas, in systems, in data analysis techniques,...) or of the most advanced results in electromagnetic theory. My research has taken a great advantage of this facility. This unique role in mixing scientists who come from different horizons, who have different scientific interests, but who are united by their aim to develop radio science up to its ultimate (if any) frontiers, must be perserved for the benefit of all the applications of Radio Science. I wanted that, on this occasion, this role of our Union be deeply acknowledged.

PRESENTATION OF THE APPLETON PRIZE

by Professor P.J.B. Clarricoats, President of the URSI Committee in the United Kingdom

It is a great pleasure to be asked to present the Appleton Prize to Professor Susumo Kato of Kyoto University on behalf of the Council of the Royal Society. Before I say a few words about the work of Professor Kato I should like to take a moment of your time to say something of Sir Edward Appleton whose memory this award honours.

Edward Appleton was born in 1892 in the northern English town of Bradford. He studied Physics at Cambridge before service in the Army during the first World War.He carried out research at the Cavendish Laboratory from 1920 until his appointment as Wheatstone Professor of Physics in the University of London in 1924. There his greatest work was conducted including the first experimental demonstration of the existence of the ionosphere in 1925. A few years later he developed the classical magnetoionic theory. He was elected a Fellow of the Royal Society in 1927 and received the Nobel Prize for Physics in 1947.

Beside his momentous scientific achievements, Edward Appleton was a leading figure in URSI from 1927 until his death in 1965. At the conclusion of the General Assembly in London in 1934 he was elected President of URSI, an office which he occupied for the next 18 years. At the same time, he took a major part in the running of two of URSI's main scientific commissions and was Chairman of one or other for no fewer than 26 years. Edward Appleton was indeed a large part of URSI and URSI was a large part of him! It is therefore most fitting that the Royal Society should have created an award perpetuating the name of one of URSI's greatests scientists.

Professor Kato, who is Director of the Radio Atmospheric Science Centre at Kyoto University, Japan, has enjoyed a most distinguished career as an ionospheric scientist. After graduating from the Geophysics Institute of Kyoto University in 1952 with a Masters Degree, he went on to obtain his PhD in 1960 majoring in Upper Atmospheric Physics. This early interest in the subject of atmospheric physics was sustained and Dr. Kato then held appointments at Kyoto and at CSIRO in Australia working in the field of atmospheric dynamics. He was awarded the Tanakadate Prize in 1959 for his study of Wind Motion in the Ionosphere and more recently in 1979 the Yamaji Science Prize for studies of Atmospheric Tides.

Professor Kato's recent achievements have centred on the middle atmosphere and lower ionosphere. He developed at Kyoto a large-scale radar observatory for the study of the Middle and Upper Atmosphere. This so-called MU radar was not only the first of its kind in the Asian region but also the most developed facility of its kind in the world. It is capable of measuring the 3-dimensional structure of the ionosphere up to 300 km.

By observations using the radar and by his theoretical calculations, Dr. Kato has contributed significantly to our understanding of ionospheric physics. In particular he has greatly enhanced our

knowledge of the dynamics of the ionosphere and of the energy/momentum flow from the lower altitude middle atmosphere. This has encompassed comprehensive work on ionospheric tides and observations of planetary and internal gravity waves by radar. Included has been the discovery of the momentum flow by internal gravity waves between a typhoon and the ionosphere.

Ladies and Gentlemen, I could go on but I think that already I have amply demonstrated that Professor Kato is a most worthy recipient of the Appleton Prize and it is a great pleasure for me to make the award on behalf of the Royal Society.

Reply by Professor S. Kato

It is a great honour not only to myself but also to my country, Japan, to my Institute, the Radio Atmospheric Science Centre of Kyoto University, and to my colleagues to be awarded the 1987 Appleton Prize. I understand that the Prize was established by the Royal Society to commemorate Sir Edward Victor Appleton who had obtained the Nobel Prize in Physics in 1947 for his great contribution to the physics of the upper atmosphere, especially for the discovery of the so-called Appleton layer. Although I have done so little for this great scientist, I am very proud of having worked in the same field of science.

It is my happy memory that I myself translated his Nobel Prize Lecture into Japanese and published it in 1978.

I am very grateful to URSI which recommended me to the Royal Society for this Prize. Among the works for which the award has been given to me I must mention the development of the MU radar of Kyoto University. It was in 1975 that URSI adopted a recommendation stressing the importance of this type of radar in Asia. This recommendation implied strong support for the construction of the MU radar.

The completion of the facility and its successful operation have only been possible with the assistance and cooperation of many excellent colleagues in Japan and abroad. I am very thankful to them.

In other works of mine for this Prize I have been very happy of having excellent friends and teachers whose invaluable discussion, advice and suggestions must be greatly acknowledged on this occasion.

PRESENTATION OF THE ISSAC KOGA GOLD MEDAL

by Professor T. Okoshi, President of the URSI Committee in Japan

It is my great honour to present, as President of the Japanese URSI Committee, the 1987 Issac Koga Gold Medal to Professor David M. Pozar.

I would like to start with introducing the career and achievements of Professor Pozar.

Professor Pozar was born in Pittsburgh, Pennsylvania, in 1952. He received both the BS and MS degrees from the University of Akron, Akron, Ohio, in 1975 and 1976, respectively, and the Ph.D. degree from the Ohio State University, Columbus, Ohio, in 1980. He is currently an Associate Professor in the Department of Electrical and Computer Engineering at the University of Massachusetts, Amherst,USA.

His research has involved analytical, numerical and experimental studies of printed antennas and phased arrays, and the related problems in applied electromagnetics. This time, Professor Pozar is awarded the 1987 Issac Koga Gold Medal for his remarkable contributions in these areas.

However, his present research interest is wider. It includes, in addition to the printed antennas and phased arrays, the transient radiation problems, electromagnetic theory, and numerical techniques in electromagnetics.

Professor Pozar has been active also in institutional activities He is currently an Associate Editor of the IEEE Transactions on Antennas and Propagation. In 1984, he received an NSF Presidential Young Investigator Award, as well as the "Keys to the Future" Award from the IEEE Antennas and Propagation Society, in addition to a number of other awards.

I would like to take this opportunity to mention very briefly the rules for the Issac Koga Gold Medal, as well as the career of the late Professor Koga.

The Medal is endowed every three years, at the occasion of the General Assembly, to a young scientist of age under 35, who has made an outstanding contribution to any of the branches of science covered by the 9 Commissions of URSI. It honours the memory of the late Professor Issac Koga, who was Vice-President of URSI from 1957 to 1963, President of the Union from 1963 to 1966, and Honorary President since 1981.

Professor Koga was born in Japan in 1899, at the end of the last century. He studied at the University of Tokyo, and became a Professor at the Tokyo Institute of Technology. Later he became also Professor at the University of Tokyo, and Dean of its Faculty of Engineering.

Professor Koga's research covered a wide variety of topics in radio science. Particularly noteworthy among these was the inventi

in 1932 of the piezoelectric crystal oscillator unit having zero frequency-temperature coefficient, which is widely known as the Koga-cut crystal, and has been used world-wide in a variety of applications.

Professor Koga was a strict educator for young students and researchers, but at the same time, a warm-hearted research leader. When he passed away in 1982, the Japanese Committee for URSI proposed to the Union to establish this Gold Medal for Young Scientists, in commemoration of Professor Koga, as a great educator, as well as a distinguished researcher. The first Koga Gold Medal was endowed three years ago at the General Assembly in Florence, and this is the second endowment.

Reply by Professor R.E. McIntosh, on behalf of Professor D.M. Pozar

Dave Pozar regrets that he could not attend this meeting in person to receive the Issac Koga Gold Medal. However, his flight from Hartford, Connecticut to Kennedy International Airport, New York arrived after the flight to Tel Aviv departed, and it was not possible to schedule another flight that would get him here on time. Dave, therefore, has asked me to accept the Medal for him.

Dave asked me to tell you that he is extremely honoured to receive this Medal. He thanks the Award Committee and URSI for the honour they are bestowing on him. He also asked me to thank his colleagues at the University of Massachusetts, who have contributed to his career development. As one of those colleagues, I am more than pleased to satisfy Dave's request!

Dave's strong contributions to radio science and to the University of Massachusetts are greatly appreciated and admired by all of his faculty colleagues. We are proud that he works with us and that his work has been recognized by URSI.

YOUNG SCIENTISTS PROGRAMME

The URSI Young Scientists Programme was initiated in 1969 at the Ottawa General Assembly. Since that time, it has become a major regular programme and is now an integral part of each General Assembly.

Of the Young Scientists selected for participation in the XXII General Assembly, 38 of them were able to attend, 11 from developing countries and 27 from developed countries. In addition two Booker Fellows participated in the Young Scientists Programme.

Fourteen Young Scientists presented papers in the regular sessions of the Commissions, and twenty-two more presented papers in two special sessions, as set out below. Both sessions were well attended and much appreciated. The standard of presentation, though variable, was generally very good indeed.

Young Scientists Session I

Chairman: Prof. S. Okamura

1. Extrinsic optrodes for pH sensing with fiber optics.
   F.Baldini, Italy.
2. Recent work on rough surface scattering and SAR ocean surface imaging.
   D. Winebrenner, USA.
3. Numerical solution of Maxwell's equations for intermediate problems.
   M. Williams, UK.
4. Configuration filtering and sampling methods in the computation of frequency-domain electromagnetic fields.
   R.W.C. van der Veeken, Netherlands.
5. Analysis of optical fiber directional coupling using recently modified coupled-mode equations.
   H.C. Chang, Taiwan.
6. Digital signal processing for radio monitoring.
   I. Novak, Hungary.
7. Continuous phase-chirp signals for M-ary data communications.
   R.K. Rao, India.
8. Detection of quadrature amplitude modulated signals.
   J. Kovats, Hungary.
9. The role of acceptability regions in electronic networks design.
   J. Ogrodski, Poland.
10. Short optical triple-waveguide couplers for duplexers and switches.
    J. Jacob, FRG.

11. Refractive index distribution measurements.
T. Zahradka, Czechoslovakia.

Young Scientists Session II

Chairman: Prof. A.L. Cullen

1. Future propagation experiments at 12.5, 10, and 30 GHz using the Olympus satellite.
G. Ortgies, FRG.

2. Tropical rain attenuation of satellite signals.
G.S. Woods, Australia.

3. Rainfall rate estimation by radar.
A.D. Ochou, Côte d'Ivoire.

4. Systematic description and microphysical interpretation of polarimetric weather radar echoes.
M. Chandra, FRG.

5. Physical processes involved in clear-air echoes with MST radars in the stable atmosphere: Comparison with in situ measurements.
F. Dalaudier, France.

6. Empirical world maps of F2-layer critical frequencies.
M.W. Fox, Australia.

7. Some studies of ionospheric scintillation and total electron content near the crest of the equatorial anomaly.
G. Maitra, India.

8. Low-frequency instabilities and magnetic field fluctuations in cometary plasmas.
N.N. Rao, India.

9. Feeds for radio astronomy.
M. Catarzi, Italy.

10. A CO survey of molecular clouds in the southern Milky Way.
L.J. Bronfman, Chile.

11. Interaction of early type stars with the interstellar medium.
Cristina E.C. de Nicolau.

REPORTS OF MEETINGS

URSI BOARD OF OFFICERS

Summary Report

I. Board of Officers 1984-1987

The Board of Officers met on three occasions, on 22, 28 and 31 August. All members were present.

Most of the discussions were devoted to items which were subsequently considered by the URSI Council and, in particular, to the recommendations arising out of the Corsendonk Conference.

Meeting on 22 August

The Board decided

a) to ask all Commissions to discuss extensively the Corsendonk recommendations and suggestions, and to review their terms of reference in the light of these recommendations;

b) to invite the Council to form a group in charge of studying the possibilities of creating new membership categories: Associate Members, Affiliate Members and Individual Members (see Report on page 69);

c) to invite the Council to form a group to examine whether the title of the Union needed to be changed in order to reflect better the activities of URSI (see Report on page 70);

d) to ask Commission A to maintain its Working Group on the Interaction of Electromagnetic Fields with Biological Systems;

e) to ask Commission F to consider the desirability of setting up a Working Group on Remote Sensing, with representatives from other Commissions;

f) to recommend appropriate steps in order to simplify the mechanism for obtaining the sponsorship of URSI for scientific meetings;

g) to bring the problem of the future of the URSI Secretariat to the attention of the members of the Council, and to ask all Member Committees to make proposals for a suitable candidate for the position of Secretary General after 1990.

Meeting on 28 August

During the second meeting of the Board, the Chairmen of the Commissions were invited to present short oral reports on the discussions within their respective Commissions, in particular with respect to the Corsendonk recommendations.

The Board welcomed warmly the proposal of Commission C to start a series of triennial URSI symposia on Signals, Systems and Electronics, the first one to be organized by Prof. R. Saal in the FRG.

Meeting on 31 August

The decision was made, according to which each Commission will be allotted a given budget for supporting symposia in its own field during the next triennium, including the 1990 General Assembly.

The Board decided to recommend to the Council to appoint Prof. V.V. Migulin as Honorary Chairman of the series of URSI symposia on the Artificial Modification of the Ionosphere.

Possible modifications to the URSI Statutes, to be submitted to the Council, were considered.

II. Board of Officers 1987-1990

The incoming Board met on 4 September in the absence of Professors Jull and Zima, who had to leave Tel Aviv earlier.

1. Distribution of responsibilities within the Board

(a) Treasurer: Dr. H.J. Albrecht
(b) URSI Awards: Prof. A.L. Cullen
(c) Membership of URSI: Prof. E.V. Jull
(d) Publications, including URSI Newsletter: Prof. R.L. Dowden
(e) Developing Countries, UNESCO, ENUWAR: Dr. A.P. Mitra
(f) Geosphere-Biosphere Programme: Prof. P. Delogne.

2. Assistant Secretary General

Professor Delogne accepted to continue as Assistant Secretary General provided his acceptance did not imply the commitment to be a candidate for the position of Secretary General in 1990.

3. Coordination of Scientific Programme for the 1990 General Assembly

The Board confirmed the recommendation of the Coordinating Committee to appoint Dr. P. Bauer as Coordinator for 1990, with Prof. J. Bach Andersen as Associate Coordinator.

4. Budget for Commissions

The Board decided to put at the disposal of each Commission the sum of $5,500 for the 1987-1990 triennium, including the 1990 General Assembly. Motivated requests for additional support may be considered by the Board.

5. Inter-Union Commission on the Allocation of Frequencies for Radio Astronomy and Space Science

In view of the serious threats to radio astronomy in the next three-year period, and the need to increase the activities of the Commission, the Board decided to allocate a sum of $2,000 in 1988 to this Inter-Union Commission.

6. Requests to ICSU

It was agreed to submit to ICSU requests for financial support for the following:

(a) Protection of frequencies for radio astronomy and atmospheric radars;

(b) Production of Volume 2 of the Handbook on Radio Propagation in

Tropical and Subtropical Countries;

(c) Attendance of Young Scientists at URSI-initiated symposia.

7. Highlights of the Tel Aviv General Assembly

A short text summarizing the main achievements and features of the XXII General Assembly will be disseminated in the radio technical press. The text will be combined with suitable details concerning the next General Assembly. The best way to cover the international press is to send the text to Member Committees for circulation and possible translation.

8. Next meeting of the Board

It was agreed that the next meeting of the Board should take place in the Spring or Summer of 1988 in Brussels, Belgium.

URSI COORDINATING COMMITTEE

Summary Report

The Coordinating Committee met on two occasions, on 23 August, before the official opening of the General Assembly, and on 3 September. Drs Shapira and Baal-Schem, representing the Israeli Organizing Committee, attended the first of these meetings.

Meeting on 23 August

1. Terms of Reference of URSI Commissions

It was agreed that the report on the Corsendonk Conference should be circulated within each Commission. The Commissions were further asked to review and, if appropriate, to update their terms of reference in the light of the Corsendonk discussions and of developments in the recent years.

2. Election of Vice-Chairmen of Commissions

In view of the lack of uniformity in the procedure applied by the various Commissions for the election of their Vice-Chairman, it was decided to bring that matter before the Council. In addition, it was felt that the Member Committees should be more involved and, in particular, that full information on the candidates should be made available to them ahead of the Assembly.

It was confirmed that only Official Members of the Commission may participate in the vote for the election of the Vice-Chairman.

3. Scientific Programme of the XXII General Assembly

Dr. P. Bauer, Chairman of the Steering Group for Coordination of the Scientific Programme, stated that the final programme for the Assembly was close to the preliminary one, but that changes had occurred until the very last days. He acknowledged the excellent cooperation provided by the local organizers.

However, he felt that, for the future, some actions were needed regarding a) deadlines for the submission of abstracts which were generally to early; b) the mechanism for providing the session conveners with precise guidelines; c) the distribution of responsibilities among those involved in the preparation of the programme: Commission Chairmen, Organizing Committee, Coordinator, URSI Secretariat.

4. Scientific Meetings

4.1 1984-1987

Prof. P. Delogne, who had been responsible for processing the requests for sponsorship in the past triennium, stated that a total of 66 symposia were sponsored or co-sponsored by URSI. He presented the tables reproduced below:

Table 1 - Financial support granted under Mode B (1984-1987)

Year	Invited Speakers	Young Scientists	Total
1985	3,720	4,961	8,681
1986	13,051	8,261	21,312
1987	5,700	4,050	9,750
	$22,471	$17,272	$39,743

Table 2 - Distribution of financial support among Commissions(1984-87)

Commission	Invited Speakers	Young Scientists	Total
A	-	2,088	$ 2,088
B	8,620	3,400	$12,020
C	873	-	$ 873
D	500	-	$ 500
E	2,600	250	$ 2,850
F	3,678	500	$ 4,178
G	4,000	5,033	$ 9,033
H	-	5,201	$ 5201
J	2,200	800	$ 3,000

At the XXII General Assembly (1984), the Council had decided that financial support should be reserved in principle to meetings generated by the Union itself, but this has proved difficult to apply in practice. Indeed the degree of involvement of the Commissions in the organization of scientific meetings was not the same in all cases. The distribution is given in Table 3 below.

Table 3 - Distribution of financial support among meetings generated by URSI and other meetings (1984-1987)

	Invited Speakers	Young Scientists	Total
URSI-generated	17,420	9,983	$27,403
Other	5,051	7,289	$12,340

4.2 Procedure for requesting URSI sponsorship

As a result of the discussions, it was decided to recommend to the Council:

(a) that the existing procedure for requesting sponsorship should be simplified since it implied excessive administrative work and long delays;

(b) that Commission Chairmen should be given more freedom in the decision making;

(c) that some budget should be allocated to each Commission for direct use.

(d) that, as far as possible, proposals for the organization or the sponsorship of scientific meetings should be made by the Commissions during a General Assembly.

5. Corsendonk Conference

A general presentation of the Corsendonk conclusions was made by Prof. W.E. Gordon, who stated that URSI had to define how to react on the rapidly changing world of communications. The scientific vitality of the Union rested with the Commissions rather than with the Council or the Board of Officers, and the Commissions should discuss their future programmes and provide inputs to the Council for debates and decisions.

The need to reinvigorate telecommunications studies within URSI was stressed, as well as the need to devote some financial resources to that objective. Concerns were expressed about giving too much importance to telecommunications, and the possibility of URSI becoming a world of technicians with little involvement in the physics of phenomena. However, it was clearly stated that there was no intention, whatever, to scale down any existing activities but rather to reinforce and expand activities in some of the Commissions.

Meeting on 3 September

1. Symposia 1987-1990

The list of scientific meetings for the next triennium, as compiled on the basis of the recommendations of the Commissions, was reviewed. The list would be submitted to the Council for approval.

2. Post-mortem of the XXII General Assembly

Reports on the completion of their programmes were presented by the Officers of each Commission. The following points were made during the discussion which followed:

- the General Lectures should be maintained at future General Assemblies, as well as the Tutorials, but it would be desirable that these be immediately followed by a session of the Commission on the same subject;
- the attendance at the scientific sessions was quite satisfactory;
- to some extent the open symposia compete with scientific sessions and it did not seem necessary to maintain them since the presentation of contributed papers can be organized in joint sessions and in poster sessions;
- a time slot of 20 minutes, instead of 30, for the presentation of papers would be preferable in that it would allow papers of 20- or 40-minute length;
- scientific sessions in Commissions C and D have been very well attended, and this seemed to be due to the fact that sessions concentrated on scientific rather than on technical subjects.

3. Coordination of Scientific Programme for the 1990 Assembly

The Officers of the Commissions expressed unanimously their appreciation of the high-quality work performed by Dr. P. Bauer as Chairman of the Steering Group.

Since the financial resources of the Union would probably allow convening a meeting of the Coordinating Committee in the year preceding the General Assembly, the need for the Steering Group had now disappeared. However, there was a definite need for centralizing the whole of the operation, and the Coordinating Committee expressed their wish to see Dr. Bauer continue as Coordinator of the Scientific Programme for 1990. It was also agreed to ask Prof. J. Bach Andersen to act as Associate Coordinator.

4. Suggestions for the Programme in 1990

Commission Chairmen were invited to submit proposals for topics and speakers for the General Lectures, and to define as soon as possible the programme of their scientific sessions. A draft programme should be ready before 1 January 1989, to be finalized at the Coordinating Committee meeting to be held during the Spring of that year.

5. Assistance to Young Scientists

The competitive character in the selection of young scientists to be supported will be maintained, under the control of the Officers of Commissions and the organizers of symposia. Biodata of selected young scientists will have to be sent to the URSI Secretariat, as in the past.

URSI COUNCIL

Summary Report

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

1. Membership of the Council

President: Dr. A.P. Mitra
Secretary: Prof. J. Van Bladel

Representatives of Member Committees:

Argentina: Prof. S. Radicella
Australia: Dr. J.G. Lucas
Austria: Prof. J. Pfleiderer
Belgium: Prof. P. Delogne
Brazil: Dr. M. Ali Abdu
Bulgaria: Prof. K. Serafimov
Canada: Prof. P.H. Wittke
China (CIE, Beijing): Prof. Feng Shizhang
China (SRS, Taipei): Mr. Yu-Kai Chen
Czechoslovakia: Prof. V. Zima
Denmark: Dr. T.S. Jörgensen
Egypt: Dr. I. Salem
Finland: Prof. M. Tiuri
France: Prof. B. Picinbono (alternate: Dr. P. Bauer)
German Dem. Rep.: Prof. Chr.-U. Wagner
Germany, F.R. of: Prof. H. Lindenmeier (alternate: Dr. Th. Damboldt)
Hungary: Prof. K. Géher (alternate: Prof. L. Zombory)
India: Prof. G. Swarup
Ireland: Prof. W.D. Ryan
Israel: Dr. J. Shapira
Italy: Prof. C. Egidi (alternates: Dr. F. Fedi, Prof.S.Leschiutta)
Japan: Prof. T. Okoshi (alternate: Dr. Morimoto)
Netherlands: Prof. J.B.H. Peek
New Zealand: Prof. R.L. Dowden
Norway: Prof. D. Gjessing
Peru: Dr. R. Woodman
Poland: Prof. S. Hahn (alternates: Prof.A. Wernik, Dr. Woliński)
Portugal: Mr. J.F. Patricio
South Africa: Mr. R.W. Vice
Sweden: Prof. P. Weissglass (alternate: Mr. P.O. Lundbom)
Switzerland: Prof. F. Gardiol
Thailand: Mr. R. Reowilaisuk
United Kingdom: Prof. P.J.B. Clarricoats
USA: Prof. R.K. Crane
USSR: Prof. M.E. Zhabotinskij

The members of the Board, the Chairmen and Vice-Chairmen of Commissions attended in an advisory capacity.

2. Formation of Temporary Committees

Publications Committee:

Prof. A.L. Cullen (Chairman), Mrs J. Hénaff, Dr. G. Hyde, Dr. G. Swarup, Prof. V. Zima.

Committee on Commissions G and H:

Prof. W.E. Gordon (Chairman), the Chairmen and Vice-Chairmen of Commissions G and H.

Committee on Title of the Union:

Prof. A.L. Cullen, Prof. P. Delogne, Prof. S. Okamura.

Drafting Committee:

Prof. A.L. Cullen, Dr. M. Petit

Committee on Membership Structure of URSI:

Prof. S. Okamura (Chairman), Prof. K. Géher, Prof. P. Delogne, Prof. Ch. Butler, Prof. Feng Shizhang, Dr. M. Petit.

3. Election of Board of Officers, and of Chairmen and Vice-Chairmen of Commissions

The results of the election were as follows:

Board of Officers

President:	Prof. A.L. Cullen (UK)
Vice-Presidents:	Dr. H.J. Albrecht (FRG)
	Prof. R.L. Dowden (New Zealand)
	Prof. E.V. Jull (Canada)
	Prof. V. Zima (Czechoslovakia)
Secretary General:	Prof. J. Van Bladel (Belgium).

Dr. A.P. Mitra remains a member of the Board as Past President.

Chairmen and Vice-Chairmen of Commissions

Comm.	Chairman	Vice-Chairman
A	Prof. S. Leschiutta (Italy)	Dr. J. Vanier (Canada)
B	Prof. T.B.A. Senior (USA)	Prof. F. Gardiol (Switzerland)
C	Prof. R. Saal (FRG)	Prof. P.A. Matthews (UK)
D	Prof. T. Okoshi (Japan)	Dr. J. Hénaff (France)
E	Prof. H. Kikuchi (Japan)	Dr. J. Hamelin (France)
F	Prof. R.K. Crane (USA)	Dr.G.Brussaard (Netherlands)
G	Dr. H. Rishbeth (UK)	Prof. A. Wernik (Poland)
H	Prof. H. Matsumoto (Japan)	Dr. D. Jones (UK)
J	Prof. R.H. Frater (Australia)	Dr. R. Ekers (USA).

Regarding the procedure for the election, the Council agreed that, in future,

(a) biographical notices on all the candidates should be circulated ahead of the Assembly;

(b) Member Committees should be more involved than in the past in the procedure for the election of the Officers of the Commissions (see Resolution U.11).

3. Discussion of the Major Issues raised at the Corsendonk Meeting

On the invitation of the President, Prof. W.E. Gordon presented briefly the main items discussed at Corsendonk in March 1987.

He first underlined the revolutionary nature of the communication explosion which, in his opinion, had a greater impact on society than the introduction of Gutenberg's printing press. URSI should consider very seriously its role in this revolution. Since the scientific vitality of URSI rested with its Commissions, he urged these to review their terms of reference in order to define the directions to follow for the next decade or so. The papers presented at the Corsendonk Meeting and summaries of discussions were published in a book which had been widely circulated.

It was felt that URSI was a unique organization since it did encompass the whole gathering of information and since its object was science on a world-wide scale. Its international and interdisciplinary character was fundamental. The activities of the Union should be strongly oriented towards telecommunications, and the contributions of Commissions C and D will be most important. The Union should retain its work on the ionosphere and the magnetosphere, in good agreement with other organizations involved. It was not possible really to separate fundamental research from technology. In the past the Union has brought up topics which were just beginning, and on which technology developed later.

It was agreed that URSI should reinvigorate its cooperation with the technical bodies of the International Telecommunication Union (CCIR and CCITT) and that it should strengthen its activities in favour of developing countries through appropriate steps.

The terms of reference as submitted to the Council by each of the Commissions were approved, and appear in Resolution U.1.

Some of the recommendations made by the Corsendonk Meeting were referred to the various temporary Committees and are dealt with in the Reports of these Committees (see Reports on pages 63-66, 69, 70).

4. Finances

The Treasurer expressed the thanks of the Union to the Member Committees for the regular payment of their annual contributions. He presented briefly his Report which had been circulated to Member Committees ahead of the Assembly. In particular, he stressed the problem associated with the changes in the value of the US dollar, which made financial predictions very difficult.

The detailed triennial report on the finances of the Union, including the audited accounts for 1984, 1985 and 1986 was accepted by the Council on recommendation of the Standing Finance Committee (see Reslution U.4). The report and recommendations of the Standing Finance Committee are reproduced on pages 54-56.

5. Standing Committee on Developing Countries

The Report of the Standing Committee on Developing Countries was approved by the Council; it appears on pages 67-68.

6. URSI-CCIR-CCITT Liaison Committee

The members of the Council were unanimous in the opinion that every effort should be made to strengthen the cooperation between URSI and the Consultative Committes of the ITU. The Report on the activities of the Committee during the period 1984-1987 (see pp. 71-75), as well as Recommendations 1 and 2 (reproduced at the end of this volume) were approved by the Council.

7. URSI Statutes

The Council agreed that Article 1 of URSI Statutes should be modified as follows:

"Art.1 - The object of URSI is to stimulate and to coordinate, on an "international basis, studies in the fields of radio, telecommuni- "cation and electronic sciences and, within these fields:
"
"a) to promote and organise research requiring international coope- " ration, and the discussion and dissemination of the results of " this research;

"b) to encourage the adoption of common methods of measurement, and " the intercomparison and standardisation of the measuring ins- " truments used in scientific work;
"
"c) to stimulate and coordinate studies of

" - the scientific aspects of telecommunications using electro- " magnetic waves, guided and unguided,
" - the generation and detection of these waves, and the " processing of the data they carry".

As a consequence of some decisions made by the Council, some modifications to other articles of the Statutes will be necessary. These will be prepared by the Drafting Committee and circulated to Member Committees for approval.

8. Scientific Programme of the General Assembly

Dr. P. Bauer, Chairman of the Steering Group for the coordination of the scientific programme, made a brief analysis of the programme at Tel Aviv, and stated that there had been 3 Open Symposia totalling 78 papers, 19 Joint Sessions totalling about 145 papers, and 59 sessions of the Commissions with a total of 378 papers. He acknowledged the work of the members of the Steering Group and of the Israeli Organizing Committee, and made a few

suggestions regarding the organisation of the programme for the 1990 General Assembly.

The Council expressed its appreciation of the work done by Dr. Bauer. It further decided to dissolve the Steering Group and to designate Dr. Bauer as Coordinator for the 1990 General Assembly, with Prof. J. Bach Andersen as Associate Coordinator(see Resolution U.10).

9. Inter-Union Commission on the Allocation of Frequencies to Radio Astronomy and Space Science (IUCAF)

The Council accepted the Report presented by Dr. J.W. Findlay, Chairman of the Commission (reproduced on p.133 in this volume) and adopted Resolution U.12 which stresses the importance of the work of IUCAF.

10. ICSU Interdisciplinary Programmes

Considering the importance of the two major programmes launched by the International Council of Scientific Unions, i.e. the International Geosphere-Biosphere Programme: A Study of Global Change, and the International Space Year, the Council agreed that URSI should express its willingness to participate in these enterprises. It further decided to set up ad hoc Committees to identify the contributions URSI can make and to follow the development of these programmes (see Resolutions U.16 and U.17).

11. ENUWAR

It was reminded that, in 1984, URSI had set up a Committee, with Mr. M. Wik as Chairman, to draft an URSI Statement on nuclear electromagnetic pulse (EMP) and associated effects, as a contribution to the work of the Working Group on Environmental Consequences of Nuclear War (ENUWAR) of the ICSU Committee on Problems of the Environment (SCOPE). This Statement had been very well received.

The Council decided to maintain this Committee (see Resolution U.18 and Report on p. 149).

12. Inter-Commission Working Groups

12.1 Coordination of URSI's Activities at Optical Wavelengths for Communication, Sensing and Processing

See Resolution U.13.

12.2 Time Domain Waveform Measurements

See Resolution U.14.

12.3 Remote Sensing

See Resolution U.15.

13. Recognition of Merits of Professor V.V. Migulin

The Council decided unanimously to appoint Prof. V.V.Migulin as Honorary Chairman of the URSI series of symposia on Artificial

Modification of the Ionosphere, in recognition of the eminent role played by him in the activities of the Union.

14. Future of URSI Secretariat

The URSI Secretariat will have to be reorganized in 1990 since Prof. Van Bladel and Mrs Stevanovitch would cease their present activity. In consequence the Member Committees were invited to consider the question seriously and to submit their suggestions to the Board of Officers, if possible before its next meeting in 1988.

15. Publications of the Union

The Council discussed at length the publications policy of URSI and, in particular the role of the "Review of Radio Science" and the proposal to launch an URSI Journal on Signals, Systems and Electronics. It approved the Report and recommendations of the Publications Committee, which appear on pp.63-66.

REPORT OF THE STANDING FINANCE COMMITTEE

1. Accounts for the years 1984-1986

The Finance Committee has examined the accounts of URSI for the years 1984 to 1986, as audited by Bureau Rahier, Brussels, and as submitted to the Council by the Treasurer in his Report dated May 1987. It is recommended that the accounts be published in the Proceedings of the URSI General Assemblies, Volume XXI.

The Committee considers that the General Reserve Fund has now reached a satisfactory level; the formal balance in hand on 31 December 1986 is about $480,000, to which an amount of $63,400 is to be added, corresponding to the appreciation in value of some of our investments (Rorento units, etc.): according to normal practice in Belgium, the figure appearing in the formal balance has to be their purchase value. It should be kept in mind, however, that the foreseen deficit for 1987, a General Assembly year, will reduce the Reserve Fund by some 100 to 150 k $.

2. Long-term Financial Policy

Definition of the unit contribution

The total of the expenditure on the URSI Secretariat is incurred in Belgian francs and it accounts for a significant part of the overall URSI budget. Problems are thus created by year to year fluctuations in the exchange rate Belgian franc/US dollar, the US dollar being the currency in which the member contributions are defined. In order to avoid these difficulties, which have been quite dramatic in the recent past, it has been suggested to switch the currency of the unit contribution from the US dollar to a currency more closely related to the Belgian economy, such as the Swiss franc or any other European currency or basket of currencies, such as the European Currency Unit (ECU). No time was available to study such a proposal carefully enough to make any recommendation in that direction. However a careful study of the problem by the Board of Officers, in collaboration with the Finance Committee, should be submitted to the Member Committees well in advance of the next General Assembly, in order to allow the Council to make a well-considered decision at that time. At the present time, the problem should be solved by authorizing the Board of Officers to adjust the unit contribution as expressed in dollars, to keep its purchasing power consistent with the budget approved by the Council.

Conservation of assets

Considering the need for quick reactions in a highly unpredictable economic situation, the Committee does not feel it appropriate to make quantitative recommendations about the way of keeping our assets. However, the situation should continue to be carefully monitored in order to keep constant the purchasing power of our assets, taking into account the expenditures likely to be incurred

in various currencies, as well as the interest rates. The Committee recommends that expert advice should be sought about possible new strategies for preserving our assets.

3. Budget 1988-1990

Of the two possible budgets prepared by the Treasurer for the General Assembly in 1990, the Committee selected Budget 1, which corresponds to a contribution of the URSI operating budget at the level of 100,000 dollars.

As a consequence of the high exchange rate between the US dollar and the Belgian franc, the unit contribution as expressed in US dollars, has been kept constant from 1984 to 1987 at the value of 610 dollars. The recent evolution of this parameter triggers the necessity of an increase of the unit contribution. However, the Committee, noting that in many countries the budget for the next year has already been established, considers that it is too late to decide an increase of the unit contribution for 1988. In consequence, it selected Model B with some modifications which are shown in Table 1.

The unit contribution for 1989 has been reduced from 780 to 740 dollars in an attempt to smooth the difficulties linked with a too large increase in rate. The scientific activities have been increased from 39.3 to 41.7 k $ in 1988 and from 41.1 to 42.5 in 1989; similarly the administration has been increased from 105 to 110 in 1988, in order to permit a satisfactory level of activity of URSI.

Each of these proposals induces a deficit. As a consequence, the surplus in 1988 becomes 0 instead of 8.4; in 1989, it becomes 24.64 instead of 35.4. Taking into account the unmodified deficit (-39.7) in 1990, year of a General Assembly, the overall deficit for the triennium is 15 k $. The Committee feels that such a deficit is acceptable on the following grounds: firstly, the Reserve Fund has reached a satisfactory level; secondly, the interests are likely to be underestimated, in particular the appreciation of the Rorento Funds has not been taken into account; thirdly, the contribution of the URSI operating budget to the 1990 General Assembly has been estimated on the safe side.

The Committee welcomes the idea of allocating a given amount, possibly of 8 k $, to the Commission Chairmen to cover support to their scientific meetings, including the General Assembly. Except by permission of the Board, these meetings should be held either during the years inbetween General Assemblies, or in the framework of the next General Assembly. An appropriate support should be given to other permanent activities of the Union, for example to the Committee on Developing Countries.

The Finance Committee:

M. Petit (Chairman)
A.L. Cullen
F. Gardiol
S. Radicella
M.E. Zhabotinskij

Assisted by:

H.J. Albrecht (Treasurer)
J. Van Bladel (Secretary General)

31 August 1987

TABLE I

Model B modified	$(000)				
	1988	1989	1990	Total	1991
Unit Contribution	0.61	0.74	0.86		0.9
INCOME					
Member Committees	142.74	173.16	201.24	519.4	210.6
Allocations (ICSU,etc)	10.0	10.0	10.0	30.0	10.0
Publications	0.56	0.58	0.56	1.7	0.6
Interests/Dividends	10.0	10.0	10.0	30.0	10.0
Total Income	163.3	193.74	221.8	578.84	231.2
EXPENDITURE					
Scientific Activities					
Normal	41.7	42.5	24.0	108.2	65.0
XXIII Gen.Assembly			60.0	60.0	
Young Scientists	4.0	4.0	8.0	16.0	4.0
XXIII Gen. Assembly: Organization			40.0	40.0	
ICSU Dues	3.6	4.6	5.0	13.2	5.3
Administration (including publications)	111.0	115.0	121.5	347.5	128.0
Loss on exchange	3.0	3.0	3.0	9.0	3.0
	163.3	169.1	261.5	593.9	205.3
Surplus (+)/Deficit(-)	0	+24.64	-39.7	-15.06	+25.9

URSI ACCOUNTS FOR THE YEARS 1984, 1985 and 1986

The Standing Finance Committee examined the audited Accounts of Income and Expenditure for the calendar years 1984, 1985 and 1986. It recommended the approval of these accounts by the Council and their publication in the *Proceedings of URSI General Assemblies*, Vol.XXI.

The URSI account books are kept in Belgian francs and US dollars, but the accounts are presented in US dollars using the United Nations rate of exchange in force at 31 December each year, as shown below:

Year	1984	1985	1986
Belgian Frs	61.5	51.0	42.0

INCOME AND EXPENDITURE ACCOUNTS

for the years ended 31 December 1984, 1985, 1986

Year ended 31 December 1984

INCOME	$	$
Sale of publications		421.80
Contributions from Member Committees		138,298,24
Allocations: from UNESCO/ICSU		19,435.00
from Italian URSI Committee		11,500.00
Miscellaneous		27.28
Interest and dividends		
Belgian francs	358.62	
US dollars	10,034.14	
		10,394.76
Total Income		180,075.08

EXPENDITURE

a) Scientific Activities

Meetings, Symposia, etc.

COSPAR	3,500.00	
IMS	500.00	
IR and MM Waves	1,000.00	
MAP Workshop	1,500.00	
Wave Propagation and Remote Sensing	1,500.00	
Radio Astronomy, Granada	2,000.00	
Wroclaw EMC Symposium	1,000.00	
		11,000.00

Subventions

FAGS	2,000.00	
IUCAF	1,250.00	
SCOSTEP	1,000.00	
INAG	525.00	
		4,775.00

XXI General Assembly

Scientific expenses	43,857.87	
Administrative expenses	20,504.77	
Printing expenses	14,063.20	
Young Scientists	10,713.36	
		89,139.20
Scientific travel		591.66
Representation of URSI		443,96
Total Expenditure: Scientific Activities		105,949.82

b) Publications

URSI Information Bulletin (No 226 to 231)	7,620.52

	$	$
c) ICSU Dues		2,967.00
d) Administration		
Salaries and pensions(incl.Soc.Sec.)		32,515.61
Office expenses		
Rent, light, heating	1,951.22	
Secretariat	142.85	
Stationery, office supplies	357.06	
Office equipment	145.02	
Postage	1,244.99	
Telephone	865.50	
Social and accounting fees	4,313.53	
Bank charges	1,274.69	
Insurance	2,654.62	
Entertainment	309.37	
Miscellaneous	99.97	
Administrative travel	2,628.55	
Difference of exchange	7,750.15	
		21,737.52
Total: Administration		54,253.13
Total Expenditure		170,790.47
Excess of income over expenditure		9,284.61
		180,075.08
Balance in hand on 1 January 1984		244,786.60
Excess of income over expenditure to 31 December 1984		9,284.61
Loss on Belgian Francs		-7,682.33
Balance in hand on 31 December 1984		246,388.88

Year ended 31 December 1985

INCOME	$	$
Sale of publications		615.96
Contributions from Member Committees		165,524.26
Allocation from Ministère Belge de l'Enseignement		2,941.18
Allocation from ICSU		20,013.00
Reimbursement Italian Committee for registration fees XXI G.A.		11,826.15
Reimbursement COSTED for Young Scientists XXI G.A.		2,382.00
Interest and dividends		
Belgian francs	2,334.94	
US dollars	12,226.17	
		14,561.11
Total Income		217,863.66

EXPENDITURE

a) Scientific Activities		
Meetings, Symposia, etc.		
ISSS	750.00	
EMC	600.00	
ICPIG	1,520.00	
Magnet. Syst.	931.14	
IRI	1,360.31	
Antenna Prop.	3,020.00	
		8,181.45
Subventions		
IUCAF	1,250.00	
SCOSTEP	1,000.00	
		2,250.00
Scientific travel		3,332.45
XXI General Assembly		
Scientific expenses	500.00	
Printing expenses	6,348.75	
		6,848.45
Total Expenditure: Scientific Activities		20,612.65
b) Publications		
URSI Information Bulletin (No 232 to 234)		4,394.37

	$	$
c) Administration		
Salaries and pensions (incl.Soc.Sec.)		44,977.37
Office expenses		
Rent, light, heating	2,352.94	
Stationery, office supplies	770.49	
Office equipment	121.00	
Postage	1,473.41	
Telephone	1,191.75	
Social and accounting fees	5,018.88	
Bank charges	1,670.89	
Insurance	3,108.37	
Entertainment	557.06	
Miscellaneous	132.45	
Administrative travel	4,894.04	
		21,291.28
Total Expenditure: Administration		70,663.26
Difference of exchange		(18,108.15)
Total expenditure		73,167.76
Excess of income over expenditure		144,695.90
		217,863.66
Balance in hand on 1 January 1985		246,388.88
Excess of income over expenditure to 31 December 1985		144,695.90
Gain on Belgian francs		16,581.46
Balance in hand on 31 December 1985		407,666.24

Year ended 31 December 1986

INCOME	$	$
Sale of publications		557,45
Contributions from Member Committees		141,198.71
Allocations:		
from Third World Academy	3,000.00	
from Ministère Belge de l'Enseignement	3,571.43	
from UNESCO (Radio Handbook)	9,428.57	
from ICSU	21,733.00	
from Royal Society London (Y.Sc.)	1,488.10	
		39,221.10
Interest and dividends		
Belgian francs	1,794.64	
US dollars	15,876.40	
		17,671,04
Total Income		198,648.30

EXPENDITURE		
Scientific Activities		
Meetings, Symposia, etc.		
Infrared and mm Waves	500.00	
Solar Maximum Analysis	1,000.00	
CPEM	2,088.00	
Asia-Pacific Microwave Conf.	8,000.00	
EMC	1,500.00	
Beacon Satellites	2,653.36	
COSPAR	677.81	
EGS	1,000.00	
Ionospheric Modelling	1,000.00	
EMT	3,000.00	
Microwave Signatures	2,500.00	
Ionospheric Modifications (including $7,000.00 Young Scientists)	1,500.00	
		25,419.17
Meeting of Board		6,232.95
Meeting of Coordinating Committee		8,932.33
Publications		
URSI Information Bulletin (No 235 to 238)		9,523.33
Subventions		
IUCAF	1,250.00	
SCOSTEP	1,000.00	
FAGS 1985 and 1986	4,000.00	6,250.00

	$	$
XXII General Assembly - Scientific		393.51
XXII General Assembly - Administrative		580.99
Scientific travel		7,604.69
Representation of URSI		5,022.17
Radio Handbook		5,937.84
Total Expenditure: Scientific Activities		75,896.98
Administration		
Salaries and social security		60,245.50
Office expenses		
Rent, light, heating	2,857.14	
Office supplies, stationery	1,247.60	
Postage	3,256.62	
Telephone	1,608.14	
Social and accounting fees	6,479.81	
Bank charges	1,854.12	
Insurance	1,143.83	
Entertainment	375.14	
Miscellaneous	693.88	
Administrative travel	4,462.07	
		23,978.35
Total Expenditure: Administration		84,223.85
ICSU Dues for 1985 and 1986		7,595.55
Difference of exchange		(6,003.58)
Total Expenditure		161,712.80
Excess of Income over Expenditure		35,935.50
		198,648.30
Balance in hand on 1 January 1986		407,666.24
Gain on appreciation of Belgian franc		35,190.56
Revised balance on 1 January 1986		442,856.80
Excess of income over expenditure		36,935.50
Balance in hand on 31 December 1986		479,792.30

REPORT OF THE PUBLICATIONS COMMITTEE

The Committee was established by the Council with the following constitution:

Prof. A.L. Cullen (Chairman)
Dr. J. Hénaff
Dr. G. Hyde
Prof. G. Swarup
Prof. V. Zima.

It met twice, but Dr. Hénaff and Prof. Swarup were unable to attend either meeting. The President of URSI attended most of the second meeting. The Secretary General attended both meetings. At the second meeting, Prof. S.A. Bowhill gave written and oral evidence on the "Review of Radio Science"; written evidence on this matter was also provided by Dr. H. Rishbeth. Prof. Bowhill also gave evidence on the proposed journal on "Signals, Systems and Electronics" and on the journal "Radio Science". The Committee is indebted to both of these gentlemen, and to the Secretary General for his guidance on administrative and other matters.

1. "Review of Radio Science"

In the discussion the following points were made:

(a) Although the Review has been criticized by senior experienced scientists, it was known to be useful to young scientists and to scientists in developing countries.

(b) The rule that every reference must be cited in the text had been criticized, but no acceptable alternative was found.

(c) A different form consisting of review articles by specialists was preferred by some, but it was felt that separate publication of the collected Tutorials and General Lectures largely met this criticism.

(d) A library of Congress number, or equivalent was essential.

(e) The possibilities of 'desk-top publishing' should be urgently explored.

(f) The disposal of spare copies to the Third World Academy of Sciences and elsewhere should be considered; it could provide a possible source of income to the Publications Fund.

(g) An increase in the total number of pages from 160 to 220 should be sought, and the page ratios amongst the Commissions should be reviewed by the Editor in the light of, e.g. comparison with Inspec.

(h) Significant articles in languages other than English and French should be included as at present.

(i) Additional copies should be made available for distribution to future contributors, Commission Editors and Member Committees.

(j) Conference proceedings should be referenced as a single item

(k) Commission Editors should accept the responsibility of ensuring genuinely international surveys, even when one or more national inputs are missing.

(l) Authors should be encouraged to put their material on a diskette, or have it typed in a form suitable for an optical character reader.

(m) Consideration should be given to the generation of a subject-indexed bibliography data base in radio science, bearing in mind the extent to which Inspec meets this need, or might do so with the help of URSI.

2. "Modern Radio Science"

In the discussion, the following points were made:

(a) The venture appears to have been well received, and should continue.

(b) It is complementary to the "Review of Radio Science", being in essence a collection of review articles by specialists, and so may be regarded as at least a partial answer to one of the suggestions made about the Review.

(c) Like the "Review of Radio Science", "Modern Radio Science" is expected to appeal strongly to young scientists and third-world countries.

(d) The arrangements with the ICSU Press were noted, and the help of the Israeli Organizing Committee in getting the book produced on time was noted with gratitude.

(e) The possibility of a wider circulation of the book through a commercial publisher was approved. This could lead to wider understanding of the work of URSI, and also to some income for the URSI Publications Fund.

3. "Handbook on Radio Propagation for Tropical and Sub-tropical Countries"

In the discussion, the following points were made:

(a) The Handbook was known to be greatly valued by the third-world countries and by young scientists.

(b) It was known to be of interest to CCIR, and would certainly be useful to industrial companies.

(c) It was felt appropriate to extend the production from 500 to 1000 copies. Of these 100 complimentary copies would be sent to URSI Member Committees, Commission Chairmen, etc. The Third World Academy of Sciences was apparently willing to purchase copies for distribution.

(d) Arrangements would be made to publicise the book appropriately.

(e) The Committee expressed its appreciation to Dr. Mitra and his team of authors, all from developing countries, for producing such a valuable book, and wished to encourage the production of a

family of URSI Handbooks in the same format. Dr. Mitra said he already had in mind a supplement to the present Handbook. For the future, it was agreed that a Handbook on microwave propagation through sandstorms, and the effects of ionospheric scintillation on microwave satellite systems would be very useful.

4. URSI Newsletter

Following up the discussion at Council, the Publications Committee warmly endorsed the concept of an URSI Newsletter. It supported the view that this should start as a 2-3 page section in the "URSI Information Bulletin", and recommended that Prof. R.L. Dowden be invited to act as editor, in consultation with the Secretary General.

The possibility of using a bulk mail distribution system of individually addressed copies via Member Committees should be examined.

5. "Signals, Systems and Electronics": A New URSI Journal

The general motives behind this proposal from the Member Committee in Czechoslovakia were warmly endorsed. The practical problems were considerable, however, and after some discussion it was agreed that further examination of some of these problems would be needed before taking the proposal further.

6. "Radio Science"

The reasons for the disappearance of USNC/URSI control and of the URSI logo from the journal "Radio Science" were outlined by Prof. Bowhill. It was agreed that this was a retrograde step for URSI, and that efforts should be made to arrange matters in such a way that the journal once more became an USNC/URSI journal. Prof. Bowhill believed that such a move was timely and offered to help. It was noted that "Radio Science" was in a financially sound position.

7. Future Trends in Publishing

Dr. Hyde summarized the possibilities of saving costs in preparation and composition - though not in printing - through desk-top publishing. URSI might in the future make use of this, e.g. for the next issue of "Review of Radio Science". ICSU might also be encouraged to consider this approach for URSI (and other) publications, and Prof. Cullen undertook to consult with Dr. Whelan of ICSU Press on this matter.

8. Young Scientists Sessions

Dr. Mitra offered to arrange for the contributions of the Young Scientists to the General Assembly to be published, subject to approval by referees, in the "Journal of the Institution of Telecommunications Engineers (of India)", or in the "Indian Journal of Radio and Space Physics". Prof. Cullen undertook to bring this offer to the attention of the Young Scientists attending the General Assembly. In the case of the latter journal, a special issue would be possible. The Committee approved this offer with thanks.

9. Recommendations to the Council

1. The Council is invited to endorse the policy of "Review of Radio Science" to take into account articles in all languages, not simply those published in English or French.

2. The Council is requested to agree to an increase in the number of pages in the "Review of Radio Science", subject to budgetary constraints, and to invite the Editor to reconsider the number of pages allocated to each Commission.

3. The Council is invited to approve the continued publication of the Tutorials and General Lectures at each General Assembly, with a wider subsequent distribution by a commercial publisher when suitable arrangements can be made.

4. The Council is invited to express its appreciation to Dr. A.P. Mitra and his colleagues for their work in preparing the "Handbook on Radio Propagation for Tropical and Sub-tropical Countries" and to support, in principle, the production of similar Handbooks in the same format covering other aspects of the work of URSI.

5. The Council is asked to approve the inclusion in the "URSI Information Bulletin" of an "URSI Newsletter" section, and to appoint Prof. R.L. Dowden an Honorary Editor to edit this section, in consultation with the Secretary General.

6. The Council is invited to establish the Publications Committee as a Standing Committee.

A.L. Cullen
Chairman

REPORT OF THE STANDING COMMITTEE ON DEVELOPING COUNTRIES

Taking into account the spirit of the Corsendonk Meeting and the concluding remarks in the document that reflects such spirit, the Standing Committee on Developing Countries proposes to perform the Programme of Activities for the triennium 1988-1990, that is described below.

The Committee also proposes the following internal organization for the next triennium:

(a) Steering Committee:

Dr. S. Feng (China, CIE)
Prof. J.O. Oyinloye (Nigeria)
Prof. S.M. Radicella (Argentina)
Dr. B.M. Reddy (India)
Mr. J. Voge (France)

(b) Corresponding Members:

Dr. S. Sadik (Iraq)
Dr. J. Siev (Israel)
Dr. I. Salem (Egypt)
Mr. A. Pamboro (Cameroon)
Dr. F. Moupfouma (Congo-Brazzaville)
Dr. P. Kaufmann (Brazil)
Dr. R. Woodman (Peru)
Mr. R. Reowilaisuk (Thailand)
Dr. A.D. Ochou (Ivory Coast)

The Committee asks to be authorized to invite colleagues from other developed countries to become corresponding members.

Programme of Activities

1. To produce a supplement to the Handbook on Radio Propagation in Tropical and Subtropical Countries, with updated information on actual data relevant to the subject obtained from different sources. It should be prepared in one year time under the responsibility of the same Working Group that prepared the Handbook, with inputs from interested parties.

2. To hold a 2nd Biregional African-Latin American Workshop on Radio Propagation and Spectrum Management. The Workshop would be held in Ilorin, Nigeria, in the first half of 1989.

3. To organize, together with the ITU, a Course on Scientific and Technological Management of Telecommunications Projects. The Course, intended for technical trained personnel of developing countries involved in telecommunications management, should be held in Geneva during 1990, preferably in conjunction with another relevant meeting.

4. To define, organize and coordinate measurement projects in South America, Africa and Asia in the following areas:

- Rainfall attenuation at selected frequencies
- HF fieldstrength and radio noise at selected frequencies.

The basic criteria to be considered for the technical definition of these campaigns would be:

(a) to take into account the international needs defined by the CCIR;
(b) to interact with the appropriate Commissions of URSI during the planning stage;
(c) to ensure the standardization of measurements and analysis methods in collaboration with CCIR in all the geographical areas to be covered.

5. To hold a Workshop where the results of the measurement projects will be presented and discussed. The Workshop would be held at the place of the next URSI General Assembly, immediately before it, and should report to the appropriate URSI Commissions during their meetings.

6. In order to coordinate adequately the proposed activities 1 to 5, the Steering Committee should be able to meet once in 1988 and once in 1989. The first meeting could be organized on the occasion of the International Symposium on Radio Propagation to be held in April 1988 in Beijing.

As in the past triennium, all the proposed activities will need a substantial economic support that should come partly from URSI and partly from external sources. In all cases the support should include the travel and living expenses for the persons from developing countries that attend meetings, workshops and courses, unless they can find local national support for their trips.

Activities 1 to 5, and in particular activity 4, require funds to cover essentially communication costs.

Activity 4 requires measuring systems that should be provided to the scientific groups involved at least on a loan basis for a period of time, not less than 14 months. These equipments should be obtained with the help of CCIR or of related national or international organizations.

S.M. Radicella

REPORT OF THE WORKING GROUP ON MEMBERSHIP STRUCTURE

The Working Group on Membership Structure was appointed by the Council to consider the membership structure of URSI. In particular, the Group was asked to consider the following possible categories: individual membership, associate membership and affiliate membership. The members of the Group were as follows: C.M. Butler (USA), P. Delogne (Belgium), Feng Shizhang (China, CIE), K. Géher (Hungary), M. Petit (France) and S. Okamura (Japan) as Chairman. Meetings were held on 25, 27 and 28 August 1987.

The Working Group recommended that the membership categories described below be initiated.

1. Associate Member Committees

It is recommended that URSI establish a category for associate member committees, subject to the following limitations and conditions:

- Committees are to be invited to join URSI by decision of the Board of Officers subject to ratification by the Council,
- The period of membership is not to exceed six years,
- Committees shall have no voting rights on URSI matters nor shall any affiliate commissions have voting rights,
- Membership contribution is not required,
- Committees are to receive limited URSI materials and publications from the URSI Secretariat.

2. Affiliate Membership

It is recommended that URSI initiate affiliate membership for the purpose of enhancing cooperation and communication between it and research organizations, professional/scientific societies, industrial companies, etc. The URSI Board of Officers is encouraged to issue affiliate membership invitations to organizations of the type listed above. It is further recommended that a Committee of affiliate members be established and that this Committee meet during each General Assembly. Affiliate members will be asked to contribute financially to URSI according to rates to be established by the Board.

3. Individual Membership

The Working Group recognizes the importance of individual membership, especially as this matter relates to active radio scientists who reside outside territories of casual Member Committees but, due to the impact this membership could have on URSI affairs and due to inadequate information on the present structure of Member Committees, it respectfully requests that action be deferred. In order to obtain the information needed about the Member Committees, the Group proposes that a questionnaire be distributed.

S. Okamura
Chairman

REPORT OF THE WORKING GROUP ON THE NAME OF THE UNION

The Council formed a Working Group to propose a possible new name for URSI. Members were Profs Cullen, Delogne and Okamura. The mission of this Working Group included a hearing phase, but no suggestions were received.

As a matter of fact, many names have already been proposed, either during the General Assembly in Florence, or at the Corsendonk meeting. A wide consensus appeared in favour of keeping the URSI logo unchanged. The Working Group feels that the Council should avoid spending again time in a lengthy discussion on possible names.

The Working Group considers that the present name seems to indicate that the Union is exclusively concerned with radio and that it should be changed to explicitly indicate that the Union is already active in other areas, and wishes to increase its activity in these fields, particularly in telecommunications and in electronics/optronics.

On the other hand, the name of the Union should remain short. The proposed name is:

International Union of Radio and Communication Sciences.

It is not felt necessary to add "and electronics/optronics" because the interest in communications automatically implies an interest in electronics and optronics related to communications. On the other hand, URSI is not interested to cover the full field of electronics and optronics, e.g. industrial.

The proposed French name is:

Union Scientifique Internationale de Radioélectricité et de Télécommunications.

The word "radio-scientifique" is dropped because it is not a correct construction in the French language.

P. Delogne

REPORT OF URSI-CCIR-CCITT LIAISON COMMITTEE (1984 - 1987)

1. Objective of the Committee

The objective of the Committee is "to develop further and to improve the cooperation between URSI and the Consultative Committees of the International Telecommunication Union." These Committees are the International Radio Consultative Committee (CCIR) and the International Telephone and Telegraph Consultative Committee (CCITT).

2. Historical Perspective

This Liaison Committee was formed in June 1976 in partial response to the decision at the 1975 General Assembly in Lima, Peru to give more impetus to the study of telecommunications within URSI. The early history of the Committee was summarized in an announcement of its formation by Dr. C.M. Minnis, then URSI Secretary General, which was prepared in August 1976 for the "URSI Information Bulletin". Dr. J.A. Saxton (UK) chaired the Committee until his death in 1980, and the URSI Board appointed M. M. Thué (France) to take over the chairmanship in September 1980. M. Thué served in this capacity until September 1984, and he prepared a report summarizing the activities from 1978-1984. The Committee met at the URSI General Assembly in Florence on 31 August 1984, and Mr. G.H. Hagn (USA) accepted the chairmanship at the request of M. Thué, Prof. W.E. Gordon (then President of URSI), and Mr. R.C. Kirby (Director, CCIR).This report will summarize the activities of the Committee from 1984 to 1987 and offer recommendations for the future.

3. Current Membership

The current membership of the Committee was given in the December 1986 issue of the "URSI Information Bulletin". It is of historical significance that Professor F.L. Stumpers (Netherlands) is the only original URSI member still serving on the Committee. His continuing contributions have been appreciated by all the Committee Chairmen.

4. Summary of Activities, 1984-1987

After the Florence URSI General Assembly, the incoming Committee Chairman and the URSI Secretary General initiated correspondence with the Directors of the CCIR and the CCITT. There has been further correspondence with the CCIR, but there has been no effective dialog with the CCITT prior to the URSI Secretary General's June 1987 visit to the CCIs in Geneva. The activities involving the CCIR will be summarized next.

Immediately after the 1984 URSI General Assembly, there was an attempt to get scientific information presented into the CCIR process in time for consideration at the CCIR meetings and September 1985 Plenary Assembly in Dubrovnik. No original URSI contributions were generated, but important material from the Assembly was submitted through the national committees of the CCIR. Examples include the contribution by Dr. Spaulding (USA) for revising CCIR Report 322 on

natural noise from ligtning and the contribution by Prof.Wielebinski (FRG) of a new radio astronomical map to CCIR Report 720. The important point is that the material presented and discussed at URSI sessions was contributed for consideration by the CCIR to improve the CCIR reports.

The Chairman of URSI Commission E, Prof. F.L. Stumpers, organized a workshop at the 6th International Symposium and Technical Exhibition on Electromagnetic Compatibility (held in Zurich, 5-7 March 1985) which was titled "URSI Workshop on Communications and EMC". The topics included EMC studies pertinent to the CCITT/CCIR. The Liaison Committee Chairman, Mr. Hagn, presented a paper entitled "The Proposed Work of the URSI-CCIR-CCITT Liaison Committee". Several possible contributions to the CCIR were discussed in the Workshop, but it proved to be impossible to prepare and submit them in time for the 1982-1986 CCIR cycle of documents.

The Committee Chairman noted four basic methods by which the Liaison Committee could assist the CCIR:

1. Respond when formally asked to provide comment on specific study questions identified by the CCIR. The formal requests are written into the CCIR plenary documents in this case.
2. Respond when asked informally for assistance by the CCIR Directorate or Study Group Chairmen.
3. Independently review CCIR (or CCITT) documents and submit written comments regarding accuracy and currency to help improve the documents.
4. Submit scientific information in the form of URSI-originated documents.

A fifth method, mentioned by Dr. Minnis, is participation in jointly sponsored meetings, and a sixth is to have URSI authors submit papers to the ITU Journal. Each of these categories will be discussed next.

At the 1985 CCIR Plenary Assembly in Dubrovnik there were no formal requests referred to URSI. There was no formal URSI attendance at this Assembly.

The Committee Chairman responded to a 1987 request by the CCIR Directorate (Dr. R. Struzak) for assistance in clarifying the status of potential speakers for a CCIR-organised session (JS 10) on spectrum management being planned for the URSI General Assembly.

The Chairman submitted comments on two CCIR items to the Director, Mr. Kirby, on 28 April 1986: 1) recommending the adoption of the revised CCIR Report 322; and 2) recommending use of URSI Review of Radio Science instead of CCIR Study Group Chairman state-of-the-art reports as suggested by Poland in CCIR Document PLEN./8-E. This URSI letter became CCIR Document PLEN./74-E for use at the CCIR Plenary Assembly in Dubrovnik. Both recommendations were accepted, although the new CCIR 322 was accepted only provisionally. The use of the URSI Review of Radio Science was followed up by the URSI Secretary General during a visit to the CCIR in Geneva in September 1986 and in further discussions by the Committee Chairman with the

CCIR Director (Mr. Kirby) and the URSI Editor (Dr. Hyde). An availability announcement in the ITU Journal was recommended by the Committee and agreed to by the Secretay General and the CCIR Director. The Committee also recommended that URSI provide enough copies of the Review of Radio Science to the CCIR so that the CCIR Study Group Chairmen and Vice-Chairmen will have ready access to the material. It has now been agreed that the Secretary General will provide 25 copies to the CCIR Director for distribution shortly after the Tel Aviv General Assembly. This input of URSI information should improve the transfer to CCIR but it will still require that the CCIR Study Groups match the URSI information to their various study programmes, reports and recommendations. This post-processing seemed the only practical approach, although it would have been desirable for the generators of the URSI review to have noted CCIR requirements for information prior to assembling the URSI review (as suggested by the CCIR).

URSI President A.P. Mitra (India) has been chairing an URSI Committee preparing a "Handbook on Radio Propagation for Tropical and Subtropical Countries", which is of considerable interest and use by the CCIR. A draft of the Handbook was provided to the CCIR in November 1986, and it is anticipated that the document will be completed prior to the URSI General Assembly in Tel Aviv. In June 1987, the CCIR provided a paper by K.A. Hughes (CCIR Study Group 5) to Dr. Mitra intended for publication in the ITU Journal: "CCIR Propagation Studies for Africa". Liaison Committee member M.P.M. Hall has initiated correspondence with Prof. Radicella (Argentina), Chairman of the URSI Standing Committee on Developing Countries, to facilitate URSI Comm.F/CCIR Study Group 5 dialog in Tel Aviv on tropospheric propagation at low latitudes.

There have been no joint URSI-CCIR scientific or technical meetings, but both organizations have endorsed some of the same meetings. Examples include: 1) Zurich EMC 1985, 1987; 2) Wrocław EMC 1984, 1986; and Liaison Committee member Dr. Fedi's International Symposium on "Present and Future in Satellite Communications: System Design and Radio Propagation Studies", Capri, June 1985.

The CCIR Report 229-4 and Recommendation 527-1 on ground constants shows no variation with frequency in the HF band; however, scientific data presented at URSI meetings have shown significant variation of relative dielectric constant for wet soils and of conductivity for dry soils. This has been called to the attention of the Director of the CCIR, and an URSI document is in preparation for submission to the CCIR recommending new frequency-dependent ground constants for selected types of soils at HF.

Dr. C.M. Rush (USA) organized an International URSI Commission G Workshop on Ionospheric Modelling in Boulder, CO in August 1986. A summary of conclusions regarding the status of ionospheric modelling is in preparation and will be brought to Tel Aviv by Dr. Rush. This report will be forwarded to the CCIR Director and to the Chairman and Vice-Chairman of CCIR Study Group 6. It is a candidate to evolve into an article for the ITU Journal.

5. Net Assessment of Committee Progress

The contributions of the URSI-CCIR-CCITT Liaison Committee to date have been modest by any account. The full Committee has not been able to meet between URSI General Assemblies which occur every 3 years, although parts of the Committee have met on specific topics at international meetings (e.g., Zurich EMC in 1985). The expense of CCIR and CCITT documents limits their availability to some Liaison Committee members. The Committee has had only limited correspondence, but the provision of URSI documents to the CCIR (Review of Radio Science, Handbook on Radio Propagation for Tropical and Subtropical Countries, and Commission G summary on ionospheric models) is an accomplishment of substance in the coordination between URSI and CCIR. Regrettably, no solid technical coupling to the CCITT has yet occurred. The Committee Chairman received no answer to his letter to the CCITT Director. The visits by the URSI Secretary General to the CCIR and CCITT headquarters in Geneva are most essential to continuing the genuine good will between URSI and the CCIR and in initiating a relationship with CCITT (which is increasingly important as URSI becomes more involved in telecommunications). The Secretary General will circulate a report of his June 1987 trip to the Committee describing his discussions with the CCIs. This helps achieve administrative coordination, but URSI scientist participation at future CCIR and CCITT meetings is important to achieving a better match of URSI scientific knowledge to CCI technical problems.

6. Recommendations for Future Activities

The following recommendations are offered for the next 3 years:

1) The Liaison Committee should be continued, perhaps under new leadership.

2) The URSI Secretary General should plan an annual visit to Geneva to assist the liaison process with the CCIs, and the Liaison Committee Chairman (or his designee) also should visit the CCI headquarters (at the same time if practical) and attend at least a portion of major CCIR meetings.

3) A full Liaison Committee meeting will be held at noon in Tel Aviv on Thursday, 27 August 1987; and another full meeting should be held in Geneva, perhaps before or after another scientific or technical meeting, with both CCIs to better determine CCI requirements to which URSI can make a contribution.

4) The Liaison Committee should make better use of URSI Working Groups by providing the Chairmen selected CCI texts for review and comment. The CCIR Study Group Chairmen should be encouraged to communicate directly with the URSI Working Group Chairmen. Toward that end, a list of names and addresses of all URSI Commission and Working Group Chairmen and Vice-Chairmen should be provided to the Directors of the CCIs, and comparable lists should be requested. A prioritized list of CCI topics to which URSI might contribute should be requested again from the CCIs.

5) The provision of the Review of Radio Science to the CCIR should be continued and the concept expanded, to the extent practical, to include providing the records of URSI symposia on selected topics

to the CCIR or CCITT Directors and appropriate Study Group Chairmen and Vice-Chairmen or Interim Working Party (IWP) Chairmen, if they were not in attendance of the meeting. The organizers of financially successful meetings could afford to offer copies if they are available after the meeting and if asked by the URSI Secretary General.

6) Copies of the CCIR and CCITT documents should be provided to the Liaison Committee members who do not have access to them. They would have to be provided without cost to the members. It may not be financially viable to provide copies to all members, but at least the Secretary General and the Liaison Committee Chairman should have copies.

7) The Liaison Committee members should watch for papers at the General Assembly and other URSI meetings which would be useful to the CCIs or which are candidates for publication in the ITU Journal. For example, the Commission F session organized by Dr. M.P.M. Hall, "Radio Propagation Effects on Interference in Radio Communications", should provide valuable inputs for CCIR Study Group 5; and the Commission E session organized by Dr. Stružak on spectrum management also should provide direct input.

8) A special attempt should be made to share URSI information and invite CCI Study Group Chairmen/Vice-Chairmen to international URSI meetings by adding them to the distribution list for the URSI Information Bulletin. This cost should be borne by URSI.

9) Joint scientific technical meetings of URSI and CCIR should be considered where the focus is on specific CCIR study questions. The suggestion of Dr. Hall that the COST Project 210 ("The influence of the Atmosphere on Interference Between Radio Communication Systems at Frequencies Above 1 GHz" colloquium envisaged for 1990 offers such an opportunity and should be pursued.

G.H. Hagn
Chairman

BUSINESS TRANSACTED BY COMMISSIONS

The following summaries of the activities of the URSI Commissions during the General Assembly have been prepared using the documents provided by the Officers of the Commissions.

COMMISSION A - ELECTROMAGNETIC METROLOGY

Chairman: Prof. S. Hahn (Poland)

Vice-Chairman: Prof. S. Leschiutta (Italy)

REPORT OF THE CHAIRMAN FOR THE PERIOD 1984-87

(Summary)

1. Scientific Programme

The Chairman reported on the planning and preparation of the scientific programme for the Tel Aviv General Assembly. A meeting of the Steering Group, chaired by Dr. P. Bauer, and the Commission Chairmen and Vice-Chairmen had already been convened at the end of the Florence General Assembly to decide on a preliminary draft programme for 1987. A second meeting was held in Brussels in the Spring of 1986 to finalize the programme and designate the speakers of Tutorials in each Commission. According to the tradition, Commission A decided to have only invited papers.

Commission A agreed to organize 7 joint sessions with other Commissions, including the session on Time Domain Waveform Measurements and Applications.

The Commission decided to organize 5 sessions of its own but, later, owing to the difficulty of finding appropriate speakers, two sessions were merged under the title "Microwave to Submillimeter Measurements and Standards", and a planned session on "Recent Progress in Telecommunication Measurements" had to be cancelled for the same reason. In view of the importance of that subject and URSI's wish to be more oriented toward telecommunications, it is hoped that such a session will be organized at the next General Assembly.

Commission A Working Group on Measurements related to the Interactions of Electromagnetic Fields with Biological Systems organized 3 sessions, jointly with Commission B and E.

The title of the Tutorial paper in Commission A is: "Laser Measurements 1968-1987 and beyond". In 1968 URSI had organized a Conference on Laser Measurements in Warsaw, Poland. This is an evidence that, 20 years ago, the importance of lasers in measurements was already well understood. Since then, the applications of lasers in various fields of science and technology have expanded considerably and new applications appear every year.

In conclusion, the Commission has been able to prepare a large scientific programme covering almost all topics included in its

terms of reference. The total number of papers in sessions organized directly by the Commission is 63, and the Commission was involved with further 27 papers in joint sessions.

The Chairman expressed his thanks to all the convenors and authors.

2. Terms of Reference

All URSI Commissions have been asked to review their terms of reference. The Chairman prepared draft terms of reference for Commission A . This draft was sent to Member Committees for opinions and comments.

The text is as follows:

- Time and frequency measurements and standards, including infrared and optical frequencies.
- Time domain measurements.
- Frequency domain measurements.
- Telecommunication measurements.
- Laser measurements.
- Quantum metrology and electrical methods in fundamental constants.
- Microwave to submillimeter measurements and standards.
- Measurements of the effects of electromagnetic fields on biological systems.

Several comments were received but no supplement was proposed. The opinion was expressed that quantum metrology and electrical methods in fundamental constants could be omitted eventually. However, the Chairman was personally in favour of maintaining this topic having in mind, among other arguments, the last achievements in new high temperature superconducting materials. This point will be open to discussion at a business meeting of the Commission.

3. Asia-Pacific Metrology Programme for Developing Countries

The Asia-Pacific Metrology Programme for Developing Countries is a joint venture of UNESCO, the Commonwealth Science Council and other organizations. In December 1985 a Third Review Meeting of the APMP and Regional Workshop on Individually Selected Fields of Metrology for Developing Countries were organized at the National Physical Laboratory in New Delhi, India. URSI Commission A was invited to find a speaker to present a paper on time and frequency measurements, and Dr. G. Kramer (FRG) was nominated. The organizers had invited Prof. J.H. Hinken (FRG) to present a paper on Josephson voltage standards, and the Chairman of Commission A presented a paper on the principles and applications of the quantized Hall resistance.

The organizers of APMP asked also URSI for eventual help in encouraging metrological or industrial laboratories in developed countries to provide developing countries with older but still usable measuring equipment and standards. The call of the Chairman of Commission A to the Official Members has had no response. This situation will have to be discussed, having in mind that the Third World Academy of Sciences in Trieste informed URSI that it would

be possible for the Academy to cover the shipping cost.

4. Conference on Precision Electromagnetic Measurements (CPEM)

CPEM is a well established international forum for presentation of new achievements and results in electromagnetic measurements; it is being held biennially. The terms of reference of CPEM and of Commission A are strongly correlated. The last CPEM has been held in June 1986 in Gaithersburg, USA with about 300 participants, and the next one will be held at Tsukuba, Japan in 1988.

URSI is traditionally a cosponsor of the CPEM and the Chairman of Commission A is an ex officio member of the Executive Committee.

For the last CPEM (1986), URSI has arranged for the first time a financial support for three young scientists (China, India and Iraq). Most probably the Young Scientists programme will be continued at the next CPEM, and Commission A will be involved in selecting the candidates.

5. URSI Register of National Standards Laboratories

URSI Commission A has established some time ago a special working group to prepare the URSI Register of National Standards Laboratories. The Chairman and Editor is Dr. A.E. Bailey (UK). The last edition of the Register was distributed to some participants in the General Assembly in Florence (1984). Further copies were distributed later, also to the participants in the Review Meeting of APMP. The Register was printed with the kind help of the National Physical Laboratory (Teddington, UK) which agreed to produce some more copies with the last corrections and additions for distribution at the General Assembly in Tel Aviv. Unfortunately, Dr. Bailey was not able to come to Tel Aviv: he is represented by Dr. Owen Jones , Head of the Division of Electrical Science at NPL.

6. Finances

For this General Assembly, Commission A has been allocated a sum of $2,000 to support the attendance of speakers in Tel Aviv. This support to authors is very much appreciated. It may look small from the point of view of one Commission but, as a whole, it must be regarded as a big financial effort of the Union.

7. The Corsendonk Meeting

A Conference on the future of URSI was held on 8-10 March 1987 in the fifteen-century abbey at Corsendonk, some 100 km from Brussels.

In preparation of that meeting, the Chairman of the Commission wrote a special letter to selected members of Commission A asking for their opinions about the role of the Commission in URSI, its present and future tasks and its relation to organizations outside URSI. Unfortunately, due to the short time available, no response was received.

The discussions and results of the Conference were summarized and published in a special booklet entitled "URSI Corsendonk Conference - Report". It contains a small chapter by S. Hahn on

"The role of Commission A on Electromagnetic Metrology in URSI".

SUMMARY REPORT ON BUSINESS MEETINGS

The Commission held three Business Meetings, on 25, 28 and 31 August 1987.

1. Election of Vice-Chairman

The following candidates were nominated for the position of Vice-Chairman for the next triennium: C. Audouin(France), R. Kaarls (Netherlands), N.S. Nahman (USA), J. Vanier (Canada). The three first mentioned candidates were not present in Tel Aviv, and there was no evidence that R. Kaarls would accept the vice-chairmanship if elected. The results of the subsequent vote were communicated to the Council:

1. J. Vanier
2. C. Audouin.

2. Terms of Reference and Sub-title of the Commission

During the discussion on the draft terms of reference presented by the Chairman, the appropriateness of having quantum metrology as an item was questioned. The general consensus was that this item should be kept but that the next Chairman of the Commission should be vigilant on the proper balance between the various topics covered by the terms of reference. It was stated that the Commission should not be too restrictive in its approach to field selections. "Normes" are also important and should probably be included.

The Commission agreed to adopt the terms of reference as proposed by the Chairman (see Section 2 of Chairman's Report on page 77).

It was also agreed that the sub-title of the Commission should read as follows: Electromagnetic measurements and standards, and interactions between electromagnetic fields and biological systems.

3. Review of Radio Science

In the absence of Dr. R. Kaarls, editor for Commission A, Mr. de Vreede gave a short report on the work done. Nineteen countries provided input to the report which contains 500 references. The major difficulties encountered in the writing of the report were inhomogeneity of texts from the various contributors and the difficulty in getting the reports delivered on time.

The Chairman said that the report from Commission A was the last one received by the General Editor of the Review.

Finally it was mentioned that the reports were too long, contain too much data, should be compressed as much as possible, and that the use of computer input should be encouraged.

At the time of the General Assembly no candidate had been found for the task of editing Commission A chapter for the new edition of the Review.

4. URSI Register of National Standards Laboratories

In the absence of Dr. Bailey, Dr. Jones of NPL gave a report. Due to recent difficulties in staffing at NPL, problems arose in the updating of the previous version of the report. Nevertheless, 5 up-dated copies were distributed and loose sheets of corrections were available for anyone wanting to up-date his present copy.

The opinion was expressed that the Register was very useful to the National Standards Laboratories for communication purposes as well as to third world countries.

It was suggested that Commission A look at the possibility of producing the Register on a commercial basis with a proper division of revenue with the editor.

5. Cosponsorship of Conferences

5.1 CPEM

The Chairman of Commission A is an ex officio member of the Executive Committee of CPEM. The question was asked whether URSI should be represented in the CPEM Programme Committee. It was felt that this may not be wise since the Programme Committee was under the responsibility of its Chairman, and that a representative from URSI may add too many constraints. The Executive Committee makes general policies and URSI has its input at that level.

CPEM'88 will take place in Tsukuba Science City in Japan, and this will be the first time that the Conference is held in Asia. CPEM'90 is most likely to take place in Ottawa, Canada.

5.2 4th Symposium on Frequency Standards and Metrology

This proposed Symposium will take place in Ancona, Italy. The organizers of the first three symposia (C. Audouin, H. Hellwig and J. Vanier), who form the Board of Governors, have written a charter which outlines the general policies regarding the organizing of symposia with that particular title. For various reasons the Board had decided not to request cosponsorship of the symposium at this time. At the meeting on 31 August, Dr. Vanier agreed to consult with the Board of Governors to reconsider this question.

5.3 International Symposium on Electromagnetic Metrology

Mr. Qiao Shiqiong gave a presentation of the International Symposium on Electromagnetic Metrology that is planned for September 1989 in Beijing, China. The Conference and the Proceedings will be in English and the major topic will be essentially radio-frequency and microwave standards.

Commission A accepted unanimously to cosponsor the Symposium.

6. Commission A Relations to Other Organizations

Delegates were nominated to the following organizations:

BIPM - Mr. D.W. Allan (USA)
CCIR - Prof. S. Leschiutta (Italy)
CCITT- Prof. S. Leschiutta (Italy)

IMEKO - (Prof. Leschiutta to find a delegate)
IEC - Mr. P.O. Lundbom (Sweden) (TC 66 - TC 68)
OIML - Mr. P.O. Lundbom (Sweden)

7. Working Group on Interaction of Electromagnetic Fields with Biological Systems and Related Measurements

A draft recommendation had been proposed by Dr. Shapira, emphasizing the need to change the status of this Working Group. However, it was felt that this could not be done at this time.

It was agreed that the Working Group should be maintained and that Prof. S. Rosenthal should be asked by the incoming Commission Chairman to continue to act as Chairman, the Vice-Chairman to be selected among the following names: Prof. H. Korniewicz (Poland), Prof C. Romero-Sierra (Canada), Mr. K. Hanson Mild (Sweden), Mr. J.O. Lin (USA). In the event that Prof. Rosenthal does not agree to continue as Chairman, one of the persons listed above could be asked to become Chairman.

Mr. Lundbom insisted on the importance that people working in the field of effects of electromagnetic fields on biological systems report as exactly as possible on the measurement techniques used and, when possible, for the purpose of comparison of results, use the same measurement techniques.

8. Recommendations of Commission A

The recommendations adopted by the Commission are reproduced at the end of this volume.

9. Closing Remarks

The Chairman of the Commission expressed his thanks to the attendees for their active participation. The participants expressed their gratitude to Prof. Hahn for his dedication during the last three years.

TITLES OF SCIENTIFIC SESSIONS

Commission A Sessions:

- Time and Frequency
  a) Time keeping and time transfer
  b) Atomic frequency standards
- Laser Measurements
- Microwave to Submillimeter Measurements and Standards
- Quantum Metrology and Electronic Methods in Fundamental Constants (2 sessions)

Joint Sessions with participation of Commission A:

- Precise Measurements in Radio Astronomy
- Interaction of Electromagnetic Waves with Biological Systems
  a) EM energy in medical diagnosis and therapy
  b) Biological effects of EM energy
  c) EM safety protection guides and rationales
- Optical Fiber Measurements
- Free Field Antenna Gain Measurements and Standards
- Microwave Metrology
- Man-made Noise Measurements - Limits - Statistics
- Time Domain Waveform Measurements.

COMMISSION B - FIELDS AND WAVES

Chairman: Prof. J. Bach Andersen (Denmark)

Vice-Chairman: Prof. Thomas B.A. Senior (USA)

REPORT ON BUSINESS MEETINGS

The following are the combined minutes of the Business Meetings of Commission B at the XXIInd General Assembly of URSI in Tel Aviv, Israel. The meetings were held on Tuesday, 25 August 1987 and Monday, 31 August 1987, and in the absence of the Commission Chairman, Prof. J. Bach Andersen, the meetings were chaired by the Commission Vice-Chairman, Prof. Thomas B.A. Senior.

1. Vice-Chairman

In accordance with URSI Resolution UC.12, four candidates were nominated for the position of Vice-Chairman for the next triennium: T. Berceli (Hungary), F.E. Gardiol (Switzerland), A. Ishimaru (USA), E.V. Jull (Canada). The Chairman introduced the four candidates. Prof. Ishimaru's request to withdraw his name was accepted. The results of the subsequent vote involving the three remaining candidates were communicated to the Council, which appointed Prof. F.E. Gardiol to be Vice-Chairman.

2. 1989 Symposium

The arrangements for the next Symposium on Electromagnetic Wave Theory to be held in Stockholm, Sweden, August 1989, were described by the Chairman of the Organizing Committee, Prof. Stefan Strom (Sweden). Subsequently, the Technical Programme Committee was established as follows: T.B.A. Senior (USA) - Chairman, F.E. Gardiol (Switzerland), J. Bach Andersen (Denmark), C.M. Butler (USA), D.L. Jaggard (USA), A.D. Olver (UK), S. Strom (Sweden) and P.M.van den Berg (Netherlands). Other members may be added later.

3. 1992 Symposium

A proposal to host the 1992 Symposium on Electromagnetic Wave Theory in Chicago, 12-17 July, in conjunction with the IEEE Antennas and Propagation Symposium and the USNC/URSI Meeting was presented by Prof. P.L.E. Uslenghi (USA). Because other countries had not had notice of the intent to select the site at this General Assembly, it was decided to delay decision until the Symposium in Stockholm in 1989. Prof. Mao (China, CIE) indicated his interest to offer Xian as a site, and Prof. A.D. Olver stated that the UK may also submit a proposal. The Commission recognized that because of the pressure on hotel accommodations in Chicago, it is uncertain whether Chicago will be able to renew its proposal at the Stockholm meeting.

4. Review of Radio Science

The Chairman introduced Prof. E.V. Jull (Canada) who served as Commission B Editor for the past three years and expressed the

Commission's thanks for the work he and his topic editors did. Prof. Jull then led a discussion about the Review. Among the problems noted was the space allocation relative to that of other Commissions. The Chairman announced the appointment of Prof. A.D. Olver (UK) as the Commission Editor for the next triennium.

5. Special issues of "Radio Science"

Selected papers from the 1986 Em Theory Symposium will appear in the Nov.-Dec. 1987 special issue of "Radio Science", edited by Prof. A. Ishimaru (USA). The Commission accepted a proposal from Prof. Ishimaru to edit another special issue of the journal devoted to papers from the 1989 Symposium in Stockholm.

6. Working Group on Inverse Scattering

The Working Group was established at the XXIst General Assembly under the chairmanship of Prof. D.L. Jaggard (USA). Prof. Jaggard described the goals and work of the Group, including the organization of the two-day Open Symposium at this Assembly. The four sessions each had an attendance of 40-80 and were well received. The Commission recommended the continuation of the Working Group with Prof. Jaggard as Chairman and membership to be established later.

7. Working Group on Time Domain Waveform Measurements

This is a Working Group on which all URSI Commissions are represented, and Prof. T.K. Sarkar (USA), IWG-TDWM Vice-Chairman, described its work. The Group organized two joint sessions at the Assembly and, in addition, held two business meetings. It believes the interest in time domain studies warrants an open symposium at the next General Assembly, and the Commission voted to recommend the continuation of the Working Group.

8. URSI-CCIR-CCITT Liaison Committee

The Chairman noted that the purpose of this Committee is to re-establish the cooperation and working relationship which formerly existed between URSI and CCIR/CCITT. Commission B is presently represented on the Committee by its Chairman and Vice-Chairman, but the aims of the Committee would be better served by having two representatives more directly involved with telecommunications. To this end, Prof. D.J. Bem (Poland) and Mr. R.M. Bevensee (USA) were appointed as the Commission's representatives.

9. Co-sponsorship of Meetings

The Commission recommended that URSI co-sponsor the following conferences:

(i) The three annual European Microwave Conferences, commencing with the 18th such Conference to be held in Stockholm, Sweden, 12-17 September 1988. Prof. S. Strom (Sweden) was appointed as the URSI representative.

(ii) The Symposium on Antennas and Electromagnetic Field Theory to be held in Shanghai, China, 29 August - 1 September 1989.

(iii) The 9th Colloquium on Microwave Communication (MICROCOLL) to be held in Budapest, Hungary in 1990.

10. Whither URSI and Commission B?

The Chairman briefly described the Corsendonk meeting held last March, and led off a discussion of the aims and objectives of Commission B by distributing copies of material describing the Commission that had been prepared for the Corsendonk meeting, as well as the present Terms of Reference for Commission B. Among the comments made were: (i) the material is too "defensive" and does not reflect the innovations and new directions that are being taken; (ii) reference to the modelling and analysis of "real world" problems, validation of the models, measurement, etc. should be made; (iii) in several instances Commission B has had a major role in the development of new areas in URSI which have subsequently been taken over by other Commissions, e.g. bioelectromagnetics and remote sensing, and this should be a source of pride; and (iv) we should continue to be active in the development of new areas, and our descriptive material should reflect this. It was agreed to establish a Committee charged with re-writing the Terms of Reference and a two-page description of the Commission's objectives, with drafts ready for discussion at a Business Meeting to be held at the EM Theory Symposium in Stockholm in 1989. The following Committee was subsequently established: Prof. F.E. Gardiol (Switzerland) - Chairman, Prof. C.M. Butler (USA), Prof. H.K. Lindenmeier (FRG) and Dr. W.R. Stone (USA).

11. Facilities at the General Assembly

Many complaints were expressed about the quality and location of the rooms allocated for the Commission B technical sessions and related symposia at the present General Assembly. It is particularly important that rooms be located so that people can move between the technical sessions of different Commissions, and the isolation of all Commission B activities made this impossible. In addition, noise from adjacent rooms was sometimes intolerable. The Commission charged the Chairman to bring this to the attention of the URSI Council in the hope that the problem can be avoided at future General Assemblies.

SUMMARY OF SCIENTIFIC SESSIONS

Commission B organized seven scientific sessions of the Commission alone and also participated in eight joint sessions with other Commissions.

B.1 Solution methods in EM theory
Convenors: D.C. Chang (USA), I.V. Lindell (Finland)
Chairman: I.V. Lindell (Finland)

B.2 Radiation and Scattering: Analytical Techniques
Convenors and Chairmen: S. Strom (Sweden), R.E. Kleinman(USA)

B.3 Transients
Convenors and Chairmen: K.G. Langenberg (FRG),
L.B. Felsen (USA)

B.4 Radiation and Scattering: Numerical Techniques
Convenors and Chairmen: D.R. Wilton (USA)
P.M. van den Berg (Netherlands)

B.5 Numerical Methods for Inhomogeneous Dielectric Bodies
Convenor and Chairman: J.W. Strohbehn (USA)

B.6 Planar Antennas
Convenors: J.R. Mosig (Switzerland), N.G.Alexopoulos (USA)
Chairman: F.E. Gardiol (Switzerland)

B.7 Reflector Antennas
Convenors: W.V.T. Rusch (USA), N.C. Albertsen (Denmark)
Chairman: P.J.B. Clarricoats (UK)

JS.4 Free Field Antenna Gain Measurements and Standards (A, B)
Chairman: M. Kanda (USA)

JS.5 Microwave Methodology (A, B)
Chairman: A.P. Anderson (UK)

JS.7 Antennas in Plasmas (B, H)
Chairman: K.G. Balmain (Canada)

JS.8 Coupling and Shielding (B, E)
Chairman: E.O. Vance (USA)

JS.9 EM Topology (B, E)
Chairman: C.E. Baum (USA)

JS.17 Time Domain Waveform Measurements and Applications (A - J)
Chairman: T.K. Sarkar (USA)

JS.18 Interaction of Electromagnetic Waves with Biological Systems (A, B, E)
Chairmen: J.C. Lin (USA), H.J. Schmitt (FRG),
E.H. Frei (Israel)

JS.19 Wave Propagation in Random Media (B, F)
Chairman: A. Ishimaru (USA).

In addition, the Commission was responsible for a tutorial lecture:

Waves and Spectra: A Modern Perspective, by L.B.Felsen (USA),

and for an Open Symposium:

OS.2 Reconstruction and Inverse Scattering
Convenor and Chairman: D.L. Jaggard (USA)

consisting of four technical sessions.

T.B.A. Senior
Chairman.

COMMISSION C - SIGNALS AND SYSTEMS

Chairman: Prof. K. Géher (Hungary)

Vice-Chairman: Prof. R. Saal (FRG)

REPORT ON BUSINESS MEETINGS

Business meetings were held on Tuesday, 25 August, Friday, 28 August, and Monday, 31 August, the agenda for the meetings having been previously circulated by the Chairman. The meeting on Friday, 28 August, was devoted to the discussion of the proposals for restructuring URSI made at the Corsendonk Meeting.

1. The presence of the Official Members of Member Committees was checked. Thirteen official representatives were present.

2. J.-C. Bic and P. Matthews agreed to act as secretaries responsible for preparing, in French and in English, the minutes of the business meetings.

3. Tellers for the election of the Vice-Chairman were selected; R. Saal and J.G. Lucas agreed to act as tellers.

4. The Chairman reported on the activities of Commission C in the period 1984-87 and described the procedures to be followed in the business meetings. The Chairman noted that, despite his request to all Member Committees to appoint Official Members to Commission C, not all had responded.

During this period 12 conferences in the field of signals and systems had been considered for sponsorship by Commission C (see item 6). The programme for the XXIInd General Assembly had been set up and the Commission C contribution to the 1987 edition of "Review of Radio Science" had been prepared. The Chairman thanked the convenors of sessions at the General Assembly for their work in selecting speakers and the contributors to the "Review of Radio Science". The Chairman commented on the problems connected with the preparation of "Review of Radio Science" and, in particular, on the difficulty to obtain a good balance between the activities in different countries. This balance had been made even more difficult because contributions had not been received from all Member Committees, and some of them had been received too late for inclusion in the Review. As not all Member Committees had designated Official Members for Commission C, contributions had been sought direct from these Member Committees.

The Chairman described some of the problems regarding the work of Commission C in relation to other URSI Commissions, professional organizations, and CCIR and CCITT. There was a need, in particular, to improve the links with CCIR and CCITT. The Chairman noted the dependence of URSI on the voluntary work of individuals involved

in its administration and closed his report by inviting comments, questions and suggestions.

5. Election of Vice-Chairman. The names of three candidates had been received and the candidates had been asked to submit curriculum vitae. Two had been received and circulated to the Official Members before the election. The order of preference to be forwarded to the Council on the basis of the numbers of votes obtained by each candidate was as follows:

1. Prof. P.A. Matthews (UK)
2. Prof. I. Bar-David (Israel).

6. Report on meetings sponsored by Commission C. The Chairman described the different types of sponsorship available from URSI. He noted that the administrative problems associated with requests for sponsorship had deterred some conference organizers, and listed those conferences which had applied for and had been granted sponsorship.

7. The work of the URSI-CCIR-CCITT Liaison Committee was described by Prof J.G. Lucas, Commission C representative, who stated that, although there was a willingness to cooperate on both sides, it was difficult to set up effective liaison. Both CCIR and CCITT invited detailed comments on their reports but, given the volume and detailed nature of these reports, the task was not easy. It was difficult to provide answers to scientific questions unless members could respond from work already being carried out. Prof. Lucas noted that he had received no comments on the papers he had circulated to Official Members. A way in which members of Commission C could offer help was in the up-dating of the CCIR Handbooks.

8. Short reports were given on the work of the Inter-Commission Working Groups. It was considered that the Group on Remote Sensing had fulfilled its original function and that there was a need now for a restructured group to consider, in particular, signal processing techniques. Commission C would welcome continuing links with that Group.

9. Proposals of the Corsendonk Meeting. The Chairman described the topics considered at that meeting. Those of main concern were: (a) the role of URSI in communications; (b) the role of URSI in telecommunications; (c) the role of URSI in the community in general resulting from the expansion of communications. These concerns had led to the need to consider: (1) the terms of reference of Commission C; (2) the publications of URSI; (3) the membership of the Union, and (4) the name of the Union.

(1) The terms of reference of Commission C were described by the Chairman. After some discussion, it was decided that, because of the wider role that Commission C was being asked to play, the incoming Chairman and Vice-Chairman should be asked to re-consider the terms of reference. The new proposed terms of reference should be sent to Member Committees for comments.

(2) It was recommended that the "URSI Information Bulletin" should

be continued in its present form. There was some discussion on the value of producing the "Review of Radio Science" in the light of developments in access to on-line abstracting systems. However it was pointed out that such access was still limited despite the communications revolution and it was recommended that the publication of the Review should be continued. It was noted that, with the expansion of the fields covered by Commission C, it was expected that the Commission would produce an expanded contribution to the Review.

Following the recommendation of the Corsendonk meeting that the publications programme of URSI should be expanded, a proposal was received from Prof Zima regarding the publication of an URSI Journal on "Signals, Systems and Electronics". The Commission welcomed this proposal but members pointed out some of the difficulties which might be encountered in starting a new journal. It was suggested that papers presented at the General Assembly could be written up in full for inclusion in the new Journal. The Commission was of the opinion that this initiative should be supported.

(3) The Commission recommended that the proposal for new categories of associate and affiliate membership should be supported.

(4) The proposal to change the name of the Union to include the words "communication" and "electronics" was discussed. There was general support for the inclusion of "communication", but it was pointed out that the word "electronics" embraced activities in the fields of computing and power electronics not appropriate to the Union. Nevertheless, the general opinion of the Commission was that both terms should be included in a new title for the Union. The URSI logo should be retained unchanged.

A proposal was received from Prof. Saal that an "URSI Symposium on Signals, Systems and Electronics" should be held in 1989 with a view of it being the first of a series. Prof. Saal offered to organize the first symposium in the Federal Republic of Germany. The proposal was welcomed by the Commission.

10. Sponsorship of Conferences. See Recommendation C.2 on page 171.

11. Commission C Editor of "Review of Radio Science". See Resolution C.3 on page 172.

12. Commission C Representatives. See Resolution C.4 on page 172.

13. The Chairman expressed his thanks to the convenors, chairmen and speakers of the scientific sessions for the work they had carried out to make them a success, and to the Minute secretaries.

The Commission expressed its appreciation to Professor Géher for his hard work as Chairman of the Commission during the last three years.

SUMMARY OF SCIENTIFIC SESSIONS

Ten scientific sessions were sponsored solely by Commission C. In addition, the Commission cooperated in the sponsorship of a number of joint sessions. Each session was planned to consist of five or seven 30-minute presentations. The programme was a full one, although a very few of the presentations were cancelled. The audience at each session averaged about 50 persons. Most papers were followed by a lively discussion period.

Commission C scientific sessions had invited speakers and oral presentations only.

The Tutorial Lecture was delivered by S. Csibi on "Queuing and Coding in Multi-User Communication: Ideas, Techniques, Theory". The full paper is available in *Modern Radio Science*, edited by A.L. Cullen, ICSU Press 1987.

The following is a very brief summary of the ten scientific sessions sponsored by Commission C. Abstracts of the papers are contained in the Abstract Book, XXII General Assembly of URSI, Tel Aviv, 1987. The present summary was prepared on the basis of the reports of the session chairmen.

Session C1: Digital Circuits and Digital Signal Processing

(Convenor: A. Fettweis; Chairman: H.W. Schussler)

1. In his talk H.W. Schussler gave an overview of the general principles in designing linear, time invariant digital systems. He pointed out that a careful formulation of the problem, based on the intended application and the available hardware is of vital interest for an optimal solution. The state of the art as well as open questions concerning the design have been outlined.

2. P.L. Emiliani presented the second paper on multi-dimensional digital filters. He described their properties in the space and frequency domain and discussed the different types of filters and the corresponding design problems. Of particular importance is the stability problem in case of IIR-systems and their application such that a linear phase behaviour is achieved.

3. H. De Man talked about CAD for digital signal processing in VSLI from a system designer point of view. The main idea is that tools should be provided for the system-oriented engineer, having only little knowledge about microelectronics. That requires an appropriate language for the description of the desired system as well as predesigned circuits for the common operations inside the total system.

4. Finally J.B.H. Peek talked about aspects of the Compact Disc digital audio system. After a short introduction into the general features of the system, he explained in some detail the different methods for detecting and correcting word errors, caused mainly by imperfections of the storing material and, in addition, by a misfunction of the receiver. These methods are applied sequentially in

different levels and yield the excellent performance of the C.D.

There was a very intensive discussion with a large number of questions after each talk. In general the session has been found to be very stimulating, not only for those attendees who are active in the solution of recent problems considered in the different presentations.

C2: Technologies in Radio Communication Systems

(Convenor: K. Miyauchi; Chairman: M. Akaike)

1. Modulation and demodulation of multilevel signals, by M.Borgne. Modulation and demodulation schemes for digital radio are first presented. The impairment due to propagation fading and countermeasure techniques are then shown. The evaluated improvement for these countermeasure techniques are graphically shown.

2. Adaptive equalization techniques for digital radio, by T.Murase. For a countermeasure technique for propagation impairment, the adaptive equalization technique and the field evaluation test of 256-QAM system are presented. The test result and other countermeasure techniques are discussed.

3. Forward error correction technology in digital microwave radio and satellite communication systems, by K. Nakamura. It is shown that the forward error correction is widely needed for overcoming the transmitting power limitation and for maintaining high-quality in data transmission in satellite communications. The application of the same technology to terrestrial digital microwave systems is presented and discussed.

4. TDMA and SCPC satellite systems, by T. Mizuike. TDMA and SCPC are two major signal channel multiplexing methods. Their suitable applications to specific systems, along with some examples for INTERSAT and domestic satellite systems are presented and discussed.

C3: Multiple User Channels

(Convenor and Chairman: J.K. Wolf)

1. The first paper was presented by G. Dueck. The title of the presentation was "Identification Models in Multi-User Communication Theory" and was co-authored by R. Ahlswede. The research was concerned with a new model for multi-user information theory.

2. The presentation by E.C. van der Meulen began with a thorough review of both source coding for correlated sources and channel coding for the multiple-access channel. The new results were given for the transmission of two correlated sources over an asymmetric multiple channel.

3. The presentation by I. Rubin, co-authored by J.K. Lee, was concerned with an analysis of the performance of interconnected metropolitan area networks where circuit switching was employed to connect certain subsets of the user in one network to other subsets of users in the other network.

4. The work by E. Zehavi concerned combined modulation and coding

for P.S.K. signals. Four dimensional signal sets were employed. The code rate for 8-P.S.K. signals was 5/6 and for 16-P.S.K. signals 7/8. The best codes with these parameters were found by computer search.

5. In the last paper by J.K. Wolf, entitled "Modulation and Coding for Recording Channels", a new type of code was introduced that had both error correction and runlength limited (i.e. /d,k/) properties. The performance of this code was compared with that obtained when separate encoders and decoders are employed for these two functions.

C4: Computer Networks

(Convenor: R. Rom; Chairman: I. Cidon)

Titles of the presentations:

1. Necessary and Sufficient Conditions for Distributed Routing with no Update Looping, J.J. Garcia-Luna-Aceves.

2. Routing and Flow Control in Processor Limited Packed Nets,M.Gerla.

3. Some New Results on Voice and Data Integration on a CSMA/CD BUS, C. Szabo.

4. The Large Control Networks for the Cern Leptons Collider,J.Altaber.

C5: Analog Sampled-Data Circuits

(Convenor and Chairman: G.S. Moschytz)

1. The first paper "Sampled-Data Processing for Communications" by C.F. Kurth demonstrated how sampled-data processing provides the basis for many of today's complex technologies used for signal processing as well as transmission. After discussing the evolution of technologies which make sampled-data processing so attractive, examples were presented on how communication system designs were affected by this evolution. The examples covered data conversion, adaptive filtering, bandwidth compression and data transmission.

2. In his presentation entitled "A/D and D/A/ Converters, State of the Art and Future Trends", A.F. Arbel introduced a classification of converters according to architecture, speed and accuracy, and the capability of certain types to perform algebraic computations in the process of conversion. This was followed by a short review of conversion errors and their measurement. The main part of the paper dealt with recent developments such as autocalibration, dynamic element matching, application of analog or digital error correction schemes, compounding, predictive coding, employment of faster devices, pipelining, and many more. Implementation of converters employing semicustom techniques and their compatibility with full custom VLSI was discussed. The paper concluded with a projection of current techniques to future developments of converters and their design tools.

3. In the paper "Designing Signal Flow Graphs for Sampled-Data Filtering", by L.T. Bruton, signal-flow graphs (sfg's) corresponding to resistively-terminated LC ladder filters were categorized and the relationships between these sfg's and analog sample data circuits

were derived. It was shown that a set of simple rules may be determined that allow the filter designer to generate, often by inspection of the sfg, many of the well-known switched-capacitor /SC/ analog sampled-data filter circuits, including the family of low-sensitivity Lossless Discrete Integrator (LDI) and Lossless Discrete Differentiator (LDD) ladder filters. Various forms of s to z domain transformations were considered in terms of the ideal requirements of zero-sensitivity at maximum power transfer in the passband, circuit stability and insensitivity to circuit parasitics. These concepts were also extended to n-dimensional analog sampled data circuits. Applications to the design of high performance 20 and 30 recursive digital filters were presented.

4. In the paper "VLSI Switched-Capacitor Filters: A General-Purpose Design Approach" by G.S. Moschytz, a design procedure for gate-array-type switched capacitor ASIC-filters was described. In particular, a basic general purpose filter chip was discussed with which arbitrary filter types within certain frequency limits are produced by a single IN-mask. This mask interconnects an array of SC resonator cells comprising a "sea of capacitors" (or "sea of caps"). The latter capacitor array is thereby interconnected to provide the desired filter frequencies and filter types. In addition a sophisticated software package (silicon compiler) that enables the final IN-mask to be determined directly from the input filter specifications was introduced. High-precision voice-band filter chips with up to 16th order, and passband specs of less than 0.2 dB, have been successfully realized. The design method and CMOS chip technology developed for these ASIC filters appears highly promising for the economical production of high-precision low-volume filters of large diversity for a large variety of applications, such as in communication systems and measuring equipment.

5. In the paper "State-of-the-Art and Future Prospects of SC Circuits", G.C. Temes presented a summary of some of the most important developments in design and analysis techniques for SC circuits. These techniques include the use of novel amplifier circuits, the application of inverters and unit-gain buffers in place of operational amplifiers, the design of circuits which can accommodate low-gain amplifiers, etc. In addition, GaAs switched-capacitor circuits were discussed, and the relative advantages and disadvantages of the Si and GaAs realizations were compared.

C6: Distributed Parameter (Microwave, SAW) Filters

(Convenor: S.C. Dutta Roy; Chairman: L. Zombory)

Four lectures were held:

1. Rigorous Field Theory Design of Waveguide H- and E-Plane Distributed Parameter Filters for Millimeter Wave Applications, F. Arndt.

2. The Sun never Sets on RC Networks, P. Bowron.

3. SAW Filter and its Application to Communication, P. Das.

4. New Analysis Method of the Nonuniform Transmission Lines Based on the Equivalent Transformations of the Lumped and Distributed Circuits, R. Sato.

The lectures were followed by long, valuable sometimes exhausting discussions. One of the reasons of this active contribution from the side of the audience is the fact that the subject of this session is not broad, therefore the interested people can follow and understand the delicate details. Summarizing the instructions of the session one can say that it was useful, successful and the vividity of the subject suggests to organize it in the next General Assembly as well.

C7: Constant Envelope Communications: Theory and Practice

(Convenor and Chairman: I. Bar-David)

1. The first speaker, T. Aulin, described in detail a suboptimal algorithm based on the Maximum Likelihood Viterbi Algorithm with the advantage that a considerably smaller number of states are used and still, performance is essentially maintained.

2. S. Shamai presented an overview of the current state of knowledge on the capacity of Gaussian channel when the signals are constrained in amplitude and/or in powerspectral density. It was pointed out that so far only isolated cases have yielded to analysis and no results are available for the capacity when constant envelope signals with arbitrary spectra are used. Such a result could indicate whether considerable improvement over the presently used Continuous Phase Modulation schemes can be expected.

3. T. Maseng presented results of very practically oriented work based on advanced signal processing technique and on thorough investigation of statistics of fading channels. The application is to communication in fjords where strong and long delayed multipath conditions dominate. Answering the question by A. Viterbi, T. Maseng pointed out that the adaptive equalization techniques are needed because the interleaving solutions, which do overcome flat fading effects, cannot provide answers to the very difficult conditions prevailing in that application.

4. The last paper by I. Kalet presented the state of the technology in the robust method of Limiter-Discriminator reception of digital signals with partial response modulating waveforms. Reviewed were direct sampling, integrate- and dump processing and more advanced sequence-estimation techniques. Gains of several dBs are available with the latter when 3 Raised-Cosine and Generalized Tamed FM signalling is used which has narrow power spectra.

C8: Packet Radio Communication

(Convenor and Chairman: I. Chlamtac)

Titles of presentations:

1. Radio Lan with Collision Avoidance Protocol, A. Herman.
2. Dynamic Behaviour of Tandem Packet Radio Networks, J.M. Jaffe.
3. Collision-Free Access Protocol for Packet Radio Networks, L.Fratta
4. A Distributed Assignment Algorithm for Multi-Hop Packet Radio Networks, I. Cidon.

5. Optimization of Collision Free Link Activation Protocols in Multi-Hop Radio Networks, I. Clamtach.

The issues covered the use of algorithmic solutions, queuing theory and linear programming to deal with the design of network protocols for controlling the channel access in multiple-hop radio networks. Random access and controlled channel access procedures were presented. It was shown that with these procedures the channel can be utilized more efficiently than with existing approaches. The design of a packet radio system for office (LAN) communication was presented dwelling on the hardware issues of packet radio communication in the office environment.

In summary the audience was introduced to a number of issues dealing with physical and logical layer protocols in computers communication networks using radio channels as medium.

C9: Mobile Radio Systems

(Convenor and Chairman: P.A. Matthews)

The titles of the lectures:

1. Wideband Cellular Radio Systems: Design Criteria and Performance Examples based on the CD 900 System, U. Langewellpott.
2. Linear Modulation Radio Systems, J.P.McGeehan (presented by K.W. Yates).
3. Digital Microcellular Radio Systems, R. Steele.
4. Impact of Novel Cellular Technologies, A. Wojnar.
5. Satellite Mobile Radio Systems, K.W. Yates.

Within the time available the discussion was limited. However a good interest was shown in all the papers. Because the papers covered a number of aspects of systems proposed for the near and more distant future they provoked interest and comment on the application of the methods proposed between the advocates of the different systems.

C10: Coding and Cryptography

(Convenor: A.D. Wyner; Chairman: J. Ziv)

In this session various topics related to coding, data compression and secure communications were discussed.

1. S.W. Colomb discussed combinatorial designs and their application to algebraic coding and to the design of pulse radar patterns, as well as frequency-hop patterns.

2. A.T. Viterbi discussed spread spectrum multiple access problem (direct sequencing), and its application to cellular radio systems.

3. I.W. Schwarty presented a joint work (with J.K. Wolf), describing special coding techniques.

4. J. Ziv presented a joint work with A.D. Wyner and discussed new properties of the entropy motion, with applications to data

compression for memories.

5. The last talk, by J. Ziv, dealt with variable to fixed-rate data compression codes, which are shown to be inferior to variable to fixed-rate codes, when the source is a finite memory Markov-source with large memory.

K. Géher
Chairman.

COMMISSION D - ELECTRONIC AND OPTICAL DEVICES AND APPLICATIONS

Chairman: Prof. W.A. Gambling (United Kingdom)

Vice-Chairman: Prof. T. Okoshi (Japan)

REPORT ON BUSINESS MEETINGS

Three formal business meetings were held, together with several informal ones. The principal items of business were as follows:

1. There were four nominations for the office of Vice-Chairman. In the event Professor B. Mroziewicz had to withdraw. It was agreed that the Official Members should vote for two of the remaining three in order of priority and the votes cast were in the relative order:

1. Mme J. Hénaff
2. Prof. H. Melchior
3. Prof. M.E. Zhabotinskij.

The first two names were therefore submitted to the Council as the Commission D recommendations for first and second choice as Vice-Chairman.

2. The terms of reference suggested by Prof. W.A. Gambling were discussed in detail and were accepted with the minor change that the first line should read: "To promote and review research in electronic and optical....".

3. It was decided to recommend to Council that the soliciting of material for the "Review of Radio Science" should follow the pattern adopted experimentally by Commission D three issues ago. This is, to invite expert specialists to review selected topics within the range of the Commission's activities and also to request the Official Members to submit material from their countries in the usual way. Copies of these submissions will then be sent to the specialist reviewers by the Commission Editor. This technique will avoid the huge gaps that can be left when large countries fail to send their contributions and will also ensure an authoritative review. Mme J. Hénaff has agreed to continue as Commission D editor.

4. The possibility of a merger with Commission C was discussed but rejected unanimously, because the subject matter to be covered would be enormous and beyond the capability of a single Commission.

5. Commission D approves the proposal of providing aid to third-world countries by suggesting speakers and programmes for seminars and workshops, to be held possibly at Trieste. It is recommended that an approach be made to the Third World Academy of Sciences seeking their formal views on the suggestion and a mechanism for providing

this aid. It is also proposed that the International Telecommunication Union be approached for funding and for their co-operation.

6. The discussion on the proposed new journal on Signals, Systems and Electronics produced two main conclusions:

a) A careful study should be made of existing journals covering these topics.

b) If it is decided to proceed with such a journal, then it will probably be advisable to concentrate initially on review articles mainly, until the reputation of the journal is fully established.

7. Detailed suggestions have been made for topics to be covered in the next General Assembly.

8. Topics for inter-Assembly meetings have been suggested and will be followed up by the incoming Chairman.

9. It was decided to recommend URSI sponsorship of the ECOC series of conferences for 1988, 1989, 1990. Prof. Gambling, Vice-Chairman of the Organizing Committee, is nominated as the representative for 1988.

10. A Working Group jointly with Commission E has been proposed for the topic of "Susceptibility of integrated circuits and semiconductor devices to damage by transients". The nominated Commission D representative is Dr. T. Itoh, USA.

11. The nominated Commission D representative on the URSI/CCIR/CCITT Liaison Committee is Prof. T. Okoshi, Japan.

REPORT ON SCIENTIFIC PROGRAMME

Commission D planned seven scientific sessions for the General Assembly in 1987 and participated in four Joint Symposia. The Commission also put forward the suggestion, which was accepted, of a General Lecture on Digital Optical Techniques in Computing and Switching. This lecture was well presented and well attended. As a complementary event to the General Lecture a scientific session on Digital Optics had been planned, with Prof. Midwinter as Convenor. He had put together an exciting set of invited speakers but, in the event, several withdrew so that the session had to be cancelled. Thus the opportunity of following up the General Lecture with a series of specialist presentations was regrettably lost. This was a great pity.

At the XXI General Assembly Commission D had proposed to concentrate on the more scientific aspects of its material in an attempt to attract a greater interest. This philosophy was followed in drawing up the programme for the XXII Assembly. The result was a success in that attendances at the scientific sessions were

considerably increased and were:

33, 36, 45, 40*, 40, 76

with a further 60 at the excellent Tutorial Lecture by Prof. Okoshi. Unfortunately the lecture hall allocated to Commission D was too small so that particularly at the session marked * many potential members of the audience could not get into the room and were turned away. This was most disappointing in view of the considerable effort put into the organization of the overall programme. Fortunately two of the sessions were held in larger rooms.

On the whole the various speakers made excellent presentations.

The retiring Chairman recommends that the emphasis on scientific aspects should be continued in future General Assemblies.

W.A. Gambling
Chairman.

TITLES OF SCIENTIFIC SESSIONS

Commission D Sessions:

- Electronic Materials of the Future
- Quantum-Well Devices and Their Applications
- Photon Countin and Optical Communications
- Ultra-Fast Electronics
- High-Speed Optical Detection
- Nonlinear Optics and Phase Conjugation

Joint Sessions with participation of Commission D:

- Optical Fiber Measurements
- Laser Measurements
- Time Domain Waveform Measurements and Applications.

COMMISSION E - ELECTROMAGNETIC NOISE AND INTERFERENCE

Chairman: Prof. F.L.H.M. Stumpers (Netherlands)

Vice-Chairman: Dr. R. Strużak (Poland)

REPORT ON BUSINESS MEETINGS

First Business Session (25 August 1987)

The Agenda was adopted as proposed by the Chairman.

Volunteers for Secretary of the Business Sessions: P. Degauque (French) and G. Hagn (English).

Present: 25 delegates, including 10 voting Official Members.

1. Symposia on Electromagnetic Compatibility (EMC)

The Commission requested the Council to cosponsor the EMC Symposia of Wrocław (1988, 1990) and Zurich (1989). A request is also made to support Young Scientists to attend the Wrocław Symposium ($1,500). This will cover registration fees and local costs.

2. Working Groups

Commission E will maintain its Working Groups as follows:

- Natural Noise (J. Hamelin)
- Man-made Noise (A.D. Spaulding)
- Permanent Damage Caused by Transients on Equipment (V. Scuka)
- Scientific Basis of Noise and Interference Control (C. Baum).

3. Terms of Reference of Commission E

No change was made at this time to the Terms of Reference of the Commission.

4. URSI-CCIR-CCITT Liaison Committee

Commission E was not in favour of splitting up this Committee into one for CCIR and one for CCITT. Commission E is well represented for both Committees.

5. Cooperation with ICAE and ICOLSE

The possible cooperation of Commission E with ICAE (Uppsala) and INCOLSE (Oklahoma City) was discussed, but no final decision was reached.

6. Nominations for Chairman

The candidates for Chairman of the Commission were J. Hamelin (France) and H. Kikuchi (Japan). The result was extremely close in favour of H. Kikuchi.

7. Other Business

Satellite lightning observations (European Space Agency). An experiment is planned to measure lightning occurrence, using a stationary satellite. The consensus was that this experiment was

scientifically useful, with a preference for an optical detector. A resolution will be proposed and discussed at the next meeting.

Dr. Baum mentioned the NEMP Conference, planned for 1988 in San Francisco and asked whether URSI Commission E would like to join US URSI Commission E in cosponsoring this (without financial involvement). There was no objection. The Chairman will ask Mr. M. Wik whether he would be able to represent Commission E.

Second Business Session (28 August 1987)

The Agenda was confirmed.

Present: 27 delegates, including 15 voting Official Members (two by proxy).

Secretaries: P. Degauque and G. Hagn.

1. Nominations for Vice-Chairman

The candidates were: J. Hamelin (France), R. Wojnar (Poland) and Krider (USA). The result of the vote was:

1. J. Hamelin
2. R. Wojnar

and will be communicated to the Council.

2. Radio Noise and Spectrum Management

Dr. Hagn circulated a draft recommendation encouraging more data on radio noise to be obtained in developing countries, and a draft recommendation on spectrum management. Both recommendations were accepted.

3. Satellite Observation of Lightning

Dr. Scuka circulated a draft recommendation on this subject. Dr. Horner enquired about the form of the data, and about the way in which the proposed 10 x 10 km resolution could be achieved. Drs D. Proctor and M. Hayakawa remarked that such observations would be useful for the study of whistlers, and also for the study of "giant lightning". Dr. Horner hoped that the results of the feasibility study could be reviewed by URSI when available. The possibility of further discussion at the EMC Symposium in Zurich, 1989, will be considered by Dr. Scuka. The draft recommendation was accepted.

4. Biological Effects of Electromagnetic Radiation

During earlier discussion of the terms of reference, it had been suggested that Commission E could take over the subject of Biological Effects of Electromagnetic Radiation, if this would be preferable to Commission A. However, in the meantime, Commission A had decided to keep this subject in its terms of reference. Thus no change was necessary in this respect.

5. Review of Radio Science

Thanks were expressed by the Commission to Prof. Kikuchi for his work in editing Commission E chapter of the "Review of Radio Science". The Chairman asked for volunteers to take over this work

now that Prof. Kikuchi had been elected Chairman. In the absence of volunteers, the Chairman agreed to take over this task.

6. Working Group on Effects of Transients on Integrated Circuits and Semi-Conductors

Dr. Scuka suggested that it would be useful to have a joint working group on this subject with Commission D, in order to benefit from the knowledge about the structure of integrated circuits available there. This was agreed and Dr. Scuka and Prof. Itoh were designated as Co -Chairmen of this Working Group.

7. Vote of Thanks

Mr. Hagn proposed a vote of thanks to the outgoing Chairman, Prof. Stumpers, for his services to the Commission over the past six years. This was agreed unanimously.

REPORT ON SCIENTIFIC SESSIONS

Of these sessions nine were special Commission E sessions. Six were organized jointly with one or more other Commissions, but with the Convenor and main responsibility with Commission E, and five other joint sessions were organized with several Commissions, with representation of Commission E in the organization.

Lightning and its effects were treated in several sessions:

Session E1: Lightning: Predischarge processes and associated radiation

Chairman Proctor described a set-up of five widely spaced receivers, used to locate local sources of radiation, leading to a three-dimensional map of lightning radiated noise. 150 flashes were studied, of which 46 were cloud to ground flashes. Earle Williams used radar, radiation sensors and current sensors, and found expanding dendritic structures in clouds. Mazur did lightning measures inside an instrumented aircraft and found that the initial part of a discharge consists of a series of short pulses with rates 10^3 to 10^4 per second. Richard also used three-dimensional interferometric analysis, but with a wide frequency band. Finally, Pirjola mentioned the new lightning location system, again based on triangulation, used in Finland.

Session E4: Lightning Interaction with Aircraft

This session was organized by DuBro. Boulay got new ideas on the effects of lightning attachment to aircraft from in-flight data, that showed a succession of E and B pulses on the structure. Anderson Plumer discussed recent developments in the standardization of lightning protection design. Rustan used in-flight measurements on a CV580 research aircraft, struck 48 times between 500 m and 6,000 m over Florida. Nearly 10% of the lightning events were triggered by the aircraft. The physical mechanism of aircraft lightning interactions was discussed. Baum described "Interaction of lightning electromagnetic fields under direct strike conditions". The lightning arc strongly affects the interaction, by changing the complex natural

frequencies of the exterior responses. Theoretical and experimental results were compared. Perala did an "Assessment of analysis approaches to aircraft lightning interaction." He used linear and non-linear models, including plasma physics formulation of air breakdown during lightning channel formation around an aircraft. Apertures, slots, seams, exposed conductors and diffusion are taken into account. Burrows discussed "Ground simulation of lightning for induced effects testing". Theoretical and practical aspects of whole aircraft tests were described and suitably extrapolated for certifying aircraft equipment.

Session E8: Lightning: Cloud to ground discharges, I and dI/dt, radiation and models

Chairman, Dr. J. Hamelin, started with a contribution on "Lightning current and current derivative correlated measurements" by Ms C. Leteinturier. She measured simultaneously current and current derivative, using the triggered lightning techniques, a coaxial shunt and a magnetic loop. The max. current was 49 kA, the max. current derivative 260 kA/μsec. Baum described an experimental and theoretical programme on "Correlation of lightning currents, fields and optical emission". Fast (5 to 10 nsec sampling rate) instrumentation is connected to optical, e.m. field and current sensors. Theoretical models of the initiation process near the ground were presented. In her second paper, Ms Leteinturier described recent measurements on "Lightning current derivative and electric field derivative correlation". She used the transmission line model, but there were some discrepancies, that need further investigation. Kawasaki discussed "Electromagnetic characteristics of positive ground strokes during winter thunderstorms in Japan". Rise times range from 350 to 800 nsec (B-field). This is quite large. "Characteristic features of LEMP in relation to their origin and path of propagation" by Scuka, referred to the triggering process fol ground flash, the striking process, and to the total number of lightning flashes and their time characteristics. Finally, Hamelin gave the Tutorial of Commission E on "Recent research on lightning". Apart from giving an extensive review, the lecture was added lustre to by two interesting motion pictures.

Session JS11 - Direction finding for whistlers and atmospherics

This E and H joint session was organized by Dr. Hayakawa. Strangeways reviewed "The goniometer triangulation system for whistler mode signals". Multiple rays in the earth-ionosphere waveguide give problems. Hayakawa discussed "Field-analysis direction finding for whistler-mode VLF waves". This is based on the simultaneous measurement of two horizontal magnetic field components and a vertical electric field component. An automatic field-analysis direction finder was described. Dowden treated "The Poyinting vector method of direction finding". His three components are complementary to those used by Hayakawa. Space vehicle measurements give all six field components. Proctor presented "A hyperbolic method for finding positions and extents of sferic sources and for obtaining radio pictures of lightning". Images with accuracies of 25 x 25 x 140 m a

obtained, and the benefits and limitations of the methods were discussed. Richard presented "VHF-UHF interferometric direction finding and spatial reconstruction of lightning". The movies from his equipment provided very useful information on the microphysics of lightning.

Session JS8 - Coupling and shielding

In this joint session of Commissions E and B, the theoretical and practical aspects of aircraft response to lightning and HEMP were discussed by Gardner in "Lightning and HEMP as noise sources aboard aircraft" and "Comparison of aircraft response to lightning and EMP". For the low-frequency interaction (below 1 MHz) the direct-strike lightning environment is more severe, while for the high-frequency interaction the high-altitude nuclear EMP environment is more severe. Stone described "The differential geometry method for transient lens design". The basic concept for transient lens design, based on exact frequency-independent solutions of the Maxwell equations was reviewed. Ianoz reviewed "Wave-conductor computation models", some of the powerful techniques concerning coupling to and propagation on transmission-line networks. Sturm discussed "Real shielding enclosures", simple ways to look at shielding, especially in the time domain.

Session E2 - Spacecraft charging and electromagnetic effects

This session was organized by Taillet. Spacecraft charging under the influence of the plasma environment produces electrical discharges harmful for the electronic equipment. These phenomena have induced a number of anomalies in the operation of communication satellites. Catani gave a "Review of high-altitude spacecraft operating anomalies". Garrett discussed "The geosynchronous plasma environment". Nanewicz presented a paper on "Charging mechanisms". Taillet gave a "Phenomenology of electrical discharges induced by satellite charging". Wenaas discussed "Electromagnetic coupling of discharges to spacecraft electronics". The processes leading to satellite anomalies are far from being fully understood. Further efforts are required.

Session E3 - Lasting effects of transients on equipment performance

This session was organized by Scuka, who started with "Performance deterioration processes in VLSI chips and methods of reliable component testing". Increasing packaging density has resulted in high power density, approaching 1 MW/m^2. Temperature distribution control is a large problem. Humidity in plastic housing and chemical corrosion of aluminium may give problems. In his paper "Application of norm concepts to transient time domain waveforms", Castillo discussed a method for characterizing transients and transient responses Welander tried to detect and analyze transient failures in bipolar and MOS devices. Lövstrand discussed "EMP testing of a large underground fixed facility". He used a newly developed pulse current injection system for this purpose. Stumpers tried to answer the question "What happened in the NEMP domain since 1984?" He discussed the relevant sessions of the EMC Symposia: Zurich 1985 and 1987,

Wocław 1986, Clermont-Ferrand 1985, Limoges 1987 and San Diego 1986, and also one paper of ICOLSE 1986 in Dayton. Special attention was given to the papers by Tesche, McCornell and Barnes, and Baum in Zurich 1987. Wik discussed the NEMP Statement in Florence 1984, and the associated SCOPE/ENUWAR results.

Session E5 - Electromagnetic phenomena related to earthquakes

This session was convened by Prof. Yoshino. At the request of the Chairman, Stumpers gave a review of an analogous session in Wrocław 1986, where papers by Yoshino and Morgounov, in particular, had given convincing evidence of increases in e.m. emission, shortly before an earthquake happened. Parrot, in "Electromagnetic perturbations observed on ground and on satellites during seismic events", shows a real correlation of electromagnetic emissions with seismic activity. Schloesin gave "Historical notes on the 'electric nature' of earthquakes", going back to the eighteenth century. In his other paper, he spoke "On the possibility of seismogenic perturbations of the fair-weather electric field". Such perturbations may be caused by charge generation and separation processes concomitant with plastic deformation and fracture and, on penetration to the surface, image charge distributions in the electrosphere. Massey described the "Los Alamos electromagnetic noise monitoring system". The receiver 50-450 KHz will be placed near the Parkfield fault in California. So far no significant nearby earthquakes had occurred. Blanc discussed "Nonlinear interaction of an acoustic wave with the ionosphere". An explosion of 4800 T ANFO at ground level causes acoustic fronts moving into the ionosphere. Yoshino treated "Observation results of LF electromagnetic emissions as precursors of volcano eruption". In November 1986 the receivers of the multipoint direction finding network system for earthquake prediction detected anomalous emissions, probably caused by volcano eruptions at Mt. Mihara.

Session E6 - The composite noise environment

This session was organized by Mr. Hagn. Spaulding presented the "Composite non-gaussian environments affecting telecommunications" and "An updated composite HF noise model". He reviewed the class A, B and C noise sources of Middleton, and an updated and improved noise model designed for use in the HF propagation prediction programme IONCAP. In "Observations of the composite noise environment", Vicent discussed the statistical properties of man-made noise. Schaning, in "The response of atmospheric radio noise on 27 KHz to long-term solar variability", looked into 35 years of monthly median values of atmospheric noise, measured at Kühlungsborn, for correlation with long-term solar variability. This paper was delivered by Wagner. Pirjola, in "On currents induced in an earthed network of conductors by an external electric field", looks at the effect of geomagnetic disturbances on the Finnish power grid.

Session E7 - Nonlinear effects in the field of EMC/EMP

The session, organized by Prof. Kikuchi, started with a survey, by the Chairman, of Satsuma's "Nonlinear waves in dispersive and

dissipative systems". Soliton theory has led to the possibility to treat exactly the interactions for a class of nonlinear wave systems and, in particular, the nonlinear dissipative system. Hayakawa discussed "Nonlinear VLF/ELF phenomena". Quasi-linear electron-cyclotron instability plays a role in VLF/ELF hiss phenomena, and can now be explained. Nonlinear wave-wave interaction, observed on board a satellite, was also treated. Noguchi treated "Soliton propagation in one- and two-dimensional transmission systems". Soliton propagation in two-dimensional space is presented on a nonlinear transmission network. Interactions are investigated numerically. Finally, Eliezer discussed "Nonlinear effects in laser plasma accelerators". The author followed up an earlier suggestion to accelerate elementary particles by beating two laser waves in a plasma medium. Nonlinear saturation effects were discussed, as well as certain relativistic equations. Strongly theoretical sessions, like this one, would benefit if the members of the audience had an opportunity to read the texts beforehand.

Session E9 - Satellite and planetary noise environment

At the request of the Chairman, the session was organized again by Dr. Smith, who had asked the radioastronomers, Moffet (CalTech) and Gulkis (JPL) to present papers. Unfortunately, Prof. Moffet had died early in August and Dr. Gulkis gave a brief eulogy at the beginning of the session. Dr. Smith provided a pictorial journey of a spacecraft from its launch to the time it passes out of the solar system. He then treated microwave noise on the surface of the earth and at geostationary orbit. Fraser-Smith (and Helliwell) treated "ELF/VLF noise observed beneath the ionosphere", and updated progress on their ELF/VLF network, extending from Thule, Greenland to the Antarctica. They are inundated with data. Trotlet spoke on "Ground-based observations of the sun". He made a comprehensive survey above 10 MHz, covering the quiet sun and the disturbed sun, with special attention to the high definition, now available from VLA. Bougeret addressed "Space-borne observations of solar radio emissions", an exciting new area for frequencies shielded by the ionosphere and magnetosphere. He relied primarily on results from the ICFE satellite at the libration point of the earth and the sun. Results at high heliocentric latitudes are expected from the future Ulysses mission. Gulkis, in his talk "Planetary noise with emphasis onUranus and millimeter and submillimeter noise", contrasted the observations of Uranus with what is known of the other planets, providing a comprehensive survey. The Voyager encounter of January 1986 noted strong modulation at the rotation period in the emission spectrum, leading to accurate determination of this period. Altenhoff, in "New radio observations of planets, their satellites and comets", treated observations with the IRAM telescope in Spain, making the isolation of the individual moons of Jupiter possible. The comet Halley showed an unusual high quiescent signal at 1 mm. Wielebinski, in "The radio continuum cosmic noise with a discussion of cosmological noise fluctuations", reviewed attempts to observe dips in the 3 Kelvin microwave background due to interstellar absorption. Recent results of dips of 3 or 4 milliKelvin were obtained with a two-frequency comparison technique. Encrenaz observed "The spectral lines

in the cosmic radio background", using space-borne receivers in the range 1 MHz to 1000 GHz and found more than 1000 transitions, with new ones being identified about once per week.

Session JS10 - Spectrum management and frequency allocation

This important joint session of Commissions E, C, F and J, was organized by Prof. Stružak who opened it with a talk on "Radio spectrum, competition and collaboration". The demand for the spectrum exceeds the available resource capacity. The ITU, and especially the CCIR, are trying since many years to find equitable solutions. Horner discussed "IUCAF and frequency allocation problems". The major function of his Commission is the preparation for the World Administrative Radio Conferences. Meteorological and navigational satellites were recently in for special study. To keep sufficient frequencies available for radio astronomy is a source of constant care. Parlow treated "Management of the radio spectrum, and especially its evolution." Digitally-based computer-controlled multi-function systems can support functions that cut across radio service boundaries. Statistical techniques for interference assessment of spectrum sharing processes are necessary. Sandell spoke on "Spectrum conservation and management assessment". Prediction of the field strength of wanted and unwanted signals, combined with the application of protection ratios, is basic. Broadcasting, with its millions of viewers, has special problems. Mayher's "International spectrum management and planning" treated the FCC experience in USA. Computers assist in the management process. Both Carmassi's "Frequency assignment theory, problems and solutions" and O'Leary's "Mathematical and computational aspects of frequency planning on an international scale" stressed the use of computers and of algorithms, based on graph theory. "Inter-service and inter-regional frequency sharing by satellite systems" were treated by Gould. There are 19 space radio communication services and hundreds of systems have been launched. Sharing processes are difficult, as satellites cover one third of the earth's surface.

Session JS12 - Communication systems performance in natural and man-made noise

This Commission E and C session, convened by Spaulding, started with "Impulsive disturbances. Smearing and desmearing filters" by Stumpers. Clipping, first and second order blanking were tried to overcome the effect of impulsive noise in sound broadcasting. Wainwright used transmit and receive filters with complementary delay as a function of frequency. Beenker, Claasen and van Gerwen used digital filters for data communication. In his thesis, Bergmans studied the application of smearing-desmearing in connection with ISDN. He took into account real pulse forms, measured by the Dutch PTT. Filters are relatively long (up to 500 steps). Combination with echo-cancellation gives special problems, which were overcome. Herman discussed "Bit error patterns and performance of Hamming codes in non-gaussian noise environments". Hamming codes perform well in gaussian noise, but much less so in non-gaussian environments. Simulation results are given. Weiss treated "Robust M-ary digital communication in non-gaussian noise". Limiter-correlators or generalized maximum likelihood estimators are used. Soft limiters give good

results for spiky noise. Bouvet tried "Modelling of gaussian noises by gaussian-gaussian mixture". A mixture of two gaussian noises was used as a model for underwater noise. Receiver operating characteristics were computed by Monte-Carlo simulation. Spaulding discussed "Locally optimum, suboptimum and non-parametric detector performance in narrow-band non-gaussian interference". Class A noise can result from coherent pulse structures. The locally optimum Bayes detector is good for small enough noise levels, but degrades rapidly as the signal level increases. A better suboptimum nonlinearity was given. "Optimum threshold detection in dependent non-gaussian noise", by Maras, extended earlier work by Spaulding and Middleton and achieved a better performance in a realistic situation without additional detector complexity.

Session JS6 - Man-made noise measurements - Limits - Statistics

This Commission E and A joint session was convened by Dr. Stružak. Stumpers trated "URSI Commission E related subjects in other international organizations". Problems of industrial and communication importance in this area come up in IEC (TC 65, TC 77 and CISPR). Several of them deserve the more scientific interest that URSI can give, e.g. I.S.M. interference, the 80-80 rule of statistics in CISPR, electrostatic discharges, quasi-peak methods. Echigo (and Sato) discussed "Application of synthetic aperture techniques to locating sources of electromagnetic emissions". With this method the authors can locate an emission within a planar space of 10 x 10 wavelengths. Trials at 300 and 400 MHz demonstrated its effectiveness Bridgwood used "A statistical technique for the treatment of rarely occurring impulsive noise on data bus lines". Poisson distributions and bursts of impulses are discussed and the theory is compared with measurements. Ma's "Characterization of unknown RF leakage sources; problems, solutions, and practical implications" characterized electrically small emitters by three orthogonal electric and three orthogonal magnetic dipole moments. Measurements from output ports of a transverse electromagnetic cell give a rigorous and practical solution. Kanda's "Possible estimation methodologies for electromagnetic field distributions in complex environments" discussed three new approaches, developed at the National Bureau of Standards: statistical distribution of scattered EM fields, finite element calculation using few measurement points, directional scanning. Each method is quite promising. Bandemer's "A real time broadband signal analyzer using acousto-optic bulk wave Bragg cells" described a set up using a temperature-controlled laser diode, two crossed Bragg cells, and a photodiode detector. The output is digitized for use b a HP desk computer.

Session JS9 - EM topology

Dr. Baum, Chairman of the Working Group on the Scientific basi of noise and interference control, convened this joint Commission E and B session concerned with the design and analysis of complex systems by partitioning them in ordered ways. The qualitative aspec were discussed by Vance - in "Shield topology applied to interferen control" - who derived from it design rules for shielding and

grounding.Karlson's "The topological concept of a shield generalized to include grounding" introduced the generalized shield concept, and provided an unambiguous definition of ground. Baum reviewed some basic concepts and discussed the application of time-domain norms to the nonlinear case in "Norms for bounding the response of electromagnetic systems". In Taylor's absence, Baum introduced his paper on "Issues concerning the bounding of signals on wires behind aperture in shields". Both measurement and calculation techniques of obtaining bounds were discussed. Finally a panel discussion with speakers from JS8 and JS9 on outstanding problems and likely developments of EM topology concluded the session.

Commission E was involved in two more groups of sessions: "Interaction of electromagnetic fields with biological systems" (Commissions A, B and E) in which Commission E was represented by Prof.H.J. Schmitt, and "Time Domain Waveform Measurements" (all Commissions) in which Commission E was represented by Dr. Baum.

Commission E meetings had usually some 50 to 60 participants, with more in some of the joint sessions. In my opinion, it was a wide ranging and successful meeting for our Commission. I thank all those who contributed to this success.

F.L.H.M. Stumpers
Chairman.

COMMISSION F - WAVE PROPAGATION AND REMOTE SENSING

Chairman: Prof. F. Fedi (Italy)

Vice-Chairman: Prof. R.K. Crane (USA)

REPORT ON BUSINESS MEETINGS

1. Vice-Chairman (1987-1990)

Dr. G. Brussaard (Netherlands) was unanimosuly elected as the candidate for Vice-Chairman of Commission F, to be submitted to the Council.

2. Report of the Chairman

The Chairman informed the Commission about the intense activities during the past triennium.

Scientific Activities

Two main symposia were organized directly by the Commission: "Wave Propagation: Remote Sensing and Communications" (Durham, New Hampshire, USA; 28 July - 1 August 1986) and "Microwave Signatures in Remote Sensing" (Göteborg, Sweden; 19-22 January 1987).

The Commission was also associated with the following symposia: "Present and Future in Satellite Communications" (Capri, Italy, 1985); "Remote Sensing over Polar Regions" (Honolulu, USA, 1985); "Optical and Millimeter Wave Propagation" (Florence, Italy, 1986); "IAMAP Symposium on Microwave Remote Sensing" (Vancouver, Canada, 1987); "IGARSS '87 Remote Sensing: Understanding the Earth as a System" (Ann Arbor, USA, 1987).

Corsendonk Meeting

The Chairman illustrated the main results of this meeting, held on 8-10 March 1987.

Business Meeting

The Chairman illustrated the outcome of the business meeting of the Commission held in Durham, USA, during the Commission Symposium.

Remote Sensing

With the help of Prof. P. Delogne, the Chairman illustrated the intense activities carried out by the Commission during the past triennium. Particularly noteworthy was the cooperation established in this field with the following bodies: IGARSS (IEEE-GRS); Radiation Commission of IAMAP-IUGG; ISPRS (International Society for Photography and Remote Sensing); COSPAR; SCOR.

Scientific Sessions for the XXII URSI Assembly

The Chairman expressed his sincere thanks to the convenors of the seven scientific sessions.

3. Terms of Reference

Commission F resolved to maintain the present terms of reference because they seemed adequate to the future work of the Commission.

4. Cooperation with IGARSS

The Commission resolved to continue to be actively involved in the organization of the annual International Geoscience and Remote Sensing Symposia by asking the Commission F Chairman to designate, in consultation with the Commission Member of the country where the Symposium is held, an adequate number of URSI representatives. The Commission also resolved to:

- keep the URSI book of abstracts separated from the proceedings of the Symposia;
- keep the role of the Commission restricted to the study of the interaction of e.m. waves with the medium (including the related instrumental problems).

5. Review of Radio Science

Commission F resolved to appoint the incoming Vice-Chairman as Editor for the next issue of "Review of Radio Science".

6. Comments on the General Assembly

The Commission was in favour of the tendency to consider the triennial Assembly as a cultural occasion where scientists of different disciplines could meet and listen to the progress of science. General lectures, tutorials and the organization of scientific sessions on the basis of invited speakers were particularly appreciated.

7. URSI-CCIR-CCITT Liaison Committee

The Commission noted with satisfaction the continuing traditional cooperation with the CCIR, in particular with Study Group 5. The Commission also recommended that the following be designated as representatives of Commission F in the Liaison Committee: F. Fedi (Italy), A. Blomquist (Sweden), M.P.M. Hall (UK), L. Boithias (France).

8. Inter-Commission Working Group on Time Domain Waveform Measurements

Commission F resolved to designate Dr. Hans Liebe (USA) as its representative on the Working Group.

9. Open Symposia and Meetings 1988-1990

1. Joint IGARSS: 1988: 13-16 September in Edinburgh, UK; 1989: 27 June - 1 July in Vancouver, Canada; 1990: in Europe.

2. Commission F Open Symposium on Wave Propagation and Remote Sensing, Fall 1989, Nice, France (Chairman: J.P. Mon, France).

3. Microwave Signatures in Remote Sensing, Spring 1990, Massachusetts, USA (Chairman: C. Swift, USA).

4. School on Atmospheric Radar (joint with Commission G), November 1988, Kyoto, Japan (Chairman: S. Kato, Japan).

5. Radio Science Methods in the Study of the Terrestrial Subsurface (Chairman: D. Gjessing, Norway).

REPORT ON SCIENTIFIC SESSIONS

The following scientific sessions were organized by the Commission:

Session F1: Remote Sensing of the atmosphere
(Convenor: J. Goldhirsh)

- Review of recent radar research of the clear atmosphere, J. Röttger
- A strategy for measuring tropical rain from space, G.R. North
- Recent advances in multiparameter radar systems for measuring precipitation, M.P.M. Hall
- Nexrad: what is it and what will it do? D.S. Zrnic.

Session F2: Radiopropagation effects on interference in radiocommunications
(Convenor: M.P.M. Hall)

- Introduction to session and clear-air aspects of interference prediction, M.P.M. Hall
- Hydrometeor scatter aspects of interference prediction, A. Ochs
- Interference reduction techniques, P.M.J. Scheeren
- Aspects of hydrometeor scatter, J. Awaka
- Interference caused by ground and building scattering, A.J. Giger
- The effect of ground roughness on propagation in surface ducts, S.W. Marcus
- Consequences for coordination between radio services above 1 GHz, L.W. Barclay.

Session F3: Clear air effects on terrestrial radio communications
(Convenor: A.R. Webster)

- Meteorological phenomena and fading on terrestrial microwave links, J.A. Schiavone
- Experimental microwave channel probing, M. Sylvain
- Single-frequency multipath fading and depolarization on terrestrial microwave links: a review, R.L. Olsen
- Diversity and cross-polar considerations in terrestrial microwave communications systems, M. Liniger
- Tropospheric propagation effects on digital radio relay systems, R. Valentin, K. Metzger.

Session F4: Radio propagation effects in land mobile radio systems
(Convenor: R.W. Lorenz)

- Statistical parameters characterising the mobile radio channel and their effects on simulation, G. Falciasecca, M. Frullone, G. Riva
- A digital simulator for the frequency-selective fading channel, K. Preuss, W. Schussler
- Statistical analysis of phase derivatives in mobile communications, theory and experiment, J. Bach Andersen
- Frequency diversity effects of frequency-hopping signals in fading channels, T. Saruwatari, M. Mizuno
- Land-mobile satellite service: a comparison of simultaneous measurements at UHF and L-band, W.J. Vogel, J. Goldhirsh.

Session F5: Remote sensing of land
(Convenor: A. Blomquist)

- Radar cross sections of rough terrain and vegetation covered terrain, E. Bahar
- Radar measurements of soil and vegetation, Th. Le Toan
- Fine-resolution measurements of vegetation, R.K. Moore
- Microwave remote sensing of snow and ice on land, M. Hallikainen
- CARABAS - a new approach to SAR, H. Hellsten.

Session F6: Remote sensing of ocean
(Convenor: A. Guissard)

- A non-gaussian statistical model for the ocean surface, N.E. Huang
- The air-sea boundary layer and in-situ measurements, R. Ezraty
- New methods for randomly rough surface scattering analysis with emphasis on the sea surface, G.S. Brown
- Wave-wave and wave-current interaction effects in ocean remote sensing, J.F. Vesecky
- An experimental investigation on microwave reflection by water surface wave fields, A. Lifermann, A. Ramamonjiarisoa, B. Jahne
- Considerations in SAR sensing of the ocean, R.K. Raney.

Session F7: Submillimeter and optical propagation
(Convenor: A. Consortini)

- Modelling atmospheric refractivity in the near-millimeter-wave range, J. Liebe
- Submillimeter and millimeter wave scintillation in the atmosphere, R.J. Hill, S.E. Clifford, J.T. Priestley, R.A. Bohlander, R.W. McMillan
- The statistics of optical scintillation, E. Jakeman
- Propagation of spatial coherence and image quality through the desert atmosphere, N.S. Kopeika

- Experimental studies of optical pulses in multiple scattering atmospheres, R.A. Elliot.

Commission F also organized sessions in cooperation with other Commissions:

Session JS13: Radar and radio studies of the middle atmosphere and lower ionosphere (Commissions F and G)
(Organizers: S.A. Bowhill, S. Kato)

Session JS19: Wave propagation in random media (Commissions B and F)
(Organizer: A. Ishimaru)

Session JS10: Spectrum management and frequency allocation (Commissions C, E, F and J)
(Organizer: R.G. Strużak).

F. Fedi
Chairman.

COMMISSION G - IONOSPHERIC RADIO AND PROPAGATION

Chairman: Dr. J. Aarons (USA)

Vice-Chairman: Dr. H. Rishbeth (United Kingdom)

REPORT ON BUSINESS MEETINGS

1. Election of Vice-Chairman

The following were nominated for the position of Vice-Chairman of Commission G, and their names were submitted to the Council in the order of preference indicated by the vote:

1. A.W. Wernik (Poland)
2. S.M. Radicella (Argentina).

Dr. Wernik was elected by the Council as Vice-Chairman of Commission G for the triennium 1987-1990.

2. Working Groups

Reports were submitted by the following Working Groups:

G.3 Southern Hemisphere Atmospheric Studies Group (SHAGS),
G.5 Mapping of Characteristics at the Peak of the F2 Layer,
G/H.1 Incoherent Scatter.

These reports are reproduced below.

The Commission decided to maintain its Working Groups as follows: Ionosonde Network Advisory Group (INAG) and Studies of the Ionosphere Using Beacon Satellites, and to form new Working Groups on Ionospheric Modelling, on Ionospheric Informatics and on Low Latitude Ionospheric Studies. It decided also to maintain its Joint Working Groups with Commission H on Incoherent Scatter and on Computer Experiments, Simulation and Analysis of Wave Plasma Processes, as well as its Joint Working Group with COSPAR on the International Reference Ionosphere (for details see Resolutions G.4, G.5 and G.6 on page 178).

3. Symposia 1987-1990

See Recommendation G.7 on page 179.

4. Recommendations of the Commission

Several Recommendations originating in Commission G were adopted as Council Recommendations in view of their importance. They concern the world-wide ionosonde network; the possible establishment of an incoherent scatter and ST radar facility in Antarctica; possible interference to incoherent scatter facilities; active experiments and the measurement of 10.7 cm flux by the Canadian National Research Council (see pp. 163-165).

Recommendations were also adopted regarding high resolution observations of ionospheric electron density; satellite monitoring

system; and HF field strength and radio noise measurements (see pp. 177-178).

REPORTS OF WORKING GROUPS

1984-1987

Southern Hemisphere Atmospheric Studies

The Working Group as a Southern Hemisphere Atmospheric Studies Group has changed its scope during the last years more toward the problems of the low latitude ionosphere.

Examples of this new orientation are the following activities related to the Working Group:

1. The URSI Biregional Latin American-African Workshop on Radio Propagation Research and Applications, held in Buenos Aires in April 1987, recommended three lines of action oriented toward low latitude ionosphere studies.

2. The URSI Handbook on Radio Propagation for Tropical and Subtropical Countries, recently edited by the Committee on Developing Countries, has shown the continuous interest in the low latitude ionosphere.

3. A recent agreement between Brazil and Argentina will make it possible to organize measurement campaigns of different ionospheric, mesospheric and geomagnetic parameters for the study of the dynamics of the low latitude ionosphere over South America. The first of such campaigns will take place during the second half of September 1987.

At this stage, it appears that a more fruitful coordinated effort can be obtained from the present Working Group if it reorients its objectives covering the low latitude of both hemispheres instead of limiting itself to the Southern Hemisphere. This is why it is proposed to redefine the Working Group as: "Working Group on Low Latitude Ionospheric Studies".

Its objectives would be:

(a) To organize and coordinate regional or global low latitude measurement campaigns of ionospheric parameters, including electron density profiles from ionograms and TEC obtained from beacon satellite data.

(b) To promote and coordinate low latitude ionospheric studies taking into account in particular problems related to modelling of the ionospheric structure and dynamics.

It is proposed to constitute initially the Working Group with the following members:

M.A. Abdu (Brazil)
V. Kakane (Ghana)
R. Woodman (Peru)
S.M. Radicella (Argentina)
N. Ortiz de Adler (Argentina)
D.N. Anderson (USA)
J.O. Oyinloyè (Nigeria)
A.G. Rastogi (India)
Xuegin Huang (China)

The list of members could include other interested colleagues.

S.M. Radicella
Chairman.

Mapping of Characteristics at the Peak of the F2 Layer

At the business meeting of Commission G at the XXI General Assembly in Florence in 1984, URSI Working Group G.5 was set up: "to make improvements in the present CCIR (International Radio Consultative Committee) maps of F2-layer characteristics through theory and observation and, in particular, to investigate the possibility of incorporating space data".

The members of the Working Group were:

P.A. Bradley (United Kingdom)
N.P. Danilkin (USSR)
K. Davies (USA), Chairman
N. Matuura (Japan)
L. McNamara (Australia)
K. Rawer (FRG)
C. Rush (USA)

The Working Group restricted its activities to the stable features of the global distribution of foF2. Thus it was decided not to include features such as the auroral zone, troughs, travelling ionospheric disturbances, and ionospheric storm effects.

The Working Group established an objective of producing a new set of numerical maps of foF2 based on available 'observed' and 'theoretical' data. The term "numerical map" is used to denote a function of three variables -- latitude, longitude, and time -- which represents the world-wide geographic and diurnal variations of an ionospheric characteristic. A numerical map is defined by a set of coefficients. In the CCIR (1967) maps, originally adopted in 1966, a set of 988 coefficients were used for each map.

The number of coefficients employed is a compromise between economy and degree of detail in the map. In the presence of noise in the data, the higher coefficients tend to represent noise rather than the parameter. Hence, above certain orders of coefficients, the series is truncated. This truncation is an important feature because it sets a limit on the spatial gradients in the map and establishes a lower limit on the spatial sizes of structures in the map. Numerical maps have several advantages compared with hand-drawn maps, such as: (1) adaptability to computer use, (2) ease by which they can be updated as new data become available.

There are two distinct aspects of mapping that can lead to improvements. They are: (a) the mathematical functions used to represent the characteristic on a spherical surface, called the basis functions, and (b) the quality, quantity, and location of the input data. The Working Group concentrated its efforts on aspect (b).

The input data come from the ionospheric sounding network of about 150 ionosonde stations. The locations of some of these stations have changed over the years. While some areas, e.g. Europe, have relatively dense networks, there are large areas, such as over oceans, where the data are sparse or non-existent. This uneven distribution leads to erroneous values over unsounded areas. Furthermore, some sounding stations have been operated for limited periods; extrapolation in time is necessary to represent conditions for sunspot numbers of 0 and 100.

The most comprehensive data base of F2 critical frequencies is that of Fox and McNamara (1986), who have collected all available data and developed procedures for rejecting and fitting data and for interpolation/extrapolation.

To include realistic data over the oceans in middle latitudes, Rush et al. (1984) introduced "theoretical data". This was accomplished by the use of a physical model of the ionosphere that included ion production and loss and, in particular, effects of winds. Using data for stations with little or no magnetic declination, the meridional neutral wind was adjusted for agreement between observation and theory. The meridional wind was used at a station with a magnetic declination, and the zonal wind adjusted for agreement between theory and observations. This wind system was then used in similar latitudes and different declinations to obtain "theoretical" values of foF2 for latitudes above $\pm$ 25°. Combining their data base with the theoretical data, Fox and McNamara (1986) produced a set of maps which are in basic agreement with the Japanese maps based on ISS-B (1980) maps.

It is the opinion of Working Group G.5 that the Fox-McNamara maps give the best existing representation of the global distribution of foF2. They differ from the widely-used CCIR maps: (1) in the number of coefficients used, and (2) in the fact that the maps are for given local times rather than universal times. The Working Group decided to produce a set of maps based on the Fox-McNamara maps, which are compatible with the CCIR maps. The coefficients which define these maps are available from Dr. C.M. Rush, National Telecommunications and Information Administration, Department of Commerce, 325 Broadway, Boulder, Colorado, USA 80303. Tests of the Working Group G.5 maps against satellite soundings indicate that they are preferable to the existing CCIR maps.

Recommendations

(1) The existence of these new maps should be drawn to the attention of interested organizations, such as CCIR.

(2) That the present Working Group be dissolved and, if appropriate, a new group be formed.

A new working group might address the following topics, for example:

(1) Make intercomparisons between existing maps and new data, especially over ocean areas. Sources of such data may include: satellite soundings, oblique ionograms, and theoretical results.

(2) Investigate the possibilities of using techniques, other than the Jones-Gallet (1962) basis functions, for the construction of the maps; for example, a system in which numerical values are assigned at grid points. Finer grids could be used in regions of high gradients.

(3) Consider the introduction of specific features such as auroral ovals, troughs, sunrise gradients, etc.

(4) Examine the need to update maps of other F2 characteristics such as: M(3000)F2, hmaxF2, gradients in foF2, minimum foF2, daily ionospheric data, and day-to-day variabilities and, possibly, to introduce new parameters as recently proposed by Working Group G.4 at the Novgorod Workshop.

(5) Study how to improve hmF2 as derived from M(3000)F2.

(6) Examine physical models of the ionosphere which might be helpful in areas where measured data are sparse.

References

CCIR, 1967, Report 340, CCIR Atlas of Ionospheric Characteristics, International Telecommunication Union, Geneva.

Fox, M.W., and L.F. McNamara, 1986, Improved empirical world maps of foF2. 1. The method, Tech. Report IPS-TR-86-03, IPS Radio and Space Services, Australia.

ISS-B, 1980, Atlas of Ionospheric Critical Frequency (foF2) Obtained from Ionosphere Sounding, Satellite-b Observation, Part 2, Radio Res. Labs, Tokyo.

Jones, W.B., and R.M. Gallet, 1962, Representation of diurnal and geographical variations of ionospheric data by numerical methods, Radio Sci., 1, 419 (J.Res. NBS 66D, 419).

Rush, C.M., M. Pokempner, D.N. Anderson, J. Perry, F.G. Stewart, and R.K. Reasoner, 1984, Global maps of foF2 derived from observations and theoretical values, US Dept. of Commerce, NTIA Report 84-140.

August 1987

K. Davies
Chairman.

Incoherent Scatter

Working Group Meetings

The Working Group has had several meetings, formal and informal, at several national and international meetings during the last three years: one at the San Francisco, American Geophysical Union, in December 1984, to establish WAGS (Worldwide Acoustic Gravity Wave Study); one at the GTMS (Global Thermospheric Mapping Study) Workshop in Cambridge, MA, USA, in July 1985 to discuss the distribution of one-day and multi-day campaigns; one at the IAGA meeting

in Prague, in August 1985, to exchange information on the facilities, the data base at NCAR, and the multi-day campaigns; one at the CEDAR (Coupling, Energetics, and Dynamics of Atmospheric Regions) Workshop at Boulder, CO, USA, in July 1986, to discuss multi-day campaigns and the World Day schedule; and one at the URSI-sponsored International Symposium on Large-Scale Processes in the Ionospheric-Thermospheric System in Boulder, CO, USA, in December, 1966, to exchange information on the facilities.

Meetings Sponsored

A proposal from the Working Group to sponsor a meeting was approved. The result was the International Symposium on Large-Scale Processes in the Ionospheric-Thermospheric System, held at NCAR (National Centre for Atmospheric Research) in Boulder, CO, USA, between 2 and 5 December 1986. The convenors were Vincent Wickwar and Art Richmond. In addition to URSI, the symposium was sponsored by SCOSTEP, NSF, AFGL, and NCAR-HAO. The meeting was attended by about 100 researchers from 9 countries.

World-Day Schedule

The first multi-day World Day period was scheduled in the Summer of 1982; however, the intended scientific purpose of that experiment was not decided until December 1983, at the San Francisco AGU meeting. Thus GISMOS (Global Incoherent-Scatter Measurements of Substorms) was born. At that same meeting, it was decided that there should be one or two scientific coordinators for each long campaign. Since then GISMOS has had five more campaigns and several workshops. Since then GTMS (Global Thermospheric Mapping Study) has had several campaigns and has evolved into GITCAD (Global Ionosphere-Thermosphere Coupling and Dynamics), WAGS has had one campaign, LTCS (Lower Thermosphere Coupling Study) will have its first campaign next month, and a hydrogen exosphere campaign is planned for early 1989. GTMS, GITCAD, and WAGS have already had workshops and LTCS has had an organizing meeting. These multi-day campaigns have become the basis for most of the observing campaigns in the US CEDAR programme and, similarly, have become the basis for most of the observing campaigns in WITS (World-wide Ionosphere-Thermosphere Study).

Thus the multi-day campaigns have proved very successful. It is now essential that they be planned significantly in advance. The scheduling has become more difficult because these periods have become a scarce resource. At the moment there are three of these campaigns a year ranging in length from 3 to 5 days and there is a pressure for a fourth. At the same time, there is an effort to maintain about 5 24-hr periods distributed throughout the year.

Incoherent-Scatter Data Base at NCAR

At the General Assembly in Washington, DC, in 1981, a strong desire was expressed for an incoherent-scatter data base. Prior to the General Assembly in Florence, in 1984, it had been established at NCAR. It is now operational and has a considerable amount of data from the Coordinated World Days and other long experiments. The head of the data base is Dr. Art Richmond; the person to contact for

data is Dr. Barbara Emery. Additional information on the data base is given in a poster presentation.

News Relevant to the ISWG

The MU radar is operating in both MST and incoherent-scatter modes. In the latter mode, it is best able to obtain density and velocity data. It operated in the incoherent-scatter mode for some of the Coordinated World Days in 1987 and is planning to operate for all of them in 1988. The person to contact is Dr. Shoichiro Fukao of the Radio Atmospheric Science Centre at Kyoto University, Gokanosho.

The Japanese and the Indonesians have been discussing building a radar similar in concept to the MU radar, but ten times as big, on the equator. It would be roughly the size of Jicamarca.

A workshop has been proposed by Dr. Wickwar for December 1987 to examine the possibility of building an incoherent-scatter radar in Antarctica. The workshop is to consider the scientific benefit, optimum location, technical and logistical challenges, implementation and operational costs, and expected timetable. Because of the challenges of establishing and operating this facility, the global nature of the science, and the special status of Antarctica, it may be appropriate to make it an international facility.

August 1987

V.B. Wickwar, Chairman
K. Schlegel, Vice-Chairman.

TITLES OF SCIENTIFIC SESSIONS

Commission G Sessions:

- Incoherent scatter studies of the ionosphere (2 sessions)
- The high-latitude ionosphere (2 sessions)
- Modelling and mapping of the ionosphere (2 sessions)
- The low-latitude ionosphere and its effects on telecommunications
- Ionospheric needs for telecommunication development.

Joint sessions with participation of Commission G:

- Radar and radio studies of the middle atmosphere and lower ionosphere (F, G)
- Active experiments in space plasmas (2 sessions) (G, H)
- Plasma instability processes (G, H)
- Time domain waveform measurements and applications (all Commissions).

COMMISSION H - WAVES IN PLASMAS

Chairman: Prof. R.L. Dowden (New Zealand)

Vice-Chairman: Prof. H. Matsumoto (Japan)

REPORT ON BUSINESS MEETINGS

Commission H held two business meetings during the General Assembly, on 25 and on 28 August 1987.

1. Corsendonk Conference

Prof. Dowden, Chairman of the Commission, reported on the discussions and the recommendations made at this Conference, which was held at Corsendonk, Belgium on 8-10 March 1987.

The discussion which followed concentrated on the issue of the division of scientific fields between URSI and IAGA in areas of interest to Commission H. All opinions expressed were strongly against a summary statement that "URSI's emphasis in the probing and geophysics area should be mostly in the area of equipment and systems". All expressed the worry that activities in "Waves in Plasmas" in URSI would end if the content of the summary statement were really adopted. However, Dr. Petit explained that nobody had really proposed that URSI Commissions G and H should confine their activities merely to equipment and systems, and that the Summary Statement, as published in "URSI Information Bulletin" No 240 (March 1987), must have been drafted by somebody who was not fully aware of the actual activities of Commissions G and H. It was further stressed that Commission H should pursue both the physics of radio science and environmental problems posed by telecommunications science.

The following agreement was reached:

"URSI Commission H should keep its current activity and should not confine its activity only to technology (equipment and systems). It should stress the importance of the fundamental physics of waves in plasmas, keeping its philosophy expressed in the current Terms of Reference. Overlapping with IAGA's interest should be avoidable by mutual agreement in planning conference programmes as has been attempted".

2. Issue of merging with Commission G

Noone presented a favourable opinion for merging with Commission G and it was concluded that Commission H membership was totally against such a merging. It was, however, confirmed that Commissions G and H should continue with their collaborative efforts to hold good joint sessions at General Assemblies with careful timetabling of scientific programmes.

3. Terms of Reference

After discussion, it was unanimously agreed to adopt the following Terms of Reference (the only difference with the present ones is the deleting of the phrase: "excluding the communications aspects which are the province of Commission G").

"Commission H deals with waves in plasmas in the broadest sense, and the interaction between these waves and charged particles. Included are electromagnetic and electrostatic waves in interplanetary, planetary and laboratory plasmas".

It was suggested that the Chairmen and Vice-Chairmen of Commissions G and H should meet to discuss their Terms of Reference so as to pursue closer cooperation and interactions on scientific and administrative activities at and between General Assemblies.

4. Election of Vice-Chairman

According to the rules, voting by the Official Members of the Commission was conducted. The nominees for Vice-Chairman were: V.I. Aksënov (USSR), R.F. Benson (USA), A. Eviatar (Israel), D. Jones (UK) and K. Suchy (FRG).

The result was as follows:

1. D. Jones
2. R.F. Benson.

5. Proposed symposia for 1988-90, including co-sponsored events

The Commission agreed to recommend sponsorship for the following meetings:

1) Wave-Induced Particle Precipitation and Wave-Particle Interactions (URSI-WIPP '89), Dunedin, New Zealand, February 1989;

2) 4th International School for Space Simulation, Kyoto, Japan, November 1989;

3) 19th International Conference on Phenomena in Ionized Gases (ICPIG-XIX), Belgrade, Yugoslavia, July 1989.

6. Working Groups

The Commission agreed to maintain the following Working Groups:

CH.1 Wave Analysis (with Commission C)
GH.1 Incoherent Scatter (with Commission G)
GH.2 Computer Experiments, Simulation and Analysis of Wave Plasma Processes (with Commission G)
URSI/IAGA.1 Passive Electromagnetic Probing of the Magnetosphere
URSI/IAGA.2 Wave Instabilities in Plasmas.

7. Proposed sessions for the next General Assembly

The programme of Commission H for the next General Assembly was discussed and proposals were put forward.

TITLES OF SCIENTIFIC SESSIONS

Commission H sessions:

- Computer analysis of plasma waves
- Waves in space plasmas (2 sessions)
- Wave-induced particle precipitation (2 sessions)
- Computer simulation on man-made and natural phenomena in space (2 sessions).

Joint sessions with participation of Commission H:

- Antennas in plasmas (B, H)
- Direction finding for whistlers and atmospherics (E, H)
- Active experiments in space plasmas (2 sessions) (G, H)
- Plasma instability processes (G, H)
- Radio waves in and from planetary and astrophysical plasmas (H, J)
- Time domain waveform measurements and applications (all Commissions).

COMMISSION J - RADIO ASTRONOMY

Chairman: Dr. R. Wielebinski (FRG)

Vice-Chairman: Prof. R.H. Frater (Australia)

REPORT ON BUSINESS MEETINGS

Two business sessions were held. The first dealt solely with the preparation of the agenda and preliminary discussions on IUCAF. The second is discussed below.

1. Election of Vice-Chairman

There were four candidates: R. Ekers (USA), J. Moran (USA), M. Tiuri (Finland) and J. Welch (USA). J. Welch withdrew his nomination; J. Moran was not present. The result of the vote, to be submitted to the Council, was as follows:

1. R. Ekers
2. M. Tiuri.

2. Terms of Reference

It was determined that the incoming Chairman, R.H. Frater, should be responsible for revising the terms of reference for Commission J for consideration by the Commission at the Prague General Assembly.

3. Proposed Symposia

It was resolved that Commission J should support four new symposia to be held during the next three years.

(i) VLBI Summer School for Young Scientists, Bologna, Italy, September 1988;

(ii) Radioastronomical Seeing, Beijing, China, May 1988;

(iii) Limits of Observational Astronomy, Sydney, Australia, August/September 1989;

(iv) Submillimeter Radio Astronomy, Hawaii, September 1988.

It was resolved also that Commission J should co-sponsor an IAU Colloquium on "Light Pollution, Radio Interference and Space Junk", to be held in Washington, 12-15 August 1988. T. Gergely is the local organizer.

4. Review of Radio Science

It was resolved that the next Commission J contribution to the Review should be prepared by a group of reviewers, each dealing with an area of specialisation, with the Commission Chairman as Editor-in-chief.

5. Topics for the next General Assembly

It was resolved that these should be selected by the Chairman with the advice of a small organizing committee.

6. Inter-Union Commission on Frequency Allocation for Radio Astronomy and Space Science (IUCAF)

Dr. J.W. Findlay reported on matters to be communicated directly to the Council. He highlighted the handling of the VEGA transmission problems where times of transmission were communicated to the world-wide astronomical community. No interference was observed. He drew attention to the serious problem of interference by the USSR GLONASS satellites. Two meetings of concern to IUCAF were identified:

(i) MOB-87, beginning 14 September 1987;
(ii) 1-3 GHz WARC.

To cope with the problems foreseen for the next three year period, IUCAF recommends an increase in membership, doubling the URSI and IAU members. IUCAF also recommends an increase in the URSI contribution to $4,000, noting that the 1960 contribution was $1,000.

Commission J recommends that the URSI membership of IUCAF be increased to four members. Noting the serious threats on radio astronomy, Commission J further recommends that the URSI Council provide whatever financial support is possible for IUCAF during this crucial three-year period.

7. URSI-CCIR-CCITT Liaison Committee

Commission J nominated Dr. B.J. Robinson as its representative with a second representative to be identified by the Commission Chairman.

8. VLBI in Israel

Dr. J. Shapira reported on studies in Israel for the establishment of a VLBI station, to be jointly operated by Israel and Egypt. The concept was endorsed unanimously by the Commission. A subcommittee (Cohen, Shapira, Schilizzi and Booth) was established to draft detailed technical recommendations. These were accepted by the Commission (see p.181).

REPORT ON SCIENTIFIC SESSIONS

Session J1: Radio astronomy in space
(Convenor: R.T. Schilizzi)

- Introduction, R.A. Preston
- A proposal for low frequency space array, K.W. Weiler, B.K. Dennison, W.C. Erickson, K.J. Johnston, M.L. Kaiser, R.S. Simon, J.H. Spencer
- QUASAT: An overview, R.S. Booth

- Technical aspects of QUASAT, A. Hawkyard, J.F. Jordan
- Japanese efforts towards space VLBI, M. Morimoto
- Very long baseline interferometry observations using the tracking data and relay satellite as an orbiting radio telescope, G.S. Levy et al.
- The ESA far-infrared space telescope: Overview, R. Genzel
- First - An ESA submillimetre astronomy mission, U. Frisk
- The large deployable reflector (LDR): A far-infrared submillimetre observatory for space, P.N. Swanson.

Session J2: VLBI Techniques
(Convenor: B. Anderson)

- The very long baseline array, J.D. Romney
- The EVN processor, A. Bos
- Continuum mapping techniques in VLBI, P. Wilkinson
- Geodetic VLBI, B.O. Roennaeng
- Phasing the Westerbork array for VLBI, A. van Ardenne.

Session J3: Short contributions from various observatories
(Chairmen: V. Radhakrishnan, M. Morimoto, M. Tiuri and R. Wielebinski).

Three sessions were held.

Session J4: Metre wave antennas and results
(Convenor: G. Swarup)

- Westerbork results at 327 MHz and ionospheric effects, W. Brouw
- Merlin observations at 151 and 408 MHz and ionospheric effects, Representative of Jodrell Bank
- VLA observations at 327 MHz and ionospheric irregularities, K. Anantharamiah
- Gauri Bidnaur array at 34 MHz, N. Udaya Shankar
- Self-calibration of radio astronomical data at metre waves, T.J. Cornwell
- VLA system at 74 MHz - Progress report, R. Ekers
- Giant metre wave radio telescope - Progress report, G. Swarup
- Wideband dipole feeds for solar radio astronomy, Meudon Group
- Metre wave antennas in USSR
- Miyun radio telescope in China at 235 MHz.

Session J5: Sub-mm wave observations
(Convenor: E. Kruegel)

- Observations with the IRAM 30m telescope, J.W.M. Baars
- Sub-mm continuum observations of active galaxies, I. Robson

- Far IR observations of molecular and atomic fine structure lines, G. Stacey
- Sub-mm heterodyne observations of giant molecular clouds, A. Harris
- Observations of H30 and H2D at sub-mm wavelengths, P. Encrenaz
- Sub-mm observations of CO in external galaxies, R.N. Martin.

Session J6: Data, signal and image processing
(Convenor: R.H. Frater)

- Kalman filtering in aperture synthesis, J.P. Basart
- A review of the clean technique, Sze M. Tan
- Multi-resolution clean, U.J. Schwarz and B.P. Wakker
- High-dynamic range with a redundant interferometer, W.N. Brouw
- Limitations of image reconstruction in radio astronomy, J.D. O'Sullivan
- Multi-frequency synthesis: A new technique in aperture synthesis imaging, J. Conway
- Radio-interferometric imaging of very extended objects: A maximum entropy algorithm, T.J. Cornwell
- Wide field mapping, L.B. Baath and T.W.B. Muxlow
- A high-speed correlator for mm-interferometry: The case for XF, M.Ewing and S. Padin.

Session JS1: Precise measurements in radio astronomy (Commissions A and J)
(Convenors: S. Hahn, R. Wielebinski)

- Absolute microwave background measurements, G. Sironi
- Measurement of weakest sources at high frequencies, W.J. Altenhoff
- Clocks and systems in VLBI, B. Anderson
- Millisecond pulsar rivals best atomic clock stability, D.W. Allan, L. Rawley, S. Stinebring, J. Taylor, M. Davis
- Accurate measurement of pulsar dispersion measure, W. Sieber.

Session JS16.1: Radio waves in and from planetary and astrophysical plasmas (Commissions H and J)
(Convenors: D. Jones and R. Ekers)

- Generation of the non-thermal e.m. continuum, C. Altman, B.Lembège, A. Roux
- A critical mechanism for the generation of the auroral kilometric radiation, E.D. Poezd, A.D. Poezd, V. Fiala
- Parallel electric field and VLF chorus in the magnetospheres of Earth and Jupiter, I.M.L. Das

- ISEE 3 observations of harmonic auroral kilometric radiation and terrestrial 2 MHz radiation, R.F. Benson, J. Fainberg
- The source location of Jovian S-burst emission, F. Genova, W. Calvert
- Jovian kilometric radiation, Y. Leblanc
- The source mechanism of terrestrial myriametric and Jovian kilometric radiations, D. Jones
- Ray tracing of electrostatic and Z-mode radiation in the Earth's magnetosphere, R.B. Home
- Observations of electromagnetic waves in the polar region of the Earth's magnetosphere, E. Ungstrup, M. Jespersen, I.B. Iversen; A. Bahnsen.

JS16.2:

- Plasma waves in planetary magnetospheres, D.A. Gurnett
- Non-thermal planetary radio emissions, M.L. Kaiser
- Poster review, D.D. Barbosa
- Fourier spectra of geomagnetic pulsations PC-1 of different kind. Resonances of the magnetospheric cavity and a theoretical model of formation of packets of waves PC-1, Y.L. Al'pert
- Pulsed radiation from Uranus and neutron stars: A comparison of emission characteristics, D.D. Barbosa.

Session JS10: Spectrum management and frequency allocation
(Commissions C, E, F, J)
(Convenor: R.G. Stružak)

See report on page 107.

Session JS17: Time domain waveform measurements and applications
(all Commissions)
(Convenors: N.S. Nahman, T.K. Sarkar)

INTER-COMMISSION WORKING GROUPS

COORDINATION OF URSI'S ACTIVITIES AT OPTICAL WAVELENGTHS FOR COMMUNICATION, SENSING AND PROCESSING

Analysis of the programme for the XXII General Assembly shows that the papers under the above category appeared in the following types of session:

Commission D sessions	15
Combined A and D sessions	11
Other sessions	4
Total	30

It is clear that the majority of the papers were in sessions organized by Commission D alone, or in collaboration with Commission A. The remaining four papers were in complementary subjects and provided no clashes with the others.

Since there have been no problems requiring the intervention, or comment, of the Working Group the recommendation is that it is terminated.

W.A. Gambling
Chairman.

TIME DOMAIN WAVEFORM MEASUREMENTS

The Inter-Commission Working Group on Time Domain Waveform Measurements (IWG-TDWM) organized and convened two scientific sessions (JS 17.1 and JS 17.2). There were nine papers from six different countries. They contained both invited and contributed presentations. There were held on Wednesday, 2 Sept. 1987. In the morning there were about 80 people and the average was 60. In the afternoon session the average was 25.

Two one-hour business meetings were held on 26 August and 1 September. In meetings the following business agenda was followed and completed with the following being accomplished.

1. Introduction of members and visitors to one another.

2. Dr. Sarkar, who was appointed as Vice-Chairman by Dr. N.S.Nahman, Chairman, reported on the overall activities of the IWG for the past three years.

Several sessions were organized at the URSI meeting at Boulder, USA on Time Domain Waveform Measurements including a NATO-ASI, which was attended by several IWG members. The following books have come out based on the meetings:

E.K. Miller, Ed. "Time Domain Measurements in Electromagnetics", Van Nostrand, 1986.

J.E. Thompson,Ed. "Fast Electrical and Optical Measurements", Vol. I and II, Martinus Nijhoff, Dordrecht, 1986.

3. The possible activities for the IWG during the next three years (if it is decided by the Council that this Group should continue) including the XXIII General Assembly were discussed. The following are suggested for adoption as a resolution by the Council:

(a) It was recommended that the IWG continue for the next triennium with the same Chairman and Vice-Chairman, and the existing terms of reference.

(b) It was recommended that for those countries in which National Radio Science Meetings are held, the IWG members residing therein should organize a time domain scientific session(s) in concert with interested Commissions.

(c) It was recommended that the IWG organize sessions on the following "hot" topics:

1. Frontier technologies for fast transient measurements including both electrical and optical sensors, and processing of such data.

2. Measurement and characterization of transient electrostatic discharge in semiconductor devices and dielectrics (carona discharge).

3. Measurements of transients in biological media.

(d) For the XXIII General Assembly, the IWG should propose an open symposium on Time Domain Waveform Measurements to provide a forum for research papers. The symposium would be organized by the IWG. The IWG should also propose at least one scientific session on Time Domain Waveform Measurements to provide review papers specific to the Commissions. The joint session would be organized by the IWG.

T. Sarkar
Vice-Chairman.

Open Symposia in Tel Aviv

OS 1: COMPUTER-AIDED DESIGN IN RADIO SCIENCE WITH EMPHASIS ON MICROELECTRONICS

This Open Symposium was held on 26 and 27 August. It was planned to cover basically all the areas of the CAD in radio science. However special emphasis was placed on the CAD in microelectronics, and papers describing recent achievements in the topological/structural design and computer simulation of IC/LSI/VLSI had been particularly solicited.

The Symposium was organized by Mrs J. Hénaff (France). It included 4 sessions which were chaired by R. Sorrentino, F.E. Gardiol, T. Itoh and J. Hénaff respectively.

OS 2: RECONSTRUCTION, IMAGING AND INVERSE SCATTERING

The Symposium was held on 28 and 31 August. It was organized and chaired by Dr. D.L. Jaggard (USA). Papers had been solicited on all aspects of reconstruction, imaging and inverse scattering, and the objective was to review and discuss methods pertinent to various problems rather than to describe specific applications.

The Symposium included the following sessions:

- Inverse scattering and image theory (2 sessions)
- Image reconstruction and signal processing (1 session)
- Applications of image and reconstruction theory (1 session).

OS 3: MILLIMETER WAVE TECHNIQUES IN TELECOMMUNICATIONS, REMOTE SENSING AND RADIO ASTRONOMY

This Symposium, which was held on 1 and 2 September, was organized and chaired by Dr. J.W.M. Baars (FRG). It was intended to bring together scientists using millimeter wave techniques in many areas of research. The Symposium included both review papers and contributed papers.

The programme of the Symposium covered four sessions as follows:

- Radio astronomy (2 sessions)
- Electromagnetics and technology (1 session)
- Propagation and remote sensing (1 session).

Reports on Activities of Inter-Union Organizations

INTER-UNION COMMISSION ON FREQUENCY ALLOCATION FOR RADIO ASTRONOMY AND SPACE SCIENCE

by

J.W. Findlay, Chairman

1. The start of IUCAF

The need to have bands of radio frequencies available for scientists to use at various parts of the spectrum was discussed at URSI, starting with the IXth General Assembly in Zurich in 1950. It was the fairly new science of radio astronomy which made the matter urgent, and between 1950 and 1957 the subject was studied by URSI, the IAU and, as soon as it was formed, by COSPAR. When the XIIth General Assembly convened at Boulder in 1957 with Lloyd Berkner as President, Sub-Commission Ve of the radio astronomy Commission V was formed to prepare for the forthcoming International Telecommunications Union (ITU) World Administrative Radio Conference (WARC) to be held in late 1959.

The tasks for this Sub-Commission (of which the author became chairman in the early summer of 1958) were to establish the scientific requirements for the protection of bands of radio frequencies throughout the spectrum and then to take action to get these requirements presented to the WARC and, if possible, to get them approved. Good international agreement was reached on the scientific requirements for radio astronomy and this was formalised in a CCIR Recommendation No 314 approved by the CCIR Plenary Meeting held at Los Angeles in April 1959. By this time the IAU had held a General Assembly in Moscow and in August 1958 passed a good resolution supporting the work of Ve and calling for bands to be cleared not only for hydrogen-line observations, but also for a series of bands at octave intervals throughout the radio spectrum. COSPAR came into being in 1958 to carry on the rocket and satellite work started in the International Geophysical Year, and so also had an obvious interest in getting space science and space operations included in the 1959 WARC.

A WARC is a major meeting called by the ITU to regulate the use of the radio frequency spectrum. A WARC is essentially a treaty-making occasion and so its pattern of work is formal. Only member countries may make submissions to the WARC and these are usually worked out well in advance and given some limited diplomatic exposure before the WARC starts. Thus the second task given to Ve required that at least one administration would enter the needs of the scientists and, if possible, several administrations should support them. As it turned out it was the Netherlands which made the vital submission; this was largely due to the leadership of Professor Jan Oort. Since it was clear that the IAU and COSPAR were also concerned with the work of the WARC, a joint representation was arranged, with at least one person acting for all as an observer a

the Conference. This cooperation can be regarded as the unofficial start of IUCAF.

2. The formation of IUCAF

The official formation of IUCAF was largely due to Lloyd Berkner. It was obvious when the work of Ve was reported at the XXIIth General Assembly of URSI at London in 1960 that the task of working to get frequencies allocated for radio astronomy and space science should be done by an Inter-Union body. Berkner arranged a series of meetings in London which led directly to the formation of IUCAF as an ICSU Inter-Union Commission with URSI as parent Union, and IAU and COSPAR as the other founding bodies. The remit was:

(a) To study and coordinate the requirements for radio frequency allocations for radio astronomy and space science, and to make these requirements known to the national and international bodies responsible for frequency allocations;

(b) To take action aimed at ensuring that harmful interference is not caused to radio astronomy or space science, operating within the allocated bands, by other radio services.

During its first years IUCAF was composed of twelve members, four being appointed by each of the founding bodies. The Director of the CCIR and the Chairman of the International Frequency Registration Board (IFRB) acted as advisers, and there was a secretary. After some years the membership was reduced to six.

3. The work of IUCAF

The ITU usually holds a full WARC every twenty years but the growth of activities in space made it necessary to hold a WARC specially devoted to space frequencies in 1963. Radioastronomers were fortunate in having their service also included. IUCAF was deeply involved in this WARC, and the outcome was a much improved allocation table. The next full WARC, held in 1979, was again an opportunity to improve and extend the frequency protection for the IUCAF sciences. One important change made by this WARC was the inclusion of radio astronomy and space research together in a number of "passive" bands where no radio frequency power may be emitted at all by any service.

It will be clear from what has been written so far that the task in paragraph 2(a) becomes most important when a WARC, either full scale or specialised, is planned for the near future. IUCAF attemps to keep up-to-date with the changes of growth of the scientific requirements of radio astronomy and space science by close contact with the relevant Commissions of URSI, IAU and COSPAR. This proves to be easier for radio astronomy than for space science, chiefly because of differences in the ways in which experimental work is planned. For example, a set of observations in radio astronomy of the lines emitted by molecules in a particular region of sky determines at once the frequencies to be used. If the molecular lines are not judged to be important, they will not have got any form of "protection" and the observer will have to do his best to find a place and time suitable for his observations. But the lines may have

been judged as important (and IUCAF, the IAU and the CCIR make and up-date such judgments) and then they are likely to have some degree of protection. And if the science appears to justify an attempt to change the degree of protection, the proposal can be made to the ITU for such a change. In some space science there can also be a clear picture of the frequencies which are scientifically most important. Observations made from a satellite of the earth's atmosphere are an example. So also are some earth observation experiments, and studies of the ionosphere where frequencies in exact harmonic relation are needed. But quite a lot of space science does not call for exact frequency requirements although it may well need specific bandwidths to be available. In order to be informed on as wide a base as possible of the requirements of space science, IUCAF has become associated with the work of the Space Frequency Coordinating Group (SFCG), as well as keeping in touch with the work of the CCIR Study Group 2 and the relevant COSPAR Commissions.

The SFCG consists of representatives from several space agencies and meets usually once a year. It is intended to provide a forum for multi-lateral discussion and coordination of spectrum and orbit matters of mutual interest concerning a number of space radiocommunication services. The group is particularly interested in getting an early understanding of future plans for space systems and in making suggestions with regard to current and future frequency needs. Members of the group also have an interest in radio astronomy and radar astronomy when these are relevant to spacecraft missions. For some years two members of IUCAF have been attending SFCG meetings as observers, and the informal interchanges have proved very useful. Despite the slight informality, Dr. F. Horner of IUCAF will act as chairman at their next meeting in Paris at the end of 1987.

4. The last three years

(a) Protecting the passive bands

Since about 1983 IUCAF has considered carefully how it might act to fulfil more energetically the second part of the task allocated to it. The need for a careful look at the problems of harmful interference being radiated into the "passive" bands was in general due to the ever-increasing pressure to find more spectrum space for new radio systems. But in the special case of several space-borne systems being planned or being implemented in the 1600-1700 MHz part of the spectrum appeared to be particularly threatening. One such system, the launch of two spacecraft to Venus and then on to rendezvous with comet Halley, was troublesome since the frequency chosen for the spacecraft to radiate was 1667.8 MHz. This frequency lies within a passive radio astronomy and space research band. There were good practical reasons for the choice of this frequency and the power levels radiated were low. Nevertheless, the precedent was unfortunate, and the problem was discussed at the XXVth Plenary Meeting of COSPAR at Graz in June 1984 and at the XXIst General Assembly of URSI at Florence later that year. IUCAF accepted the task of keeping radio-astronomers informed of the transmission schedules of the spacecraft, and many communications were sent to observers around the world. (No problems were anticipated in space science since the pow

levels at earth were very low). Another outcome of the concerns about possible interference from space transmissions were the actions taken by URSI in Florence in passing two Resolutions, U.17 and U.18. The first of these asked administrations planning experiments requiring radio transmissions from space to use IUCAF to help protect sensitive passive radio observations. The second made formal the IUCAF work described above in informing scientists of the radio transmissions from the Vega spacecraft. By the time of the IAU XIXth General Assembly at New Delhi in November 1985 it was possible to report that the Vega missions had been successfully carried out and that no cases of radio interference had occurred. The actions of URSI were paralleled by the IAU in passing two Resolutions, B.3 and B.4, on the subject of radio interference from spacecraft. Finally, at the XXVIth Plenary Meeting of COSPAR at Toulouse in July 1986 two Decisions, 14/86 and 15/86, were passed which essentially aligned all three of the IUCAF sponsors on this subject.

This agreement on the need for further action by IUCAF on this difficult subject is certainly welcome; but the format for that action is far from clear. IUCAF has encouraged the international watch for potential or actual cases of improper usage of the protected bands. At present there are cases of damaging interference from satellites in the 1610-1614 MHz band, which is protected for radio observations of the OH line. Such cases can be studied and the characteristics of the interference can be made known to scientists in countries around the world. IUCAF documents on such interference go as a matter of course to the IFRB as an adviser to IUCAF. The relationship between IUCAF and the SFCG described in paragraph 3 also opens a channel by which planners of activities in space can be kept alert to the need to protect the protected bands. In fact, the SFCG at its most recent meeting (No 6 in Tokyo, April 1986) adopted a Resolution C/6-2G which strongly supports the statements from URSI, the IAU and COSPAR. By the time this paper is made final, there will have been a meeting organised by the Netherlands radioastronomers to study these problems and to propose future actions. The plans for this meeting have been discussed by IUCAF and have the Commission's support. One course which will certainly be discussed by the meeting will be to encourage individual administrations to report formally to the ITU on cases of troublesome or harmful interference. The channel for such reports is probably through the IFRB.

(b) IUCAF and other meetings

This paper so far has referred to the presence of IUCAF members at various meetings over the last three years. IUCAF has not met together since the URSI Assembly in Florence in 1984, but it is hoped that it will be possible to meet again during the Tel Aviv Assembly.

The following meetings have had IUCAF representatives present:

- the 5th meeting of the SFCG, Orlando, Florida, 22 October 1984;
- the ITU WARC ORB-85, Geneva, August-September 1985;
- the XIXth IAU General Assembly, New Delhi, 19-28 November 1985;
- the 6th meeting of the SFCG, Tokyo, 21-25 April 1986;
- the XXVIth Meeting of COSPAR, Toulouse, 30 June - 11 July 1986.

Throughout the period F. Horner has been the Chairman of CCIR

Study Group 2, and has thus been present at meetings of that group and also at the CCIR Plenary Meeting held in Dubrovnik in May 1986.

(c) Documents issued by IUCAF

A list of formal documents issued by IUCAF since the meeting in Florence (Doc. IUCAF 323) to the present (Doc. IUCAF 342) is given in Appendix 1. Less formal papers are circulated in the form of News Letters and general correspondence from time to time.

Appendix 2 gives the present members and the advisers. Appendix 3 is a copy of the IUCAF Accounts as prepared and audited at the end of December 1986.

Appendix 1

IUCAF Papers issued since the Florence Meeting

IUCAF Number	Date	Short title
325	8.09.84	Minutes of the Florence Meeting
326	9.05.84	URSI Council Resolution U.17
327	9.05.84	URSI Council Resolution U.18
328	9.10.84	L-band signals from Vega
329	10.13.84	IUCAF/SFCG Cooperation
330	11.27.84	5th meeting of the SFCG, Oct.84
331	1.03.85	Description of the Vega missions
332	1.15.85	IUCAF during 1985-1986
333	3.18.85	IAU Comm.40 W.G. on molecular lines
334	August 85	Interference to RA from GLONASS
335	4.13.86	IUCAF finances as of 12.31.1985
336	May 86	IUCAF Report to ICSU
337	June 86	IUCAF Report to COSPAR
338	September 86	Report on the COSPAR XXVIth meeting
339	September 86	Report on the 6th SFCG meeting
340	8.11.86	HAYSTACK observations of GLONASS
341	1.14.87	A meeting of European astronomers.

Appendix 2

Members and Advisers of IUCAF

Chairman:	Dr. J.W. Findlay (appointed by URSI)
Secretary:	Dr. A.R. Thompson
Members:	Mr. S. Hieber (appointed by COSPAR)
	Dr. F. Horner (appointed by COSPAR)
	Dr. B.J. Robinson (appointed by URSI)
	Dr. R.T. Schilizzi (appointed by IAU)
	Dr. G. Swarup (appointed by IAU)
Advisers:	The Director of CCIR
	The Chairman of the IFRB.

Appendix 3

Statement of income and expenditure for the year ended 31.12.1986

	$	$
INCOME		
Contributions from: URSI	1,250.00	
IAU	1,250.00	
COSPAR	1,000.00	
Total income		3,500.00
EXPENDITURE		
Travel expenses	7,736.09	
Audit fees	100.00	
Total expenditure		7,636.09
Excess of expenditure over income for the year		(4,236.09)
Accumulated balance at 1 Jan 1986		9,066.15
Accumulated balance at 31 Dec 1986		4,830.06

Rates of exchange

1 Jan 1986: $1 = 51 BF
31 Dec 1986: $1 = 42 BF.

FAGS AND THE PERMANENT SERVICES

FAGS COUNCIL

At present, ten Services constitute the Federation of Astronomical and Geophysical Data Analysis Services (FAGS). These are as follows:

- International Polar Motion Service (IPMS)
- Bureau International de l'Heure (BIH)
- Quarterly Bulletin on Solar Activity (QBSA)
- International Service of Geomagnetic Indices (ISGI)
- Permanent Service for Mean Sea Level (PSMSL)
- Bureau Gravimétrique International (BGI)
- International Centre for Earth Tides (ICET)
- International Ursigram and World Days Service (IUWDS)
- World Glacier Monitoring Service (WGMS)
- Centre de Données Stellaires (CDS).

Each Service operates under a Directing Board which includes representatives of the interested Unions, and the Director of the Service itself. URSI is directly concerned, together with IAU and IUGG, only with the BIH and the IUWDS.

The necessary accommodation and many other facilities required by the Services are provided by the national laboratories or observatories in which they are located. However, expenditure incurred by the Services cannot be provided entirely from national sources, and it is essential that each Service shall receive an adequate annual grant from the FAGS Council.

Three Unions (IAU, IUGG and URSI) are represented in the FAGS Council, which meets annually and makes decisions on the size of the grant to be made to each Service. The URSI representatives are Dr. J.C. Ribes and Dr. R. Wielebinski. Each of the Unions provides the Secretary of the Council in turn. Dr. Wielebinski has kindly agreed to act, on behalf of URSI, as Secretary of FAGS as from September 1986.

As will be seen from Dr. Guinot's and Mr. Steele's reports (see following pages), the responsibility for the International Atomic Time (TAI) has been transferred to the Bureau International des Poids et Mesures (BIPM) in Paris, and BIH as such will cease operation in 1988. A new Service, the International Earth Rotation Service (IERS), will be formed by IAU and IUGG to take over the other responsibilities of BIH. In consequence, URSI will be directly concerned only with one Service, the IUWDS.

In 1987, the funds available to the FAGS Council were as follows:

	$
ICSU/UNESCO Subvention	20,727
ICSU Fund	19,273
IUGG Grant	8,000
IAU Grant	2,000
URSI Grant	2,000
	$52,000

With the 1986 balance of $4,974, the total funds available in 1987 are $56,974.

A meeting of the General Committee of FAGS, which includes the Directors of the Services and the members of the Council, will be held during the General Assembly of IUGG in August 1987 in Vancouver, Canada. This will give the Directors of the Services the opportunity to exchange views on the operation of their Services and on the treatment of astronomical and geophysical data.

THE BUREAU INTERNATIONAL DE L'HEURE

I. Report prepared by B. Guinot, Director BIH

The BIH was created in 1911 with the task of unifying time.

This was first accomplished by analyzing the astronomical measurements of the rotation of the Earth. Then, when the data of atomic clocks began to be currently available (in 1955), the BIH has undertaken to establish an atomic time scale, which became the International Atomic Time (TAI), after the recognition by the 14e Confé-

rence Générale des Poids et Mesures (CGPM) in October 1971.

In the present situation, the unification of time is obtained:

- by establishing TAI, and its sister time scale, the Coordinated Universal Time (UTC), on the basis of readings of a large number of atomic clocks;
- by publishing the corrections to be added to the readings of master clocks of national time services, in order to get TAI and UTC.

The time scale UTC is the basis of all dissemination of time and frequency.

From this historical development, it results that the BIH has now two different fields of activity:

- the establishment of TAI and UTC, which corresponds to its initial mission;
- the evaluation of the Earth Rotation Parameters, and the unification of terrestrial and celestial references.

It was agreed by the different bodies concerned with these activities (URSI, IAU, IUGG, and bodies of the Meter Convention), that a reorganization should take place.

- The responsibility of TAI should be taken by the Bureau International des Poids et Mesures (BIPM) and by the Comité International des Poids et Mesures (CIPM).
- The work on the rotation of the Earth and the reference systems should be pursued and developed by a new "International Earth Rotation Service".

In 1985, the establishment of TAI was transferred from the Paris Observatory (which housed the totality of the BIH) to the BIPM. However, the full reorganization should be effective at the beginning of 1988, after the decisions of the IUGG General Assembly and of the 18th CGPM in October 1987 (the URSI and IAU having already expressed their official agreement).

Establishment of TAI and UTC

Improvement of time comparisons and participation of new laboratories

The main progress during the last three years was the development of the time comparisons using the Global Positioning System GPS.

The potential accuracy of the GPS time comparisons, using the "common view" method devised by Allan and Weiss of the National Bureau of Standards (NBS), USA, is of the order of 10 ns. However, in practice, larger discrepancies, up to about 50 ns, appear, due to a lack of coherent system of adopted corrections for receiver delays, to receiver software errors, and various other causes. Jointly with the NBS, the BIH has undertaken to visit the time laboratories where GPS tracking is performed, with a portable GPS receiver in order to homogenize the delay corrections and to try to understand some causes of discrepancies.

In July 1986, 14 of the 38 laboratories cooperating in the

establishment of TAI are equipped with GPS receivers. With the help of LORAN-C receptions for ensuring the local time links, it was possible to open the participation to TAI to all time services in Far East and in Australia.

The comparison of the GPS and LORAN-C links shows that the latter may have a precision of 50 ns, or better, for regional links, but in some cases seasonal variations occur: especially for paths over the mountains in Europe. We have tried to minimize the biases and uncertainties due to the LORAN-C by selecting the links with the GPS-equipped laboratories, by organizing simultaneous observations, and by improving our softwares. A recent study has shown that the random uncertainty of the reading of TAI (i.e. of the clock corrections to obtain TAI), for 10-day averages, is 16 ns for the laboratories using GPS receivers, about 50 ns with the LORAN-C.

The improvement of the LORAN-C links has also permitted to enter in the BIH evaluations the data of the hydrogen masers and primary cesium standards of USSR.

To give an idea of the amount of data handled by the BIH, we mention that 182 clocks participated to the computation of TAI for May-June 1986.

Stability and accuracy of TAI

We recall that we establish first a free atomic time scale EAL, using all the clocks which are available. Then we estimate the duration of the scale interval of EAL, according to the data of primary standards. TAI is a linear functions of EAL, with a frequency offset adjusted when necessary by steps of 2×10^{-14}, so that the scale interval of TAI be close to the second (at sea level), as produced by the primary standards.

The stability of EAL appears to be of the order of 1×10^{-14} for sample time of one year, thus the steering is not needed frequently: the last step of 2×10^{-14} was made on 1984 February 29. In 1985 we estimate that, in the average,

$$f(\text{TAI}) - f(\text{primary standards}) = 1.2 \times 10^{-14}$$

with a standard deviation of 4×10^{-14}. The primary standards are those of NBS, NRC, PTB and RRL.

Researches

The seasonal variations are the main limitation to the TAI stability. It appears that they are partly due to the LORAN-C links, partly to the clocks. An attempt to model them did not give satisfactory results. Another approach was to investigate their global effect by varying some parameters of the algorithm producing TAI. Although the difference of answers reveals the global effect, it is not sufficiently well defined to correct it. However, we observe that the seasonal differences between TAI and the laboratories time scales have decreasing amplitudes (≤ 0.5 µs peak to peak) which can be explained by the cancellation of some LORAN-C links and, maybe, by

better environmental conditions of the clocks.

We have attempted to clarify the definition of TAI in relativistic theories and its relationship with the barycentric dynamical time which is needed in the dynamics of the solar system.

Rotation of the Earth

We briefly summarize the BIH activity in this field.

The data on the rotation of the Earth are now mainly provided by the very long baseline radio interferometry, and by laser ranging on LAGEOS and on the Moon, with a precision increased by a factor 10, at least, with respect to the optical astrometry. The uncertainties are of the order of 0,001" (3 cm on the ground) for the motion of the pole and 0,000 1 s for the Universal Time. The BIH combines the data of various sources, after studying their systematic differences.

Since these methods also provide station positions in a global terrestrial system, the BIH, using colocation of techniques has established a terrestrial frame of reference, which was first published in the Annual Report for 1984 and improved in the Annual Report for 1985.

II. Report prepared by J.McA. Steele, URSI Representative on the BIH Directing Board

It will be recalled that URSI Recommendation A1 adopted at Florence (1984) recommended that "the responsibility for the maintenance of TAI be taken over completely by BIPM within the framework of its present Committees" and that, in 1985, the IAU at its XIXth General Assembly adopted Resolution B1 in very similar terms. The second Recommends in the IAU text refers to the need for a permanent committee under the sponsorship of CIPM to "take care of the interests of TAI users". This echoes the concerns expressed at the 10th session of the Consultative Committee for the Definition of the Second (CCDS) held earlier in 1985 and embodied in Recommendation S1 (see Annex 1). As will be seen this does in fact set up a Working Group of the CCDS on TAI with representatives inter alia of IAU, IUGG and URSI. The chairmanship of the Working Party will fall to the representative of the respective Union in turn at five yearly intervals.

This arrangement preserves a slight anomaly which existed in the previous constitution of the CCDS vis-à-vis the Directing Board, i.e. URSI is not represented on the CCDS although it was a member of the Directing Board and will continue as a member of the new Working Group. It might be profitable to seek a direct representation for the Union on the CCDS both to preserve consistency and also to provide an additional voice from a Union representing the physical, as opposed to the astronomical sciences on that body.

I have had the honour and satisfaction of representing URSI on the Directing Board of the BIH since 1973. With the change in the arrangements for the supervision of TAI it would appear that this is also an appropriate time for a change in the representation and

I suggest that consideration be given at Tel Aviv to the choice of a successor to serve on the future Working Group of the CCDS, bearing in mind that the chairmanship of the Group will rotate to URSI only in five years out of fifteen. No initial preference is expressed in S1 but in view of the physical basis of TAI it might be thought appropriate that URSI should provide the chairman for the first, and what is likely to be the most formative, quinquennium in the new Group's existence.

The arrangements envisaged in A1 (URSI), B1 (IAU) and S1 (CCDS) must await the approval of the IUGG, the third of the parent Unions of the BIH. The XIXth General Assembly of the IUGG takes place in August of this year and is fully expected to endorse the proposals of IAU and URSI, thereby enabling the formal transfer of responsibility for TAI to the CIPM and CGPM early in 1988.

In Annex 3 I have drawn attention to another IAU Resolution emanating from Commission 19 and 31 which sets up a Provisional Directing Board to serve as a steering body for the new International Earth Rotation Service which will combine the non-TAI part of the BIH with the International Polar Motion Service. URSI is not represented on this Board and there is no suggestion that it should be.

In a previous letter to the Chairman of Commission A in advance of the Corsendonk meeting, I had referred to Recommendation S3 from the CCDS meeting recommending..."that national and international bodies support experiments over satellite telecommunications links for the study of synchronization by means of PRN modulation....as part of the generation of TAI". The technique of exchanging PRN sequences has powerful applications in time transfer at the highest precision (1-10 ns) and has been used to a limited extent in experiments both within Europe and between Europe and North America and China. The successful exploitation of the technique depends on the use of the so-called VSATs or very small aperture terminals sited close to the time scale generators in each laboratory and operating in a transmit/receive mode. In contrast to the USA with a uniform regulatory structure there are difficulties within Europe in securing clearance for even a small VSAT network across national boundaries. It seemed to me that URSI might have a role to play in a regional capacity by convening a meeting with the interested users and the respective PTTs and this may be something which could be explored at the forthcoming General Assembly when a number of the laboratories involved will be represented.

May I comment, finally, that the developments which have resulted in the formation of TAI coming within the aegis of BIPM and CIPM are very much to be welcomed and it is very satisfactory, also, that URSI should continue to participate in the oversight of the time scale.

Annex 1 - Recommendation of the Comité Consultatif pour la Définition de la Seconde submitted to the CIPM Working Group of the CCDS on the TAI - Recommendation S1 (1985)

The Comité Consultatif pour la Définition de la Seconde,

considering

that the establishment of International Atomic Time (TAI) is henceforth taken in charge by the Bureau International des Poids et Mesures (BIPM) and that it is envisaged that this activity shortly be placed entirely under the responsibility of the Comité International des Poids et Mesures (CIPM);

that the Scientific Unions and the International Organizations concerned with TAI should have the opportunity of assuring that in the long term the service of TAI meets their needs;

proposes

1 - that a Working Group of the CCDS on TAI be created;
2 - that this Working Group be composed of

   a) a representative of each of the following organizations:
      International Astronomical Union (IAU),
      International Union of Geodesy and Geophysics (IUGG),
      International Union of Radio Science (URSI),
      International Radio Consultative Committee (CCIR),
      Comité International des Poids et Mesures (CIPM),
   b) the Director of BIPM,
   c) the person in charge of TAI at BIPM;

3 - that a representative of IAU, IUGG and URSI be invited in turn to take the Presidency of this Working Group, the period of each Presidency being five years [+];
4 - that the mandate of this Working Group be as follows:

   a) to examine the remarks and requirements expressed by the users of the service of TAI,
   b) to prepare directives for the improvement of the service of TAI to be submitted for approval by the CCDS and then by the CIPM;

5 - that the said mandate extend equally to Coordinated Universal Time UTC, in respect of its metrological qualities but not its definition nor its astronomical content;
6 - that the Working Group work routinely by correspondence addressed to its President and that it meet, if possible annually, at the request of its President;
7 - that the Working Group on the steering of TAI, established by the CCDS in 1977 (Recommendation S1 (1977)), *BIPM Com.Cons.Déf.Seconde*, 8, 1977) be abolished, the conditions to be met by steering and means to achieve them being defined by the CCDS, which can delegate this task to an ad hoc Working Group.

[+] At its meeting in October 1985 the CIPM has added: "and that the BIPM provide the permanent secretariat for the Working Group".

Annex 2 - IAU Resolution, issued from Commissions 19 and 31

Commissions 19 and 31 of the International Astronomical Union,

recognizing the highly significant improvements in the determination of the orientation of the Earth in space as a consequence of the MERIT/COTES programme of observation and analysis, and

recognizing the importance for scientific research and operational purposes of regular Earth-orientation monitoring and of the establishment and maintenance of a new Conventional Terrestrial Reference Frame,

thanks all the organizations and individuals who have contributed to the development and implementation of the MERIT and COTES programmes and to the operations of the International Polar Motion Service and the Bureau International de l'Heure,

endorses the final report and recommendations of the MERIT and COTES Joint Working Groups,

decides

(1) to establish in consultation with IUGG a new international service within FAGS for monitoring Earth-rotation and for the maintenance of the Conventional Terrestrial Reference System; the new service is to replace both the IPMS and the BIH as from 1988 January 1;

(2) to extend the MERIT/COTES programme of observation, analysis, intercomparison and distribution of results until the new service is in operation;

(3) to recommend that as long as optical instruments continue to be recognized as useful for the rapid determination of UT1, an optical astrometric network be maintained for this purpose;

(4) to set up a Provisional Directing Board to submit recommendations on the terms of reference, structure and composition of the new service, and to serve as the Steering Committee for the new service;

invites National Committees for Astronomy and for Geodesy and Geophysics to submit proposals for the hosting of individual components of the new service by national organisations and observatories, and

urges the participants in Project MERIT to continue to determine high-precision data on Earth-rotation and reference systems and to make the results available to the BIH until the new service is in operation.

THE INTERNATIONAL URSIGRAM AND WORLD DAYS SERVICE (IUWDS)

by

Richard Thompson, Chairman IUWDS

1. Introduction

According to its terms of reference, the International Ursigram and World Days Service (IUWDS) is a permanent service of URSI, IAU and IUGG which "aims to provide information rapidly to the world scientific community to assist in the planning, coordination and conduct of scientific work in relevant disciplines".

Two basic mechanisms have been selected to accomplish this programme. Firstly IUWDS prepares the International Geophysical Calendar each year. This calendar gives a list of "World Days" which scientists are encouraged to use for carrying out their experiments. Secondly, there is the International Ursigram Service for assisting those who need a specific state of solar activity, earth atmosphere or magnetosphere at the time of their experiment. Both programmes are very flexible and can be adjusted to fit the needs of the scientific community.

In addition, on behalf of COSPAR, each month IUWDS summarizes the status of satellite circulation around the earth and of space probes in the interplanetary medium in the Spacewarn Bulletin. Future launches are announced, actual launches are reported, new satellites receive an international designation, decays in the earth atmosphere are predicted and announced, and finally series of satellites useful for international participation are listed.

2. The International Ursigram Service

The International Ursigram Service operates through a number of Regional Warning Centres (RWC) scattered all around the world. Warning Centres are located in: Boulder (USA), Darmstadt (FRG), Moscow (USSR), Paris (France), New Delhi (India), Prague (Czechoslovakia), Tokyo (Japan), Sydney (Australia) and Warsaw (Poland).

In its own geographic area, each RWC collects all the data and reports available concerning the state of the sun-earth environment. In some cases, these data come from observatories operated directly by the Regional Warning Centre. In many cases, they are gathered from regional scientific institutes and universities. The data accessible by IUWDS are very diverse and much is highly regarded by the scientific community. The types of data include: spectroheliograms and filtergrams; observations of magnetic field structures on the sun; quiet sun emission from radio to X-ray wavelengths; reports of flares observed by a wide variety of methods; solar radio and X-ray bursts; the flux of solar particles recorded by satellites, by riometers in the polar cap and by neutron monitors; geomagnetic activity as measured by 3-hourly K indices and by reports of sudden storm commencements; ionospheric data giving critical frequencies of the F and E layers; and cosmic ray data and reports of Forbush decreases.

These data and reports (about 150 data sets from around 100 Institutes or Observatories) are coded according to the IUWDS Code Book and distributed daily, on request to users and currently to other RWCs. Data exchange is generally via a daily, or more frequent, telex message. In the last few years, new modes of communication have developed. Some of these such as electronic mail and facsimile transmission will be incorporated into IUWDS data exchange as appropriate.

Information transmitted through the IUWDS network is analysed by Regional Warning Centres which produce a number of "summary" reports and forecasts. A particularly important one of these is the "Geoalert" - a forecast of solar-geophysical conditions for the next few days. Each RWC prepares its forecast ("Geoalert") and these are sent each day to the World Warning Agency (Boulder) which issues a daily Geoalert. This is distributed all around the world daily at 0300 UT through the IUWDS network and through the WMO (World Meteorological Organization) network. Many RWCs also relay the WWA Geoalert to users within their region.

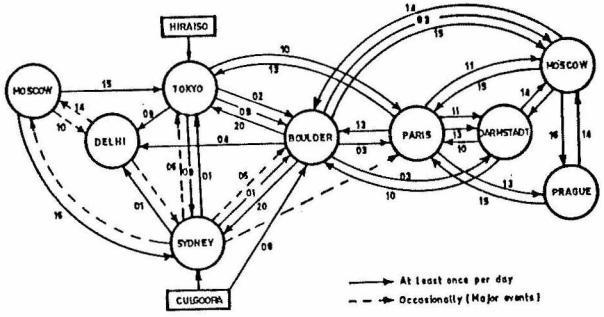

Figure 1 : Daily Schedule of Interchange Messages between RWCs

In addition the IUWDS network is used for the prompt distribution of the preliminary values of the International Sunspot Number which is prepared monthly at the Uccle Observatory. IUWDS also relays the geomagnetic "aa" indices which are computed each week at Meudon from two antipodal stations. IUWDS also contributes by supplying the Uccle Observatory and the Institut de Physique du Globe (Paris) with some of the raw data reports which are required for the preparation of the various indices.

3. Publications

The International Geophysical Calendar is distributed free of charge throughout the world. The present distribution is approximately 2000 copies produced at a nominal cost.

The Spacewarn Bulletin is also distributed free of charge throughout the world. Approximately 600 copies are produced.

The Geoalerts and the abbreviated Calendar records are published monthly in Solar and Geophysical Data which is distributed to 2000 users.

The daily Geoalerts and Ursigram messages distributed daily by telex are "real-time" information. These are obsolete after a few days and only a summary is printed as Geoalert and Abbreviated Calendar Records. However, the production and distribution of Ursigrams is a very important part of the current expenses of the RWCs. This expense is borne by the host institutions.

The IUWDS Code Booklet is updated and reprinted occasionally. The last edition was made in 1973 at a cost of US$3,000. This has been followed by several partial updatings made at very low cost.

4. IUWDS Activities during 1986

IUWDS held a meeting of its steering committee during the July COSPAR/SCOSTEP Congress in Toulouse, France. One of the important functions of the meeting was to select a new Chairman of IUWDS to replace Dr. Paul Simon who has retired. Dr. Simon served as IUWDS Chairman for many years and the organisation is deeply indebted to him for efforts on its behalf. The steering committee selected Dr. Richard Thompson as its new Chairman. Dr. Thompson is the head of the IUWDS Regional Warning Centre at IPS Radio and Space Services in Sydney, Australia.

The Steering Committee meeting also included a discussion of the recent developments at each of the Regional Warning Centres. The common theme of these developments was the upgrading of the communications between centres and their users. This involves the introduction of new communications technology such as electronic mail and facsimile. A number of centres have also automated the distribution of their data through the telex system. Also, the use of IUWDS codes has been improved by the development of computer-based decoding programmes. The centre at Boulder has introduced a new data transmission system called SELDADS II. This system allows their users to obtain access to data in many ways including via a satellite.

The meeting discussed and adopted a number of new codes. These codes were made necessary by the availability of new kinds of data or by improvements in the understanding of the solar phenomena which influence the sun-earth environment. The need for a general update of the IUWDS Code Book was also discussed by the meeting. In particular, it was decided that the codes should be structured to be decodable by computer with greater efficiency.

The Steering Committee decided that another STP Workshop would be held in 1989 in Sydney, Australia. This Workshop follows the very successful prediction workshops in Boulder (1979) and Meudon (1984).

The printing of the "Proceedings" from the 1984 Meudon STP Workshop is being coordinated by the Boulder RWC. These have been made available early in 1987.

The present list of IUWDS officers and representatives is as follows:

IUWDS Steering Committee and Directing Board

IUWDS Chairman	R. Thompson	RWC Sydney
IUWDS Secretary/Secretary for Ursigrams	G. Heckman	WWA Boulder
IAU Representative	E.A.Tandberg-Hanssen	NASA/MSFC
IUGG Representative/Secretary for World Days	H. Coffey	NOAA Boulder
URSI Representative	L.McNamara +	Andrew Antennae, Adelaide
	D. Cole	RWC Sydney
	J. Hirman	WWA Boulder
	S.I. Avdiushin	RWC Moscow
	A.D. Danilov	RWC Moscow
	N. Matuura	RWC Tokyo
	H. Mori	RWC Tokyo
	Th. Damboldt	RWC Darmstadt
	Z. Klos	ARWC Warsaw
	P. Triska	ARWC Prague
	B.M. Reddy	ARWC New Delhi
	J. Vette	WDC-A Rockets and Satellites
	P. Lantos	RWC Paris.

+ Dr. McNamara has been replaced by Dr. B.M. Reddy (India) as from September 1987.

THE SCOPE-ENUWAR PROJECT AND THE ROLE AND PURPOSE OF URSI

by

Mr. M. Wik, Chairman of the URSI ad hoc Group on ENUWAR

The SCOPE-ENUWAR project (Scientific Committee on Problems of the Environment - Environmental Consequences of Nuclear War) was initiated by ICSU in 1982 and involved approximately 300 scientists from more than 30 countries.

Nearly all scientists belonged to the SCOPE community. However, it was recognized that among the effects of nuclear explosions information was needed concerning the electromagnetic pulse and associated effects.

In order to include such information URSI was requested to make a contribution. This was performed by an ad hoc group at the URSI General Assembly in Florence in 1984. The URSI interest in producing a statement that should be unemotional, non political, authoritative and readily understandable was demonstrated by the number of attendants representing many countries at the open meetings of the ad hoc group during the General Assembly.

The statement was unanimously approved (in principle) by the

URSI Council. Due to the limited time available during the General Assembly some editorial work, including some remarks at the Council meeting, was left to be done.

The statement was sent to SCOPE-ENUWAR and also printed in the "URSI Information Bulletin" (No 232, March 1985). After some minor changes it was also sent to ITU and published in "Telecommunication Journal" (Vol.52, No X, October 1985).

After this the ad hoc Group was requested by SCOPE-ENUWAR to make a draft contribution about the effects of high altitude nuclear explosions in Chapter 1 of Volume I of SCOPE Report 28 concerning Physical and Atmospheric Effects. This draft was produced early in 1985 and was used when editing the chapter. It was also to some extent used when producing a popular version of the scientific material.

A round table discussion in connection with the URSI Factual Statement on EMP and Associated Effects was organized at the 6th Symposium on Electromagnetic Compatibility in Zurich in March 1985.

The result of the URSI contribution to SCOPE-ENUWAR was presented at the Nuclear EMP Meeting in May 1986 in Albuquerque, New Mexico, USA.

The work was also referred to at a conference on "Nuclear Winter" in March 1986 at Virginia Polytechnic Institute and State University in Blacksburg, USA, at a nuclear winter seminar in Stockholm in September 1986 and at a lecture at ETH, Zurich in October 1986.

After the publication of the SCOPE-ENUWAR report some requests have been made about further information. One such request has come from The New Zealand Planning Council about the effects of nuclear weapons generated electromagnetic pulses on communications facilities.

The URSI cooperation with SCOPE resulted in drawing attention to URSI itself, to SCOPE and to ICSU. The great value of this world-wide non-governmental community has been appreciated by people from the non-scientific community. It appears that steps have been taken to make various groups of people with different background aware of the necessity to be able to communicate with one another in order to better understand complex problems (Blacksburg and Stockholm conferences).

The scientific community has an increasing important object to investigate and make the non-scientific community aware of the limitations set by physical and biological laws. Unawareness of such limitations could cause unacceptable situations in the future.

One future role of URSI would be to contribute in broad interdisciplinary scientific programmes that will produce better fundamental information for high-level decision-making. Such information will also help decision-makers to better understand the importance of a well functioning scientific community and to support it. The significance, however, that this community remains non-governmental and non political must never be underestimated.

References

1. URSI Factual Statement on Nuclear Electromagnetic Pulse (EMP) and Associated Effects, URSI Information Bulletin, No 232, March 1985.

2. Nuclear electromagnetic pulse (EMP) and associated effects, URSI Statement, Telecommunication Journal, Vol. 52, No X, October 1985.

3. Environmental Consequences of Nuclear War, SCOPE 28, Vol. 1 - Physical and Atmospheric Effects, A.B. Pittock, T.P. Ackerman, P.J. Crutzen, M.C. MacCracken, C.S. Shapiro and R.P. Turco, John Wiley & Sons, ISBN 0 471 90918 1.

4. Environmental Consequences of Nuclear War, SCOPE 28, Vol. 2 - Ecological and Agricultural Effects, M.A. Harwell, T.C. Hutchison, John Wiley & Sons, ISBN 0 471 90898 3.

5. Planet Earth in Jeopardy, Lydia Dotto, Jan 1986, John Wiley & Sons, ISBN 0 471 90908 4.

RESOLUTIONS AND RECOMMENDATIONS OF THE COUNCIL

U.1 URSI Scientific Commissions

The URSI Council,

noting that the nine URSI Scientific Commissions had been asked to review their titles, sub-titles and terms of reference during the XXII General Assembly in Tel Aviv;

having considered the recommendations submitted by each of the Commissions;

approves the titles, sub-titles and terms of reference for the next triennium, as given in the Annex.

Annex

1. Commission A - ELECTROMAGNETIC METROLOGY. Electromagnetic measurements and standards, and interaction between electromagnetic fields and biological systems.

   Terms of Reference:

   (a) Time and frequency measurements and standards, including infrared and optical frequencies.
   (b) Time domain measurements.
   (c) Frequency domain measurements.
   (d) Telecommunication measurements.
   (e) Laser measurements.
   (f) Quantum metrology and electrical methods in fundamental constants.
   (g) Microwave to submillimeter measurements and standards.
   (h) Measurements of the effects of electromagnetic fields on biological systems.

2. Commission B - FIELDS AND WAVES. Electromagnetic theory and practice, including antennas and waveguides.

   Terms of Reference:

   Deals with the theory of electromagnetic fields and waves in a general sense. Of particular interest are analytical and numerical methods for solving problems of

   (a) scattering by objects;
   (b) propagation in complicated media or over complicated surfaces;
   (c) transient phenomena;
   (d) inverse scattering;
   (e) guiding structures;
   (f) antennas.

3. Commission C - SIGNALS AND SYSTEMS. Communications systems and system theory (including circuits); information theory and signal processing (including stochastic problems).

4. Commission D - ELECTRONIC AND OPTICAL DEVICES AND APPLICATIONS.

Terms of Reference:

(1) To promote research and to review new developments in electronic and optical devices and their applications, with particular reference to radio science and telecommunications. Emphasis will be placed on generation, detection, storage and processing of electromagnetic waves and signals at all frequencies.

(2) To arrange scientific sessions and meetings drawing the attention of other Commissions to such of these developments which may be of particular interest to them.

5. Commission E - ELECTROMAGNETIC NOISE AND INTERFERENCE.

Terms of Reference:

(a) Terrestrial and planetary noise of natural origin; man-made noise.
(b) The composite noise environment.
(c) The effects of noise on system performance.
(d) The lasting effects of transients on equipment performance (this includes the Nuclear Electromagnetic Pulse).
(e) The scientific basis of noise and interference control.
(f) Spectrum utilization.

Note: Many of the subjects mentioned are treated under the common denominator: Electromagnetic Compatibility.

6. Commission F - WAVE PROPAGATION AND REMOTE SENSING (including radio-meteorology, radio-oceanography and remote sensing of non-ionized media).

Terms of Reference:

(1) To study all aspects of wave propagation at all frequencies in a non-ionized environment:

(i) wave propagation over the Earth's surface,
(ii) wave propagation in, and interaction with, the neutral atmosphere,
(iii) wave interaction with the Earth's surface, oceans, land and ice,
(iv) wave propagation through, and scattering by, the sub-surface medium,
(v) characterization of the environment as it affects wave phenomena;

(2) to encourage the application of the results of these studies, particularly in the areas of remote sensing and communications

(3) to develop the required cooperation with other URSI Commissions and other relevant organizations.

7. Commission G - IONOSPHERIC RADIO AND PROPAGATION (including ionospheric communications and remote sensing of ionized media).

Terms of Reference:

Deals with the study of the ionosphere in order to provide the broad understanding of this medium necessary to radio communications. Included are the morphology of the ionosphere, its structure and variations, and the tools needed to measure its properties.

8. Commission H - WAVES IN PLASMAS.

Terms of Reference:

Deals with waves in plasmas in the broadest sense, and the interaction between these waves and charged particles. Included are electrostatic waves in interplanetary, planetary and laboratory plasmas.

9. Commission J - RADIO ASTRONOMY (including remote sensing of celestial objects).

Terms of Reference:

(1) The activities of the Commission shall be concerned with:

(a) radio sources in space, particularly radio emission from the quiet and active sun, from the solar system, from the galaxy and from discrete sources in the Universe;
(b) the study of meteors, the sun, moon, planets and other objects in the solar system by the radio echo technique.

(2) The Commission shall study and promote the development of technical methods in relation to the above and shall endeavour to protect the observations from interference.

(3) In connection with (1) the Commission will aim:

(i) to work jointly with other Commissions of URSI where there are common interests;
(ii) to work jointly with Commission 40 of the International Astronomical Union in convening symposia on Radio Astronomy;
(iii) to cooperate with Commission 40 of IAU on the choice of topics for discussion in order to prevent any undesirable overlapping.

(4) The Commission shall formulate recommendations appropriate to URSI on any subjects in relation to the above, for consideration by other URSI Commissions and other international bodies.

U.2 Membership of URSI

The URSI Council,

noting

(a) the various suggestions regarding the URSI membership, made at the Corsendonk Meeting (March 1987);

(b) the recommendations made in the report of the ad hoc Group appointed at the General Assembly, and chaired by Prof. S.Okamura;

resolves,

1. to establish a new category of membership, the Associate Member Committees, for Committees considering membership of URSI or having some difficulties in paying the annual contribution to the Union;

2. to include in the URSI Statutes provisions defining the conditions under which Associate Member Committees will be admitted to the Union;

3. to ask the Standing Committee on Membership to consider other possible categories of membership, such as individual membership and affiliate membership for professional societies and industry, and to report to the URSI Member Committees, possibly for a vote by mail before the next General Assembly;

4. to appoint the following as members of the Standing Committee on URSI Membership:

Chairman: M. Petit (France)

Members: Yu-Kai Chen (China, SRS)
E.V. Jull (Canada)
S. Okamura (Japan)
K. Serafimov (Bulgaria)
J. Shapira (Israel).

U.3 Revision of URSI Statutes

The URSI Council,

considering that some of the decisions made at the present General Assembly require a revision of the URSI Statutes, in particular Article 1 (Objects) and Articles 2 to 12 (Members);

resolves

1. that the Drafting Committee be instructed to prepare a revised version of the URSI Statutes before the end of 1987;

2. that the URSI Secretariat be instructed

(i) to circulate the draft revised version of the Statutes to the Member Committees for approval by correspondence;

(ii) upon adoption of this new version by the Member Committees, to provide for its publication.

U.4 URSI Finances and Membership of Standing Finance Committee

The URSI Council,

noting the recommendations contained in the Report of the Standing Finance Committee, dated 31 August 1987;

considering that the Standing Finance Committee should include representatives of various membership categories of URSI;

resolves

1. to approve the audited accounts of the Union for the years ending 31 December 1984, 1985 and 1986;

2. to approve the Income and Expenditure Budgets (Model B) as given in Annex 1 to the Minutes of the 4th Meeting of the URSI Council, Tel Aviv (31 Aug. 1987);

3. to adopt the unit contributions proposed in Budget Model B, namely $610 in 1988, $740 in 1989 and $860 in 1990;

4. to authorize the Board of Officers to adjust the unit contribution, as expressed in dollars, to keep its purchasing power consistent with the budget;

5. to publish the Report of the Standing Finance Committee in Volume XXI of the *Proceedings of URSI General Assemblies*;

6. to appoint the following as members of the Standing Finance Committee for the next triennium:

   Chairman: F. Gardiol (Switzerland)

   Members: C.M. Butler (USA)
   K. Géher (Hungary)
   J.G. Lucas (Australia)
   J.B.H. Peek (Netherlands)
   S. Radicella (Argentina)
   W.D. Ryan (Ireland).

U.5 Publications Committee

The URSI Council,

noting the recommendations contained in the Report of the Publications Committee, dated 31 August 1987;

considering the great importance of the publications programme for the credibility and visibility of the Union;

resolves

1. to adopt recommendations 1, 2, 3, 4, 5 and 8 of the Report, with some minor modifications;

2. to publish the Report of the Publications Committee in Volume XXI of the *Proceedings of URSI General Assemblies*;

3. to establish the Publications Committee on a permanent basis;

4. to appoint the following as members of the Standing Publications Committee for the next triennium:

   Chairman: R.L. Dowden (New Zealand)

   Members: P.J.B. Clarricoats (UK)
   G. Hyde (USA)
   B. Picinbono (France)
   Ch.-U. Wagner (GDR).

U.6 Standing Committee on Developing Countries

The URSI Council,

having considered

(a) the report submitted by the Standing Committee on Developing Countries on its activities during the last triennium;

(b) the proposed plan for action for 1988-1990;

resolves

1. to congratulate the Committee on the successful completion of its programme in the last three years;

2. to express its appreciation to Dr. A.P. Mitra and his colleagues for their work in preparing the *Handbook of Radio Propagation in Tropical and Subtropical Countries*;

3. to approve in principle the programme of activities for the next triennium as outlined in the Report of the Committee, subject to approval of the budget;

4. to appoint the following as members of the Committee:

Chairman: S. Radicella (Argentina)

Members: Feng Shizhang (China, CIE)
F. Mopfouma (Congo Brazzaville)
J.O. Oyinloye (Nigeria)
B.M. Reddy (India)
J. Voge (France).

U.7 Standing Committee on Future General Assemblies

The URSI Council,

considering the importance of the task devolved on the Committee on Future General Assemblies in seeking invitations from the Member Committees for the organization of the General Assemblies of the Union

resolves

1. to maintain this Committee for the next triennium;

2. to appoint the following as members of the Committee:

Chairman: V. Zima (Czechoslovakia)

Members: T.B.A. Senior (USA)
J. Shapira (Israel)
R. Woodman (Peru)
M.E. Zhabotinskij (USSR).

U.8 XXIII General Assembly 1990

The URSI Council,

having considered the invitations for the XXIII General Assembly, which had been submitted by the URSI Member Committees in Czechoslovakia, in Sweden and in the United Kingdom;

resolves

1. to accept the invitation of the Czechoslovak URSI Committee to

hold the XXIII General Assembly in Prague in the second half of 1990;

2. to record its thanks to the URSI Committees in Sweden and in the United Kingdom for their invitations.

U.9 URSI-CCIR-CCITT Liaison Committee

The URSI Council,

noting

(a) the recommendation of the Corsendonk Meeting (March 1987) that it is essential that the liaison between URSI and the Consultative Committees of the International Telecommunication Union (ITU) be reinvigorated;

(b) that the URSI-CCIR-CCITT Liaison Committee already provides a structure and a mechanism which should facilitate achieving this objective;

resolves

1. to maintain the URSI-CCIR-CCITT Liaison Committee for the next triennium;

2. to instruct the Committee to make every effort to strengthen the cooperation between URSI and the Consultative Committees of the ITU;

3. to appoint the following as members of the Committee for the next triennium:

Chairman: G. Hagn (USA)

Vice-Chairmen: W.A. Gambling (UK)
F.L. Stumpers (Netherlands)

Members:

Commission A - S. Leschiutta (Italy)
Commission B - D. Bem (Poland), R.M. Bevensee (USA)
Commission C - J.G. Lucas (Australia)
Commission D - T. Okoshi (Japan)
Commission E - A.D. Spaulding (USA)
Commission F - A. Blomquist (Sweden), L. Boithias (France), F. Fedi (Italy), M.P.M. Hall (UK)
Commission G - L.W. Barclay (UK)
Commission J - R.H. Frater (Australia), B.J.Robinson (Australia).

U.10 Coordination of URSI Scientific Programme

The URSI Council,

noting

(a) that the Steering Group for the Coordination of URSI Scientific Programme had been created at a time when it was not possible, for financial reasons, to convene a meeting of the Coordinating Committee in the year preceding the General Assembly;

(b) that the need for this Steering Group has now disappeared since

the resources of the Union will permit a meeting of the Coordinating Committee to be held in the Spring of 1989 to discuss and finalize the scientific programme for the XXIII General Assembly in 1990;

(c) that, nevertheless, there is a need for centralizing the whole operation;

resolves

1. to terminate the Steering Group for the Coordination of the URSI Scientific Programme;

2. to appoint Dr. P. Bauer as Coordinator, and Prof. J. Bach Andersen as Associate Coordinator for the XXIII General Assembly;

3. to express its appreciation to Dr. Bauer and to the members of the Steering Group for their efforts in preparing the scientific programme for this 1987 General Assembly.

U.11 Procedure for Election of URSI Officers

The URSI Council,

considering

(a) that the Member Committees should be fully informed on the candidates for members of the Board, Chairmen and Vice-Chairmen of Commissions;

(b) that there is a lack of uniformity in the procedure for the election of Vice-Chairmen in the various URSI scientific Commissions, and that the Member Committees should be more involved in that procedure;

resolves

1. to instruct the URSI Secretariat to circulate biographical summaries of candidates for the various offices in URSI to Member Committees ahead of the General Assembly;

2. to authorize the Board of Officers to define a single procedure to be applied in all the Commissions, bearing in mind that the Member Committees should be involved in the whole operation.

U.12 Inter-Union Commission on Allocation of Frequencies to Radio Astronomy and Space Science

The URSI Council,

considering

(a) that the activities of the International Telecommunication Union (ITU) continue to grow in size and complexity with the consequence that the needs for spectrum space for radio astronomy and space research must, more than ever, be assessed with care and stated with clarity;

(b) that, as the use of the radio spectrum grows, so also do the dangers of serious damage to scientific research by other users of the radio spectrum;

resolves

1. to approve the Report submitted by Dr. J.W. Findlay, Chairman of IUCAF;

2. to implement the recommendations contained in that report, namely:

   (i) to facilitate the establishment of closer links with radio astronomers in the various parts of the world;

   (ii) to increase from two to four the number of URSI members in the Inter-Union Commission, and to recommend to the International Astronomical Union (IAU) to act likewise;

   (iii) to make every effort to ensure that the very important activities of the Inter-Union Commission on the Allocation of Frequencies to Radio Astronomy and Space Science are properly supported and funded.

U.13 Inter-Commission Working Group on Coordination of URSI's Activities at Optical Wavelengths for Communication, Sensing and Processing

The URSI Council,

noting that the report presented by Prof. W.A. Gambling, Chairman of the Inter-Commission Working Group on Coordinating of URSI's Activities at Optical Wavelengths for Communication, Sensing and Processing indicates that the problems which required the intervention of the Working Group have now disappeared;

resolves

1. to terminate this Inter-Commission Working Group;

2. to express its deep thanks to Prof. W.A. Gambling for the successful completion of the task of the Working Group.

U.14 Inter-Commission Working Group on Time Domain Waveform Measurements

The URSI Council,

considering

(a) the report on the work of the Inter-Commission Working Group on Time Domain Waveform Measurements during the present General Assembly;

(b) the recommendations made by the Working Group regarding its programme of activities for the next triennium;

resolves

1. to maintain the Inter-Commission Working Group, with the same terms of reference;

2. to reappoint N.S. Nahman (USA) and T. Sarkar (USA) as Chairman and Vice-Chairman of the Working Group respectively.

U.15 Inter-Commission Coordinating Group on Remote Sensing

The URSI Council,

considering

(a) that remote sensing activities are covered by the terms of reference of Commission F;

(b) that this Commission can achieve coordination both inside URSI, in consultation with the Coordinating Committee, and with other organizations, such as the International Association of Meteorology and Atmospheric Physics (IAMAP) and the IEEE Geoscience and Remote Sensing Society (GRS);

resolves

1. to terminate the Inter-Commission Coordinating Group on Remote Sensing;

2. to express its appreciation to Prof. J.F.R. Gower for his work as Chairman of this Coordinating Group.

U.16 International Geosphere-Biosphere Programme: A Study of Global Change

The URSI Council,

noting

(a) that the International Council of Scientific Unions (ICSU) has launched a major interdisciplinary cooperative programme, under the title "International Geosphere-Biosphere Programme: A Study of Global Change", which will contribute to the understanding of the interactive physical, chemical and biological processes that regulate the total Earth system;

(b) that a Special Committee has been established by ICSU to provide for the development and correlation of the scientific programme;

(c) that the operational phases of the programme will start in the early 1990's;

resolves

1. to form an ad hoc Group on the Geosphere-Biosphere Programme, the task of which will be to identify the areas where the Union can make useful contributions;

2. to appoint the following as members of the ad hoc Group:

Chairman: P. Delogne (Belgium)

Members: F. Fedi (Italy)
V.V. Migulin (USSR)
R. Wielebinski (FRG)
G. Valenzuela (USA).

U.17 International Space Year (ISY)

The URSI Council,

noting

(a) that an International Space Year has been proposed for 1992 in celebration of the 500th Anniversary of Columbus' voyage and the 35th Anniversary of the launching of the first spacecraft;

(b) that the ICSU Committee on Space Research (COSPAR) has formed a committee to support the scientific content of the International Space Year;

(c) that the International Council of Scientific Unions (ICSU) has established a Coordinating Committee to consider the components of the ISY;

expresses the willingness of URSI to contribute to the International Space Year programme;

resolves to appoint an ad hoc Group for the ISY with the following membership:

Chairman: W.E. Gordon (USA)

Members: M. Tiuri (Finland)
P. Bauer (France)
a representative from the USSR, to be designated.

U.18 Ad hoc Group on Environmental Consequences of Nuclear War (ENUWAR)

The URSI Council,

considering

(a) the vital importance of the task of the Working Group on Environmental Consequences of Nuclear War (ENUWAR) of the ICSU Committee on Problems of the Environment (SCOPE);

(b) the valuable contribution which URSI has made in the form of a Statement on Nuclear Electromagnetic Pulse (NEMP) and Associated Effects, prepared by the Group set up in Florence (1984);

resolves

1. to express its appreciation to Mr. M. Wik for the remarkable work performed by the Group;

2. to maintain the ad hoc Group on ENUWAR during the next triennium, with Mr. M. Wik as Chairman, and two members to be selected by the Board of Officers in consultation with the Chairman.

U.19 Natural Noise from Lightning

The URSI Council,

considering

(a) that Commission E promotes scientific research in the field of the electromagnetic environment, including natural noise from lightning;

(b) that, as part of a forthcoming meteorological satellite being planned by the European Space Agency (ESA), continuous recording of lightning on a world-wide basis could lead to significant improvement in long-term and short-term radio noise predictions;

(c) that optical observations could be made with high accuracy in location, time and amplitude level and, when correlated to radio observations, could be used as input data for propagation-based models of radio noise;

(d) that it is expected that such studies of lightning would also contribute to the geophysical aspects relating to the magnetosphere and to the Earth-ionosphere waveguide and its boundaries;

(e) that, in view of the high competence of URSI Commissions E and H, it would be a great advantage if URSI could participate in the planning of LFD data processing, data interpretation and application;

(f) that URSI has stressed the importance of scientific data pertinent to reliable communications for our society and to geophysical studies, and agrees that a satellite-based lightning flash mapper would contribute to this objective;

noting that the results of such a project would be of strong interest to the International Telecommunication Union (ITU) and its technical advisory body, the International Radio Consultative Committee (CCIR);

recommends strongly that the potentialities of the proposed lightning flash detector should be evaluated and given serious consideration for inclusion in a meteorological satellite.

U.20 World-Wide Ionosonde Network

The URSI Council,

noting

(a) the recommendation of Commission G on Ionospheric Radio and Propagation regarding the importance of an operating world-wide ionosonde network;

(b) the important contributions made for many years by the ionosonde stations of the New Zealand network in both the scientific and communications fields;

(c) the important contributions made for many years by the ionosonde station at De Bilt, Netherlands;

(d) the need to achieve world-wide coverage by the ionosonde network;

expresses its great concern at the proposed closing of the ionosonde stations of the New Zealand network and at the proposed closing of the ionosonde station at De Bilt;

urges

1. the responsible authorities in New Zealand to reconsider this decision and to continue the operation of the stations;

2. the responsible authorities in the Netherlands to reconsider their decision and to continue the operation of the station at De Bilt

and the associated observatory at Wileveen;

encourages the Chilean authorities to install and operate an ionosonde on Easter Island, which would be a most valuable contribution to the World Ionosphere/Thermosphere Study (WITS), and would also fill a notable gap in the world-wide network of ionosondes, thus providing essential input to the scientific and communications data base on which forecasts are made.

U.21 Incoherent Scatter and ST Radar Facility in Antarctica

The URSI Council,

noting the joint recommendation of Commission G on Ionospheric Radio and Propagation and Commission H on Waves in Plasmas;

considering

(a) that URSI has supported the establishment of large research facilities (such as large incoherent-scatter radars) when it has been apparent that they have valuable and unique contributions to make;

(b) that an opportunity now exists to establish a modern incoherent scatter (IS) and stratospheric/tropospheric (ST) radar facility in Antarctica;

(c) that the expected scientific results of such a facility include filling the void in South hemisphere investigations of differences in the atmospheric energy and momentum budget and the atmospheric response; details of the coupled thermospheric-ionospheric system; information on tropospheric-stratospheric dynamics pertaining to changes in ozone concentration in the lower stratosphere and geographic/geomagnetic asymmetries;

(d) that, if the Antarctic facility is magnetically conjugate to a large Northern hemisphere radar, it would make possible extensive studies of magnetic conjugacy, hence topology of magnetospheric particles and fields;

recommends that the establishment of an incoherent scatter stratospheric-tropospheric (IS-ST) radar facility in Antarctica be encouraged.

U.22 Possible Interference to Incoherent Scatter Facilities

The URSI Council,

noting the joint recommendation of Commissions G on Ionospheric Radio and Propagation and H on Waves in Plasmas;

considering

(a) that incoherent scatter radars (ISR) are most suitable tools to study the Earth's upper atmosphere, particularly in polar regions;

(b) that the EISCAT-ISR constitutes one of the essential links in the global network of ISRs;

(c) that data from the ISR network are provided to the international scientific community through the NCAR ISR data base;

(d) that the increasing spectrum congestion resulting from the expansion of existing radio services and the development of new communication systems may cause harmful interference to these valuable scientific facilities;

(e) specifically, that the imminent deployment through the Nordic countries of cellular radiotelephone services in frequency bands overlapping that of the EISCAT is expected to have a critical impact on the EISCAT operation;

resolves to inform the international bodies (i.e. the International Telecommunication Union (ITU), the International Frequency Registration Board (IFRB), the International Radio Consultative Committee (CCIR)), as well as the national Nordic telecommunication authorities about this problem, and to urge them to undertake appropriate measures to mitigate or eliminate any interference problems occurring at EISCAT and at other ISR facilities to ensure their continued operation.

U.23 Active Experiments

The URSI Council,

noting the joint recommendation of Commissions G on Ionospheric Radio and Propagation and H on Waves in Plasmas;

considering

(a) that both COSPAR and URSI have Working Groups on Active Experiments overlapping in many fields and providing similar services (advance notices of active experiments for observing scientists);

(b) that a single URSI/COSPAR Joint Working Group would serve these needs more efficiently and effectively than the present two separate Working Groups, and would lead to better co-ordinated symposia in this field;

resolves to invite COSPAR to form with URSI such a Joint Working Group on Active Experiments consisting of four Co-Chairmen, two appointed by COSPAR and two by URSI (URSI Co-Chairmen: W.E. Gordon, USA; Santimay Basu, USA).

U.24 Measurement of 10.7 cm Flux

The URSI Council,

noting the recommendation of Commission G on Ionospheric Radio and Propagation;

considering that the termination of the long-standing 10.7 cm solar flux measurement by the Canadian National Research Council is a major setback to ionospheric modelling and prediction work;

urges the Canadian Administration to renew its support of the routine measurement of the 10.7 cm solar flux.

U.25 Recognition of Merits of Prof. V.V. Migulin

The URSI Council,

considering

(a) the important role played by Prof. V.V. Migulin in the activities of URSI and, in particular his administrative work in the Board of Officers, and his scientific work in Commission G;

(b) the very successful Symposia on Artificial Modification of the Ionosphere, organized by him in Suzdal, USSR, in 1983 and 1986;

noting that Prof. Migulin's help and advice will be available to URSI in various ways, including the series of symposia;

resolves that Prof. Migulin be appointed Honorary Chairman of the URSI series of Symposia on Artificial Modification of the Ionosphere.

U.26 UNESCO Subvention

The URSI Council,

considering that the annual subventions received from UNESCO, via ICSU and through direct contracts, have greatly contributed to the success of the URSI Young Scientists Programme and of its activities in the field of publications and of assistance to developing countries

resolves to convey to UNESCO its warmest thanks and appreciation for the valuable support thus provided.

U.27 Young Scientists Programme

The URSI Council,

noting that forty Young Scientists could be invited to attend the General Assembly in Israel, eleven of whom coming from developing countries;

resolves to convey its thanks to the organizations which so generously contributed to the financial support of this Programme:

The International Council of Scientific Unions (ICSU),
The ICSU Committee on Science and Technology in Developing Countries (COSTED),
The United Nations Educational, Scientific and Cultural Organization (UNESCO),
The Royal Society of London,
The URSI Committee in Israel.

U.28 Vote of Thanks to the Israeli URSI Committee

The URSI Council,

noting that the Israeli Organizing Committee spared no effort to make this XXII General Assembly of the Union a very successful event;

resolves to express its gratitude and appreciation

1. to the Israeli URSI Committee and to the Israel Academy of Sciences and Humanities for the invitation to hold the XXII General Assembly in Tel Aviv and, in particular, to Dr. J. Shapira, President of the URSI Member Committee in Israel;

2. to the members of the Organizing Committee for the successful completion of the detailed arrangements for the Assembly.

RESOLUTIONS AND RECOMMENDATIONS OF COMMISSIONS AND COMMITTEES

COMMISSION A - ELECTROMAGNETIC METROLOGY

A.1 Time Comparisons

Commission A,

considering

(a) that there is a scientific need for additional time and frequency comparisons between the national time scales and the new frequency standards under development;

(b) that there is a deficiency between the available comparison accuracies and the capabilities of the best atomic frequency standards and clocks, which could be available to any interested laboratories;

(c) that a number of time and frequency comparison methods are in the process of being evaluated, including VLBI, one-way and two-way pseudo random noise signals and LASER techniques on ground and in satellites;

recommends

1. that investigations on all the proposed or new time comparison methods should be actively pursued;

2. that simultaneous campaigns of mutual comparisons should be performed;

3. that the relevant activities be coordinated and the results be published under the auspices of the Bureau International des Poids et Mesures (BIPM).

A.2 Future Editions of the URSI Register of National Standards Laboratories

Commission A,

considering that the URSI Register of National Standards Laboratories provides helpful information on world-wide calibration facilities for electromagnetic quantities;

recommends that future editions of this Register should be formally

adopted as URSI documents (as opposed to Commission A documents) and that they should be printed and sold by a commercial publisher;

instructs the Chairman of the Working Group for the Register to negotiate a suitable commercial arrangement with a publisher, for approval by the URSI Council.

Note: Referred to the Standing Publications Committee.

A.3 Updating of the URSI Register of National Standards Laboratories

Commission A,

considering the new arrangements for the publication of the URSI Register of National Standards Laboratories, resulting from the recommendations in Recommendation A.5 (Florence, 1984), and Recommendation A.2 (Tel Aviv, 1987);

recommends that the next updated edition of the Register should appear in 1988 and that updating should take place at intervals of four years thereafter;

instructs its Official Members to submit to the Chairman of the Working Group, by 31 December 1987 and at 4-year intervals thereafter, information updating the entry for their country in the document (or a nil return).

A.4 Quantum Metrology Standards and Fundamental Constants

Commission A,

considering

(a) that standards of physical measurements, in particular those related to basic and derived electrical units, are the basis for the accurate measurements of important parameters in radio science;

(b) that changes are taking place in the implementation of these standards, through the use of quantum phenomena;

(c) that the knowledge of the exact value of selected fundamental constants is necessary for the implementation of these standards;

(d) the need to realize the meter according to its SI definition, with frequencies in the visible range;

(e) the importance of optical frequency measurements for the determination of fundamental constants and the fact that optical frequency measurements are carried out only in a few laboratories;

(f) that decisions are going to be made by the Comité International des Poids et Mesures (CIPM) in the near future regarding electrical units;

recommends that all National Standards Laboratories involved in that field be encouraged to

1. continue actively their work on the exact determination of fundamental constants;

2. continue actively their work on the implementation of practical quantum metrology standards;

3. support the development of methods which permit the measurement of visible frequencies with an accuracy equivalent to that currently reached with primary frequency standards;

4. make their results known to other organizations, especially to the Bureau International des Poids et Mesures (BIPM).

A.5 Improvements of RF Standards at Millimetre to Submillimetre Wavelengths

Commission A,

considering

(a) the increasing importance of the region of millimetre to submillimetre wavelengths for various technical and scientific applications, such as communication and data transfer, radar, remote sensing, environmental research, radio astronomy and nuclear fusion, and also its importance to electromagnetic compatibility;

(b) the need for improved standards and metrological support for these applications in order to provide reliable measurements

  (i) of the basic RF quantities: power, noise temperature and scattering coefficients;

  (ii) of the permittivity and permeability of RF materials to be used in this frequency range;

  (iii) for both guided-wave and free-field modes of operation;

recommends that increased emphasis should be placed on fundamental and applied research on advanced RF standards and measuring methods, and on material measuring methods, in the range of the millimetre to submillimetre wavelengths.

A.6 Working Group on Interaction of Electromagnetic Fields with Biological Systems and Related Measurements

Commission A,

considering the recommendations adopted at the XVIII, XIX, XX and XXI General Assemblies of URSI, which recognize the interest of URSI in the biological effects of electromagnetic fields and the need for international cooperation among physical, biological and medical scientists and their organizations, in order to increase the knowledge of interaction of electromagnetic fields with biological systems;

noting that this discipline is of interest to several URSI Commissions;

recommends

1. that a Working Group on the Interaction of Electromagnetic Fields with Biological Systems and Related Measurements should be maintained, with a Chairman and two Vice-Chairmen, one represent-

ing Commission A and the other representing the other URSI Commissions;

2. that the members of the Working Group shall be nominated by the Working Group Chairman, in consultation with the Member Committees;

3. that the Commissions of URSI should be invited to appoint a representative in the Working Group;

4. that the Working Group should be asked to continue its efforts toward:

   (i) convening of symposia covering the interaction of electromagnetic fields and biological systems;

   (ii) cooperating with other organizations in the planning and convening of such symposia;

   (iii) lending active support to international organizations that are concerned with matters of health and safety as these relate to electromagnetic fields and waves, and

   (iv) promoting related scientific activities in its field of interest.

COMMISSION B - FIELDS AND WAVES

B.1 Symposium on Electromagnetic Wave Theory

Commission B,

considering

(a) that the URSI Symposia on Electromagnetic Wave Theory have been held at intervals of three years for over 30 years;

(b) that these Symposia are major events which represent an important activity of Commission B between Assemblies;

confirms that the next Symposium in the series will be held in Stockholm, Sweden, in August 1989.

B.2 Co-sponsorship of International Conferences

Commission B,

considering that various forthcoming international conferences are of direct interest to the Commission;

recommends that URSI co-sponsor the following conferences:

1. the three annual European Microwave Conferences in 1988, 1989 and 1990 (the Conference to be held in Stockholm, Sweden, from 12 to 17 September 1988 will be the eighteenth in the series);

2. the Symposium on Antennas and Electromagnetic Field Theory, to be held in Shangai, China, 29 August - 1 September 1989;

3. the 9th Colloquium on Microwave Communication (MICROCOLL) to be held in Budapest, Hungary, in 1990;

4. the International Conference on Antennas and Propagation (ICAP'89).

B.3 Working Group on Inverse Scattering

Commission B,

considering

(a) the rapidly growing interest in inverse scattering in a wide variety of fields;

(b) the need for adequate communication between those employing inverse scattering techniques for different applications;

(c) the success of the two-day Open Symposium on Inverse Scattering held at the present General Assembly;

recommends that its Working Group on Inverse Scattering continue its activities under the chairmanship of Prof. D.L. Jaggard (USA).

B.4 Inter-Commission Working Group on Time Domain Waveform Measurements

Commission B,

considering the activity of the Working Group on Time Domain Waveform Measurements during the past triennium and, in particular, the two scientific sessions joint between all Commissions held at the present General Assembly;

recommends that the Inter-Commission Working Group on Time Domain Waveform Measurements (IWG-TDWM) be continued.

COMMISSION C - SIGNALS AND SYSTEMS

C.1 URSI Publications

Commission C

recommends

1. that the "URSI Information Bulletin" should be continued in its present form;

2. that the publication of the "Review of Radio Science" at the occasion of the General Assemblies of the Union should continue;

3. that the initiative regarding an URSI Journal on Signals, Systems and Electronics should be supported.

C.2 Sponsorship of Conferences

Commission C

recommends URSI sponsorship for the following conferences:

1. URSI Symposium on Signals, Systems and Electronics, to be organized jointly with Commission D in 1989;
2. 9th Colloquium on Microwave Communication (MICROCOLL) to be held in Budapest, Hungary, in 1990 following the XXIII General Assembly of URSI;
3. European Conference on Optical Communication (ECOC), in 1988, 1989 and 1990;
4. European Conference on Circuit Theory and Design, London, UK, September 1989;
5. International Zurich Seminar on Digital Communication, 1988 and 1990.

C.3 Commission C Editor for "Review of Radio Science 1987-89"

Commission C

resolves to appoint Prof. J.G. Lucas as Editor for the next issue of the "Review of Radio Science".

C.4 Commission C Representatives

Commission C

resolves to appoint

1. Prof. J.G. Lucas as its representative on the URSI-CCIR-CCITT Liaison Committee;
2. Prof. S. Halme as its representative on the Inter-Commission Working Group on Time Domain Waveform Measurements;
3. Prof. J.L. Lacoume as its representative on the Joint Working Group of Commissions C and H on Wave Analysis.

COMMISSION D - ELECTRONIC AND OPTICAL DEVICES AND APPLICATIONS

D.1 "Review of Radio Science"

Commission D,

considering that it is desirable to devise a mechanism whereby

(a) the huge gaps that can be left in the "Review of Radio Science" when some Member Committees fail to send their contributions to the Commission Editor would be avoided;

(b) the authoritative character of the Review would be ensured;

recommends that the soliciting of material for the "Review of Radio Science" should follow the pattern adopted experimentally by Commission D in 1981, that is

1. to invite expert specialists to review selected topics within the range of activities of each Commission,

2. to request the Official Members of the Commission to submit material from their countries in the usual way, these submissions to be sent to the specialist reviewers by the Commission Editor.

D.2 Commission D Editor for "Review of Radio Science 1987-1989"

Commission D

resolves to appoint Dr. J. Hénaff as Commission D Editor for the 1990 issue of "Review of Radio Science".

D.3 Proposed New Journal on Signals, Systems and Electronics

Commission D,

considering the proposal for a new journal on Signals, Systems and Electronics;

recommends

1. that a careful study of the existing journals covering these topics be made before any decision is taken;

2. that, if it is decided to proceed with such a journal, the journal should concentrate initially on review articles mainly, until the reputation of the journal is fully established.

D.4 Aid to Developing Countries

Commission D,

considering the suggestion made of providing aid to developing countries by proposing speakers and programmes for seminars and workshops;

recommends

1. that an approach be made to the Third World Academy of Sciences (TWAS) seeking their formal views on the suggestion, and a mechanism for providing this aid;

2. that a similar approach be made to the International Telecommunication Union (ITU).

D.5 Sponsorship of the European Conferences on Optical Communication

Commission D

recommends

1. that URSI co-sponsor the European Conferences on Optical Communication (ECOC) in 1988, 1989 and 1990;

2. that Prof. W.A. Gambling, Vice-Chairman of the Organizing Committee, be appointed as URSI representative for the 1988 Conference.

D.6 Joint Working Group with Commission E

Commission D

recommends the formation of a Joint Working Group with Commission E for the topic of Susceptibility of integrated circuits and semiconductor devices to damage by transients, with Dr. T. Itoh (USA) as its representative.

D.7 URSI-CCIR-CCITT Liaison Committee

Commission D

resolves to appoint Prof. T. Okoshi (Japan) as its representative on the URSI-CCIR-CCITT Liaison Committee.

COMMISSION E - ELECTROMAGNETIC NOISE AND INTERFERENCE

E.1 Working Groups

Commission E

resolves

1. to maintain its Working Groups, as follows, for the next triennium:

   E.1 Man-made Noise (Chairman: A.D. Spaulding, USA)
   E.2 Natural Noise (Chairman: J. Hamelin, France)
   E.3 Damaging Effects of Transients on Equipment (Chairman:V.Scuka, Sweden)
   E.4 Scientific Basis of Noise and Interference Control (Chairman: C. Baum, USA);

2. to form, jointly with Commission D, a Working Group on Effects of Transients on Integrated Circuits, Transistors, Computers, etc. with V. Scuka (Sweden) as Co-Chairman for Commission E and T.Itoh (USA) as Co-Chairman for Commission D, and to arrange a first meeting of the Group in conjunction with the Zurich Symposium on Electromagnetic Compatibility in March 1989.

E.2 Wrocław and Zurich Series of Symposia on Electromagnetic Compatibility

Commission E

recommends that URSI continue its fruitful co-sponsorship of the Symposia on Electromagnetic Compatibility in the Zurich and Wrocław series.

E.3 Radio Noise

Commission E,

considering

(a) that CCIR Report 322 (1984) providing world-wide maps of atmo-

spheric noise levels resulting from ligtning, was developed originally and revised in 1984 without the benefit of much data from the Southern hemisphere;

(b) that CCIR Report 258 on man-made noise was developed using data from the USA taken over 20 years ago;

recommends

1. that atmospheric noise data should be acquired at quiet locations to check the new CCIR Report 322 predictions for a period of at least two years using equipment of the type specified by the URSI Commission E Working Group on Natural Noise, with priority being given to data in the Southern hemisphere;

2. that data on man-made noise should be acquired in locations in various parts of the world, with priority being given to data outside the USA;

3. that the URSI Standing Committee on Developing Countries should play a leading role in coordinating the measurement of noise in developing countries, with priority being given to the Southern hemisphere for atmospheric noise from lightning.

E.4 Spectrum Management

Commission E,

considering

(a) that developing countries have needs for information on the scientific and technical approaches to spectrum management, problems of data bases, analytical modelling and measurements;

(b) that URSI has some knowledge of the scientific and technical aspects of spectrum management and the supporting disciplines;

(c) that the International Radio Consultative Committee (CCIR) and the International Frequency Registration Board (IFRB) have continuing studies in spectrum management;

recommends that URSI cooperate with the CCIR and the other ITU organs to make the appropriate information available in the form of video cassettes of tutorial lectures, visiting lecturers, etc., and that this cooperation be coordinated by the URSI-CCIR-CCITT Liaison Committee.

COMMISSION F - RADIO PROPAGATION AND REMOTE SENSING

F.1 Cooperation with IGARSS

Commission F

resolves

1. to continue to be actively involved in the organization of the

annual International Geoscience and Remote Sensing Symposia (IGARSS) by asking its Chairman to designate an adequate number of URSI representatives, in consultation with the Commission Official Member of the Member Committee in the country where the Symposium is held;

2. to keep the URSI Book of Abstracts separated from the Proceedings of the Symposia;

3. to keep its role restricted to the study of the interaction of em waves with the medium (including the related instrumental problems)

F.2 "Review of Radio Science"

Commission F

resolves to appoint Dr. G. Brussaard, incoming Vice-Chairman of the Commission, as Editor for the next issue of "Review of Radio Science".

F.3 URSI-CCIR-CCITT Liaison Committee

Commission F,

noting with satisfaction the continuing traditional cooperation with the International Radio Consultative Committee (CCIR), in particular with Study Group 5,

resolves to designate the following as its representatives on the URSI-CCIR-CCITT Liaison Committee: A. Blomquist (Sweden), L.Boithias (France), F. Fedi (Italy) and M.P.M. Hall (UK).

F.4 Inter-Commission Working Group on Time Domain Waveform Measurements

Commission F

resolves to designate Dr. Hans Liebe (USA) as its representative on the Inter-Commission Working Group on Time Domain Waveform Measurements.

F.5 Symposia and Meetings, 1988-1990

Commission F

recommends the organization or co-sponsorship, as appropriate, of the following events:

1. International Geoscience and Remote Sensing Symposia (IGARSS) as follows:

   1988 - 13-16 September, Edinburgh, UK,
   1989 - 27 June-1 July, Vancouver, Canada,
   1990 - Europe;

2. Commission F Open Symposium on Wave Propagation and Remote Sensing, Fall 1989, Nice, France (Chairman: J.P. Mon, France);

3. Microwave Signatures in Remote Sensing, Spring 1990, Massachusetts, USA (Chairman: C. Swift, USA);

4. School of Atmospheric Radar (joint with Commission G), November 1988, Kyoto, Japan (Chairman: S. Kato, Japan);

5. Radio Science Methods in the Study of the Terrestrial Subsurface (Chairman: D. Gjessing, Norway).

COMMISSION G - IONOSPHERIC RADIO AND PROPAGATION

G.1 High-Resolution Observations of Ionospheric Electron Density

Commission G,

considering the need for accurate knowledge of the ionospheric electron density with high spatial and temporal resolution for radio wave propagation predictions;

noting

(a) that the incoherent scatter radars (ISR) are operating during several incoherent scatter radar coordinated world day periods per year, collecting electron density and temperature data;

(b) that these ISR operation periods form an integral part of world-wide coordinated projects within the World Ionosphere/Thermosphere Study (WITS);

(c) that a large number of vertical incidence (VI) ionosondes exists which can provide rapid sequences of electron density profiles which could calibrate the ISR profiles for co-located stations;

(d) that the study of effects of gravity waves on the electron density distribution requires better E/F valley information;

recommends that world-wide campaigns with rapid (5 min) ionogram sequences be organized to cover the incoherent scatter radar coordinated periods.

G.2 Satellite Monitoring System

Commission G,

considering

(a) that empirical mapping of the peak parameters of the terrestrial ionosphere is of great interest for radio wave propagation predictions, for empirical modelling of the electron dentity in the International Reference Ionosphere (IRI) and for aeronomic investigations;

(b) that such maps derived from satellite observations could only recently be obtained via direct world-wide observations, e.g. with the Japanese ISS-b satellite and with the Soviet Intercosmos 19;

noting that the maps obtained by one satellite cover a large time period so that seasonal and diurnal variations are intermixed;

recommends the establishment of a satellite monitoring system, consisting of several polar orbiting satellites, that generates a global map within a short time interval.

G.3 HF Field Strength and Radio Noise Measurements

Commission G,

considering the proposed programme of activities of the Standing Committee on Developing Countries;

supports the proposal made by this Committee to organize and coordinate a project of HF field strength and radio noise measurements at selected frequencies in different tropical and subtropical countries;

declares its willingness to cooperate with the Committee in the planning of such project.

G.4 Working Groups

Commission G

resolves

1. to maintain the following Working Groups:

   G.1 Ionosonde Network Advisory Group (INAG)
   (Chairman: J.A. Gledhill, South Africa);

   G.2 Studies of the Ionosphere Using Beacon Satellites
   (Chairman: R. Leitinger, Austria);

2. to form Working Groups as follows:

   G.3 Ionospheric Modelling
   (Chairman: C. Rush, USA)

   Terms of reference: To promote methods of developing empirical and physical models of the ionosphere of use to communications and radio science;

   G.4 Ionospheric Informatics
   (Chairman: B.W. Reinisch, USA)

   Terms of reference: To promote the application of information theory to the acquisition, processing, archiving and distribution of ionospheric data;

   G.5 Low Latitude Ionospheric Studies
   (Chairman: S.M. Radicella, Argentina)

   Terms of reference: To promote international cooperation in studying the low latitude ionosphere, particularly for applications to communication.

G.5 Joint Working Groups with Commission H

Commission G

resolves to maintain the following joint Working Groups with Commission H:

GH.1 Incoherent Scatter
(Co-Chairmen: V.B. Wickwar, USA; K. Schlegel, FRG);

GH.2 Computer Experiments, Simulation and Analysis of Wave Plasma Processes
(Co-Chairmen for Commission H: H. Matsumoto, Japan; M. Abdalla, USA;
Co-Chairman for Commission G: S. Ossakow, USA).

G.6 Joint Working Group with COSPAR

Commission G

resolves to maintain the URSI/COSPAR Working Group on the International Reference Ionosphere (IRI), with L. Bossy (Belgium) as Chairman.

G.7 Symposia 1987-1990

Commission G

recommends the organization of the following symposia to be sponsored and financially supported by URSI:

1. Symposium on Large Scale Processes in the Ionosphere and Thermosphere, December 1989, Boulder, CO, USA (Organizers:V.B.Wickwar and A. Richmond, USA). Joint with Commission H.
2. Symposium on Artificial Modification of the Ionosphere, 1988 or 1989 (Organizers: V.V. Migulin, USSR; W.E. Gordon, USA). Joint with Commission H.
3. Ionospheric Studies Using Satellite Beacons, 18-22 April 1988, Xinxiang, Henan, China (Organizers: Huang Xuegin and Gao Chong, China; Convener: R. Leitinger, Austria).
4. International School of Atmospheric Radar, 24-28 November 1988, Kyoto, Japan (Organizer: S. Kato, Japan). Joint with Commission F.

COMMISSION H - WAVES IN PLASMAS

H.1 Sponsorship of Symposia and Meetings

Commission H

recommends sponsorship by URSI of the following events:

1. URSI-WIPP 1989: Wave-Induced Particle Precipitation and Wave Particle Interactions, Dunedin, New Zealand, 5-11 February 1989 (Organizers: R.L. Dowden, New Zealand; H. Matsumoto, Japan; U.S. Inan, USA) under Mode C;
2. ISSS-4: Fourth International School for Space Simulations, Kyoto, Japan, November 1989 (Organizer: H. Matsumoto, Japan) under Mode B;
3. ICPIG-XIX: 19th International Conference on Phenomena in Ionized Gases, Belgrade, Yugoslavia, 10-14 July 1989 (Organizer: J.Purić, Yugoslavia) under Mode B.

H.2 Joint Working Groups with IAGA

Commission H

resolves

1. to maintain URSI/IAGA Working Group 1 on Passive Electromagnetic Probing of the Magnetosphere (Co-Chairman for URSI: U.S. Inan, USA);

2. together with Commission G, to maintain URSI/IAGA Working Group 2 on Wave Instabilities in Plasmas (Co-Chairman for Commission H: T. Sato, Japan; Co-Chairman for Commission G: S. Ossakow, USA).

H.3 Joint Working Groups with other Commissions of URSI

Commission H

resolves to maintain the following Joint Working Groups with other URSI Commissions:

CH.1 Wave Analysis
(Co-Chairman for Commission H: D. Jones, UK);

GH.1 Incoherent Scatter
(Co-Chairmen: V.B. Wickwar, USA; K. Schlegel, FRG);

GH.2 Computer Experiments, Simulation and Analysis of Wave Plasma Processes
(Co-Chairmen for Commission H: H. Matsumoto, Japan; M. Abdalla, USA;
Co-Chairman for Commission G: S. Ossakow, USA).

JOINT COMMISSIONS G AND H RESOLUTION

G/H.1 "Review of Radio Science 1987-1989"

Commissions G and H

resolve to appoint a single Editor for the joint Commissions G and H triennial report to be included in the 1990 edition of "Review of Radio Science", and

recommend to the Editor to appoint seven sub-editors to prepare international reviews on the following topics:

(1) Techniques
(2) Plasma environments of Earth and Planets
(3) Physics of wave propagation
(4) Applications of wave propagation
(5) Plasma instabilities
(6) Active experiments
(7) Wave-particle interactions.

GH.2 Computer Experiments, Simulation and Analysis of Wave Plasma Processes
(Co-Chairmen for Commission H: H. Matsumoto, Japan; M. Abdalla, USA;
Co-Chairman for Commission G: S. Ossakow, USA).

G.6 Joint Working Group with COSPAR

Commission G

resolves to maintain the URSI/COSPAR Working Group on the International Reference Ionosphere (IRI), with L. Bossy (Belgium) as Chairman.

G.7 Symposia 1987-1990

Commission G

recommends the organization of the following symposia to be sponsored and financially supported by URSI:

1. Symposium on Large Scale Processes in the Ionosphere and Thermosphere, December 1989, Boulder, CO, USA (Organizers:V.B.Wickwar and A. Richmond, USA). Joint with Commission H.
2. Symposium on Artificial Modification of the Ionosphere, 1988 or 1989 (Organizers: V.V. Migulin, USSR; W.E. Gordon, USA). Joint with Commission H.
3. Ionospheric Studies Using Satellite Beacons, 18-22 April 1988, Xinxiang, Henan, China (Organizers: Huang Xuegin and Gao Chong, China; Convener: R. Leitinger, Austria).
4. International School of Atmospheric Radar, 24-28 November 1988, Kyoto, Japan (Organizer: S. Kato, Japan). Joint with Commission F.

COMMISSION H - WAVES IN PLASMAS

H.1 Sponsorship of Symposia and Meetings

Commission H

recommends sponsorship by URSI of the following events:

1. URSI-WIPP 1989: Wave-Induced Particle Precipitation and Wave Particle Interactions, Dunedin, New Zealand, 5-11 February 1989 (Organizers: R.L. Dowden, New Zealand; H. Matsumoto, Japan; U.S. Inan, USA) under Mode C;
2. ISSS-4: Fourth International School for Space Simulations, Kyoto, Japan, November 1989 (Organizer: H. Matsumoto, Japan) under Mode B;
3. ICPIG-XIX: 19th International Conference on Phenomena in Ionized Gases, Belgrade, Yugoslavia, 10-14 July 1989 (Organizer: J.Purić, Yugoslavia) under Mode B.

COMMISSION J - RADIO ASTRONOMY

J.1 Joint Israeli/Egyptian VLBI Telescope

Commission J,

recognizing

(a) that very-long-baseline interferometry (VLBI) is important in astronomy and astrophysics, and in the study of the motions of the Earth and its crust;

(b) that radio astronomical measurements provide an excellent training ground for young scientists and engineers;

(c) that VLBI is inherently an international activity which fosters communication and exchange among scientists from many countries;

noting

(d) that the Israeli radio astronomy community has expressed interest in building and operating a VLBI telescope, and has proposed to the URSI Committee in Egypt to make it a joint project;

(e) that such a telescope in this geographical area would significantly improve the performance of the European VLBI Network (EVN) by providing baselines of the order of 3000 km in length, which increases the resolution and quality of the images of cosmic radio sources;

(f) that such a telescope would occupy a strategic position for geodetic studies of the fractured crustal plates in the Mediterranean region;

recommends that this telescope should have the following characteristics:

(1) the telescope should have a diameter in the range 25-40 m, to provide adequate sensitivity,
(2) the telescope and its receiving equipment should be compatible with other elements of the EVN and with VLBI telescopes world-wide,
(3) the telescope should be capable of operation at frequencies up to at least 23 GHz;

urges the appropriate agencies to provide the requisite support to establish and complete this project.

J.2 Sponsorship of Symposia

Commission J

recommends that URSI should support the following symposia to be held during the next three years:

1. VLBI Summer School for Young Scientists, September 1988, Bologna, Italy (Organizers: M. Felli, Italy; R.E. Spencer, UK);

2. Radioastronomical Seeing, May 1988, Beijing, China (Organizer: J. Baldwin, UK);

3. Limits of Observational Astronomy, August/September 1989, Sydney, Australia (Organizer: R.H. Frater, Australia);

4. Submillimeter Radio Astronomy, September 1988, Hawaii (Organizer: T. Phillips, USA).

J.3 "Review of Radio Science 1987-1989"

Commission J

resolves that the next issue of "Review of Radio Science" should be prepared by a group of reviewers, each dealing with an area of specialisation, with the Chairman of the Commission as Editor-in-Chief.

J.4 Inter-Union Commission on the Allocation of Frequencies to Radio Astronomy and Space Science (IUCAF)

Commission J,

noting the serious threats to radio astronomy in the next three-year period;

recommends

1. that the URSI membership of the Inter-Union Commission on the Allocation of Frequencies to Radio Astronomy and Space Science (IUCAF) be increased to four members;

2. that URSI should provide whatever financial support is possible for IUCAF during this crucial three-year period.

J.5 URSI-CCIR-CCITT Liaison Committee

Commission J

resolves

1. to appoint Dr. B.J. Robinson (Australia) as its representative on the URSI-CCIR-CCITT Liaison Committee;

2. to invite the Chairman of the Commission to appoint a second representative on that Committee.

URSI-CCIR-CCITT LIAISON COMMITTEE

1. Cooperation with the URSI Standing Committee on Developing Countries

The URSI-CCIR-CCITT Liaison Committee,

considering

(a) that the URSI Standing Committee on Developing Countries has initiated studies and research, the first phase of which has produced:

- Handbook on Radio Propagation for Tropical and Subtropical

Countries, 1987;

- Biregional Latin American/African Workshop on Radio Propagation Research and Applications (including spectrum management), Buenos Aires, 1987 (190-page Proceedings) with recommended further research areas including: ionospheric data acquisition; sporadic E phenomena; scintillation; low latitude studies; refractivity studies; rainfall attenuation; electromagnetic compatibility; spectrum management;

(b) that the Standing Committee on Developing Countries has asked the assistance of the URSI-CCIR-CCITT Liaison Committee in facilitating the implementation of these recommendations;

(c) that the International Radio Consultative Committee (CCIR), in the conduct of its activities, has a need for the results of measurements made in developing countries on the topics identified by the Standing Committee on Developing Countries;

recommends

1. that the appropriate URSI Commissions consider each of these topics with a goal of recommending priorities from a scientific standpoint, standardization of equipment and measurement methods, and durations of measurements required to obtain meaningful data;

2. that the CCIR should be asked to suggest priorities to URSI;

3. that the Standing Committee on Developing Countries and the appropriate URSI Commissions should coordinate with the appropriate CCIR Study Groups for planning measurement campaigns in developing countries and, where appropriate, hold joint meetings or symposia on topics of current interest (e.g. rainfall rate and attenuation);

4. that working contacts between the Standing Committee on Developing Countries and pertinent CCIR Interim Working Parties (IWP) be established, including participation in CCIR to facilitate coordination;

5. that URSI should offer some financial support to the Standing Committee on Developing Countries for participation in coordination and planning meetings.

2. Cooperation with the International Telecommunication Union (ITU)

The URSI-CCIR-CCITT Liaison Committee,

noting the recommendation made by the Corsendonk Conference (March 1987) regarding the desirability of reinvigorating the cooperation between URSI and the technical Committees of the International Telecommunication Union (CCIR, CCITT and IFRB);

recommends the following programme of activities for the next three-year period:

1. a workshop at the 1989 Zurich EMC Symposium reviewing selected CCIR documents pertinent to noise and interference (F.L. Stumpers, Netherlands);

2. a possible URSI Commission E and CCIR joint session on spectrum management at the 1989 Zurich EMC Symposium (R.D.Parlow, USA);

3. a possible Commission F/URSI Standing Committee on Developing Countries/CCIR planning meeting on available data and the measurement of rainfall rate and attenuation (R.K. Crane, USA; S. Radicella, Argentina);

4. a possible workshop on URSI scientific inputs to long-range telecommunication strategic planning (J. Shapira, Israel);

5. the attendance by an URSI representative at the 1988 CCITT Plenary Assembly in Melbourne, Australia (J.G. Lucas, Australia);

6. meetings of the URSI-CCIR-CCITT Liaison Committee at other symposia of opportunity;

7. an URSI Commission E submission to CCIR Study Group 6 on recommended equipment for radio noise measurements;

8. an URSI Commission A and F submission of ground constants data at HF to CCIR Study Group 5 (G. Hagn, USA);

9. encouragement of URSI authors to submit papers to the ITU Journal;

10. consideration of video taping of selected URSI lectures to be provided to the Consultative Committees of ITU for training.

RÉSOLUTIONS ET RECOMMANDATIONS DU CONSEIL

U.1 Les Commissions scientifiques de l'URSI

Le Conseil de l'URSI,

notant que les neuf Commissions scientifiques de l'Union ont été invitées à revoir, pendant la XXIIe Assemblée générale à Tel Aviv, leurs titres, sous-titres et mandats,

ayant examiné les recommandations soumises par chacune des Commissions,

approuve, pour les trois années à venir, les titres, sous-titres et mandats des Commissions figurant en annexe.

Annexe

1. Commission A - METROLOGIE ELECTROMAGNETIQUE. Mesures et étalons électromagnétiques, et interaction entre les champs électromagnétiques et les systèmes biologiques.

   Mandat:

   (a) Mesures et étalons de temps et de fréquence, y compris les fréquences infrarouges et optiques.
   (b) Mesures dans le domaine temporel.
   (c) Mesures dans le domaine des fréquences.
   (d) Mesures dans les télécommunications.
   (e) Mesures laser.
   (f) Métrologie quantique et méthodes électriques dans le domaine des constantes fondamentales.
   (g) Mesures et étalons dans la gamme allant des hyperfréquences aux ondes submillimétriques.
   (h) Mesures des effets des champs électromagnétiques sur les systèmes biologiques.

2. Commission B - ONDES ET CHAMPS. Théorie électromagnétique et applications, y compris les antennes et les guides d'ondes.

   Mandat:

   Etude de la théorie des ondes et des champs électromagnétiques au sens général, avec un intérêt particulier pour les méthodes numériques et analytiques permettant de résoudre les problèmes suivants:

   (a) diffusion par les objets,
   (b) propagation dans des milieux complexes ou au-dessus de surfaces complexes,
   (c) phénomènes transitoires,
   (d) inversion de la diffusion,
   (e) structures guides,
   (f) antennes.

3. Commission C - SIGNAUX ET SYSTEMES. Systèmes de communication et théorie des systèmes (y compris les circuits); théorie de l'information et traitement du signal (y compris les problèmes stochastiques).

4. Commission D - DISPOSITIFS ELECTRONIQUES ET OPTIQUES ET APPLICATIONS.

Mandat:

(1) Promouvoir les recherches et faire le point des nouveaux développements dans le domaine des dispositifs électroniques et optiques et de leurs applications, particulièrement en ce qui concerne la radioélectricité scientifique et les télécommunications. L'accent sera mis sur la production, la détection, le stockage et le traitement des ondes et signaux électromagnétiques à toutes les fréquences.

(2) Organiser des séances et conférences scientifiques destinées à attirer l'attention des autres Commissions sur les développements susceptibles de présenter pour elles un intérêt particulier.

5. Commission E - BRUITS ET BROUILLAGES ELECTROMAGNETIQUES.

Mandat:

(a) Bruits terrestres et planétaires d'origine naturelle; bruits artificiels.
(b) Bruits composites ambiants.
(c) Effets des bruits sur la qualité des systèmes.
(d) Effets durables des phénomènes transitoires sur la qualité des équipements (incluant l'impulsion électromagnétique nucléaire).
(e) Base scientifique des bruits et maîtrise des brouillages.
(f) Utilisation du spectre.

Note: Nombre des sujets précités sont traités sous le dénominateur commun de Compatibilité électromagnétique.

6. Commission F -PROPAGATION DES ONDES ET TELEDETECTION (y compris la radio-météorologie, la radio-océanographie et la télédétection des milieux non ionisés).

Mandat:

(1) Etudier tous les aspects de la propagation des ondes à toutes les fréquences dans un milieunon ionisé:

(i) propagation des ondes au-dessus de la surface de la Terre,
(ii) propagation des ondes dans l'atmosphère neutre et interaction des ondes avec l'atmosphère neutre,
(iii) interaction des ondes avec la surface de la Terre: océans, sol et glace,
(iv) propagation et diffraction des ondes en milieu souterrain,
(v) caractérisation de l'environnement en ce qu'il affecte les phénomènes ondulatoires;

(2) encourager l'application des résultats de ces études, en particulier dans les domaines de la télédétection et des communications;

(3) développer une collaboration appropriée avec les autres Commissions de l'URSI et les organisations concernées.

7. Commission G - RADIOELECTRICITE IONOSPHERIQUE ET PROPAGATION (y compris les communications ionosphériques et la télédétection des milieux ionisés).

Mandat:

Etude de l'ionosphère ayant pour but la compréhension générale de ce milieu nécessaire aux radiocommunications. Sont compris la morphologie de l'ionosphère, sa structure et ses variations, ainsi que les outils nécessaires à la mesure de ses caractéristiques.

8. Commission H - ONDES DANS LES PLASMAS.

Mandat:

Etude des ondes dans les plasmas, au sens le plus large, et des interactions entre ces ondes et les particules chargées. Sont incluses les ondes électromagnétiques et électrostatiques des plasmas interplanétaire, planétaire et de laboratoire.

9. Commission J - RADIOASTRONOMIE (y compris la télédétection des objets célestes).

Mandat:

1. Les activités de la Commission concernent:

   a) les radiosources dans l'espace, en particulier les émissions radioélectriques du Soleil calme et du Soleil actif, du système solaire, de la galaxie et des sources discrètes dans l'Univers;

   b) l'étude des météores, du Soleil, de la Lune, des planètes et autres objets du système solaire par la technique des échos radioélectriques.

2. La Commission étudiera et tendra à promouvoir le développement des méthodes techniques en relation avec les sujets ci-dessus, et s'efforcera de protéger les observations contre les interférences.

3. En relation avec le paragraphe 1, la Commission se propose:

   (i) de travailler conjointement avec les autres Commissions de l'URSI dans le domaine de leurs intérêts communs,

   (ii) de travailler conjointement avec la Commission 40 de l'Union Astronomique Internationale (UAI) pour l'organisation de symposia sur la radioastronomie,

   (iii) de coopérer avec la Commission 40 de l'UAI vis-à-vis du choix des matières à discuter, afin d'éviter les doubles emplois indésirables.

4. La Commission formulera pour l'URSI les recommandations appro-

priées sur tout sujet lié aux matières évoquées ci-dessus, en vue de leur examen par les autres Commissions de l'URSI et les autres organismes internationaux.

U.2 Membres de l'URSI

Le Conseil de l'URSI,

ayant pris connaissance

(a) des différentes suggestions relatives aux catégories de membres de l'Union émises lors de la Conférence de Corsendonk (mars 1987);

(b) des recommandations formulées dans le rapport du groupe ad hoc formé pendant l'Assemblée générale sous la présidence du Prof. S. Okamura,

décide

1. d'instaurer une nouvelle catégorie de membres, les Comités Membres associés, à l'intention des Comités envisageant d'adhérer à l'URSI, ou bien éprouvant quelque difficulté à payer la contribution annuelle à l'Union;

2. d'inclure dans les Statuts de l'URSI les dispositions définissant les conditions d'admission des Comités Membres associés;

3. d'inviter le Comité permanent pour l'adhésion à l'URSI à étudier la possibilité d'établir d'autres catégories de membres comme, par exemple, des membres individuels ou des membres affiliés, sociétés professionnelles ou firmes industrielles, et à faire rapport aux Comités Membres sur ce point, en vue d'un éventuel vote par correspondance avant la prochaine Assemblée générale;

4. de désigner les personnalités suivantes comme membres du Comité permanent pour l'adhésion à l'URSI:

   Président: M. Petit (France)

   Membres: Yu-Kai Chen (Chine, SRS)
   E.V. Jull (Canada)
   S. Okamura (Japon)
   K. Serafimov (Bulgarie)
   J. Shapira (Israël).

U.3 Revision des Statuts de l'URSI

Le Conseil de l'URSI,

considérant que certaines des décisions prises pendant l'Assemblée générale entraînent la modification des Statuts de l'URSI et, plus spécialement de l'Article 1 (Buts) et des Articles 2 à 12 (Membres),

décide

1. de charger le Comité de rédaction de préparer la version modifiée des Statuts avant la fin 1987;

2. de charger le Secrétariat de l'URSI

   (i) de diffuser la version modifiée des Statuts aux Comités Membres pour approbation par correspondance,

(ii) une fois cette version approuvée par les Comités Membres, d'en assurer la publication.

U.4 Finances de l'URSI et composition du Comité permanent des finances

Le Conseil de l'URSI,

ayant pris connaissance des recommandations formulées dans le Rapport du Comité des finances, en date du 31 août 1987,

considérant qu'il serait souhaitable que le Comité permanent des finances comprenne des représentants de plusieurs catégories d'adhésion à l'URSI,

décide

1. d'approuver les comptes de l'Union certifiés pour les années prenant fin au 31 décembre 1984, 1985 et 1986;
2. d'approuver les prévisions budgétaires (Modèle B) figurant à l'Annexe 1 du Procès-verbal de la 4e réunion du Conseil (Tel Aviv, 31 août 1987);
3. d'adopter, pour la contribution annuelle, les montants proposés dans le Modèle B des prévisions budgétaires, à savoir 610 dollars pour 1988, 740 dollars pour 1989 et 860 dollars pour 1990;
4. d'autoriser le Bureau à ajuster le montant en dollars de l'unité de contribution annuelle de façon à ce que son pouvoir d'achat reste conforme aux prévisions budgétaires;
5. de publier le Rapport du Comité permanent des finances dans le Volume XXI des *Comptes Rendus des Assemblées générales de l'URSI*;
6. de désigner les personnalités suivantes comme membres de ce Comité:

   Président: F. Gardiol (Suisse)

   Membres: C.M. Butler (EUA)
   K. Géher (Hongrie)
   J.G. Lucas (Australie)
   J.B.H. Peek (Pays-Bas)
   S. Radicella (Argentine)
   W.D. Ryan (Irlande).

U.5 Comité des Publications

Le Conseil de l'URSI,

ayant pris connaissance des recommandations formulées dans le Rapport du Comité des publications, en date du 31 août 1987,

considérant que le programme des publications revêt une grande importance pour ce qui concerne la crédibilité et le rayonnement de l'Union,

décide

1. d'adopter les recommandations 1, 2, 3, 4, 5 et 8 de ce Rapport, moyennant quelques modifications de caractère mineur;

2. de publier le Rapport du Comité des publications dans le Volume XXI des *Comptes Rendus des Assemblées générales de l'URSI*;

3. de donner au Comité des publications le statut de Comité permanent;

4. de désigner les personnalités suivantes comme membres du Comité permanent des publications:

Président: R.L. Dowden (Nouvelle Zélande)

Membres: P.J.B. Clarricoats (Royaume-Uni)
G. Hyde (EUA)
B. Picinbono (France)
Ch.-U. Wagner (RDA).

U.6 Comité permanent pour les pays en développement

Le Conseil de l'URSI,

ayant pris connaissance

(a) du rapport présenté par le Comité permanent pour les pays en développement sur ses activités au cours des trois années écoulées;

(b) du programme d'action proposé pour la période 1988-1990,

décide

1. d'adresser au Comité ses félicitations pour avoir mené à bien le programme fixé pour les trois dernières années;

2. d'exprimer au Dr. A.P. Mitra et à ses collaborateurs sa gratitude pour le travail accompli dans la mise au point du *Handbook of Radio Propagation in Tropical and Subtropical Countries*;

3. de donner son accord de principe au programme d'activités pour les trois années à venir figurant dans le rapport du Comité, sous réserve de l'approbation des prévisions budgétaires;

4. de désigner les personnalités suivantes comme membres du Comité permanent pour les pays en développement:

Président: S. Radicella (Argentine)

Membres: Feng Shizhang (Chine, CIE)
F. Mopfouma (Congo Brazzaville)
J.O. Oyinloye (Nigeria)
B.M. Reddy (Inde)
J. Voge (France).

U.7 Comité permanent pour les Assemblées générales de l'URSI

Le Conseil de l'URSI,

considérant l'importance de la tâche dévolue au Comité pour les Assemblées générales de l'URSI, laquelle consiste à rechercher auprès des Comités Membres des invitations pour l'organisation des Assemblées générales futures de l'Union,

décide

1. d'accepter l'invitation du Comité tchécoslovaque de l'URSI d'organiser la XXIIIe Assemblée générale à Prague dans la deuxième moitié de 1990;

2. d'exprimer aux Comités Membres en Suède et au Royaume-Uni ses remerciements pour leurs invitations.

U.9 Comité de liaison URSI-CCIR-CCITT

Le Conseil de l'URSI,

notant

(a) que, parmi autres recommandations, la Conférence de Corsendonk (mars 1987) a estimé essentiel de relancer la coopération entre l'URSI et les Comités Consultatifs de l'Union Internationale des Télécommunications (UIT);

(b) que le Comité de liaison URSI-CCIR-CCITT offre une structure et un mécanisme susceptibles de faciliter la réalisation de cet objectif,

décide

1. de maintenir le Comité de liaison URSI-CCIR-CCITT pendant les trois années à venir;

2. d'inviter le Comité à mettre tout en oeuvre pour renforcer la collaboration entre l'URSI et les Comités Consultatifs de l'UIT;

3. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir:

Président: G. Hagn (EUA)

Vice-Présidents: W.A. Gambling (Royaume-Uni)
F.L.H.M. Stumpers (Pays-Bas)

Membres:

Commission A - S. Leschiutta (Italie)
Commission B - D. Bem (Pologne), R.M. Bevensee (EUA)
Commission C - J.G. Lucas (Australie)
Commission D - T. Okoshi (Japon)
Commission E - A.D. Spaulding (EUA)
Commission F - A. Blomquist (Suède), L. Boithias (France), F. Fedi (Italie), M.P.M. Hall (Royaume-Uni)
Commission G - L.W. Barclay (Royaume-Uni)
Commission J - R.H. Frater (Australie), B.J. Robinson (Australie).

U.10 Coordination du programme scientifique de l'URSI

Le Conseil de l'URSI,

notant

(a) que le Groupe pour la coordination du programme scientifique de l'URSI fut créé à une époque où, pour des raisons d'ordre financier, il était impossible de réunir le Comité de Coordination dans l'année précédant l'Assemblée générale;

(b) que les ressources actuelles de l'Union permettront la convocation du Comité de coordination au printemps de 1989, pour examiner et mettre au point le programme scientifique de la XXIIIe Assemblée générale de 1990 et que, dès lors, la raison d'être du Groupe a disparu;

(c) qu'il est néanmoins nécessaire de centraliser l'ensemble de cette opération,

décide

1. de dissoudre le Groupe pour la coordination du programme scientifique de l'URSI;

2. de désigner le Dr. P. Bauer comme Coordonnateur et le Prof. J.Bach Andersen comme Coordonnateur associé pour la XXIIIe Assemblée générale;

3. d'exprimer au Dr. P. Bauer et aux membres du Groupe sa gratitude pour leur travail de préparation du programme scientifique de la présente Assemblée générale.

U.11 Procédure pour l'élection des membres du Bureau et des Vice-Présidents des Commissions

Le Conseil de l'URSI,

considérant

(a) que les Comités Membres devraient disposer de tous renseignements utiles sur les candidats au Bureau et à la vice-présidence des Commissions;

(b) qu'il y a manque d'uniformité quant à la procédure appliquée par chacune des Commissions pour l'élection de son Vice-Président et, en outre, que les Comités Membres devraient être davantage impliqués dans cette procédure,

décide

1. de charger le Secrétariat de l'URSI de diffuser aux Comités Membres des notices biographiques sur les candidats aux différentes fonctions au sein de l'URSI, et ce avant l'Assemblée générale;

2. d'autoriser le Bureau à définir une procédure unique, à appliquer par toutes les Commissions, pour l'élection des Vice-Présidents en gardant à l'esprit que les Comités Membres doivent prendre une part plus active dans le déroulement de la procédure.

U.12 Commission inter-Unions pour l'attribution de fréquences à la radioastronomie et à la science spatiale (IUCAF)

Le Conseil de l'URSI,

considérant

(a) que, vu l'ampleur et la complexité croissantes des activités de l'Union Internationale des Télécommunications (UIT), il est nécessaire, plus que jamais, d'évaluer avec soin et de définir en toute clarté les besoins en bandes de fréquences de la radioastronomie et de la science spatiale;

(b) que le danger de voir la recherche scientifique sérieusement affectée par les autres utilisateurs augmente parallèlement à l'utilisation toujours plus large du spectre radioélectrique,

décide

1. d'approuver le rapport présenté par le Dr. J.W. Findlay, Président de la Commission inter-Unions pour l'attribution de fréquences à la radioastronomie et à la science spatiale (IUCAF);

2. de mettre en oeuvre les recommandations formulées dans ce rapport, à savoir:

   (i) faciliter l'établissement de contacts plus étroits avec les radioastronomes dans les différentes parties du monde;

   (ii) faire passer de deux à quatre le nombre des représentants de l'URSI au sein de la Commission inter-Unions, et inviter l'Union Astronomique Internationale (UAI) à faire de même;

   (iii) prendre toutes les mesures possibles pour appuyer et financer de façon appropriée les très importantes activités de la Commission inter-Unions pour l'attribution de fréquences à la radioastronomie et à la science spatiale.

U.13 Groupe de travail inter-Commissions pour la coordination des activités de l'URSI pour les communications, la détection et le traitement des données dans la gamme optique

Le Conseil de l'URSI,

ayant pris connaissance du rapport présenté par le Prof.W.A.Gambling, Président du Groupe de travail inter-Commissions pour la coordination des activités de l'URSI pour les communications, la détection et le traitement des données dans la gamme optique, qui indique que les problèmes qui avaient requis l'intervention du Groupe de travail se trouvent actuellement résolus,

décide

1. de dissoudre ce Groupe de travail inter-Commissions;

2. d'exprimer au Prof. W.A. Gambling sa profonde gratitude pour avoir mené à bien la mission de ce Groupe de travail.

U.14 Groupe de travail inter-Commissions sur la mesure des formes d'ondes dans le domaine temporel

Le Conseil de l'URSI,

ayant pris connaissance

(a) du rapport présenté par le Groupe de travail inter-Commissions sur la mesure des formes d'ondes dans le domaine temporel;

(b) des recommandations formulées par le Groupe de travail concernant son programme de travail pour les trois années à venir,

décide

1. de maintenir ce Groupe de travail inter-Commissions et de confirmer son mandat;

2. de désigner N.S. Nahman (EUA) et T. Sarkar (EUA) respectivement comme Président et Vice-Président du Groupe de travail.

U.15 Groupe de coordination inter-Commissions sur la télédétection

Le Conseil de l'URSI,

considérant

(a) que le domaine de la télédétection est couvert de façon adéquate par le mandat de la Commission F;

(b) que cette Commission est à même d'assurer la coordination nécessaire tant au sein de l'URSI, en consultation avec le Comité de coordination, qu'avec d'autres organismes, tels que l'Association Internationale de Météorologie et de Physique de l'Atmosphère (IAMAP) et la Société de Géoscience et de Télédétection (GRS) de l'IEEE,

décide

1. de dissoudre le Groupe de coordination inter-Commissions sur la télédétection;

2. d'adresser au Prof. J.F.R. Gower ses remerciements pour son action en tant que Président de ce Groupe.

U.16 Programme International Géosphère-Biosphère: Etude globale de leur évolution

Le Conseil de l'URSI,

notant

(a) que le Conseil International des Unions Scientifiques (CIUS) a lancé un programme de coopération interdisciplines d'importance primordiale sous le titre "Programme International Géosphère-Biosphère: Etude globale de leur évolution", lequel contribuera à la compréhension des interactions des processus physiques, chimiques et biologiques qui régissent l'ensemble du système terrestre;

(b) que le CIUS a établi un Comité spécial chargé de suivre le développement et d'assurer la coordination du programme scientifique;

(c) que la phase opérationnelle du programme commencera au début des années 1990,

exprime la volonté de l'URSI de participer à cette entreprise capitale,

décide

1. de former un Groupe ad hoc pour le programme Géosphère-Biosphère avec pour mission de déterminer dans quels domaines l'Union pourra apporter une contribution utile;

2. de désigner les personnalités suivantes comme membres du Groupe ad hoc:

Président: P. Delogne (Belgique)

Membres: F. Fedi (Italie)
V.V. Migulin (URSS)
G. Valenzuela (EUA)
R. Wielebinski (RFA).

U.17 Année Internationale de l'Espace (AIE)

Le Conseil de l'URSI,

notant

(a) qu'il a été proposé d'organiser en 1992 une Année Internationale de l'Espace (AIE) pour célébrer le 500e anniversaire du voyage de Christophe Colomb et le 35e anniversaire du lancement du premier engin spatial;

(b) que le Comité du CIUS pour la Recherche spatiale (COSPAR) a formé un Comité chargé de promouvoir le contenu scientifique de l'AIE;

(c) que le CIUS a formé un Comité chargé d'examiner les différentes composantes du programme de l'Année Internationale de l'Espace,

exprime la volonté de l'URSI de participer au programme de l'AIE,

décide de désigner un Groupe ad hoc pour l'AIE, composé comme suit:

Président: W.E. Gordon (EUA)

Membres: M. Tiuri (Finlande)
P. Bauer (France)
un représentant qui sera désigné par le Comité Membre de l'URSI en URSS.

U.18 Groupe ad hoc sur les Conséquences d'une guerre nucléaire pour l'environnement

Le Conseil de l'URSI,

considérant

(a) l'importance capitale de la tâche dévolue au Groupe de travail sur les conséquences pour l'environnement d'une guerre nucléaire du Comité sur les Problèmes de l'environnement (SCOPE) du CIUS;

(b) l'importante contribution apportée par l'URSI sous la forme du chapitre relatif à l'impulsion électromagnétique nucléaire et les effets associés, préparé par le Groupe créé à Florence (1984),

décide

1. d'exprimer à M. M. Wik sa gratitude pour le remarquable travail accompli par son Groupe;

2. de maintenir pour les trois années à venir le Groupe ad hoc sur les conséquences pour l'environnement d'une guerre nucléaire, lequel sera présidé par M. M. Wik et comprendra deux membres désignés par le Bureau en consultation avec le Président du Groupe.

U.19 Bruits radioélectriques d'origine naturelle dus aux orages

Le Conseil de l'URSI,

considérant

(a) que la mission de la Commission E est de promouvoir la recherche scientifique dans le domaine des bruits électromagnétiques ambiants, bruits naturels dus aux décharges orageuses inclus;

(b) que le projet de l'Agence Spatiale Européenne (ASE) d'adjoindre à l'un des futurs satellites météorologiques un système permanent d'analyse, à l'échelle du globe, de l'activité orageuse serait susceptible d'améliorer de façon significative les prévisions à court et long terme des bruits radioélectriques;

(c) que des observations optiques de haute précision portant sur la localisation, l'heure et l'amplitude, mises en corrélation avec des observations radioélectriques, pourraient être utilisées comme données complémentaires dans l'élaboration de modèles spatio-temporels des bruits radioélectriques;

(d) qu'il est estimé que l'étude des bruits naturels dus aux orages contribuerait également à l'étude des siffleurs, de même qu'aux aspects géophysiques concernant la magnétosphère et le guide d'ondes Terre-Ionosphère ainsi qu'à ses limites;

(é) que, vu la haute compétence de ses Commissions E et H, il serait très avantageux que l'URSI participe à l'élaboration des projets portant sur le traitement, l'interprétation et l'application des données issues du détecteur de décharges orageuses;

(f) que l'URSI a souligné l'importance de données scientifiques pertinentes afin de disposer, pour notre société, de systèmes de communications fiables et de contribuer à la recherche géophysique, et qu'elle estime qu'un instrument, monté sur satellite, de cartographie des décharges orageuses contribuerait à la réalisation de cet objectif,

notant que les résultats d'un projet de ce genre présenteraient le plus vif intérêt pour l'Union Internationale des Télécommunications (UIT) et son organe technique, le Comité Consultatif International des Radiocommunications (CCIR),

recommande instamment que les possibilités offertes par ce projet de détecteur de décharges orageuses soient évaluées et que son intégration à un satellite météorologique soit sérieusement examinée.

U.20 Réseau mondial d'ionosondes

Le Conseil de l'URSI,

notant

(a) la recommandation de la Commission G concernant l'importance du bon fonctionnement du réseau mondial d'ionosondes;

(b) les importantes contributions apportées pendant de nombreuses années par les stations ionosphériques du réseau néo-zélandais, tant dans le domaine de la recherche scientifique que dans celui des communications;

(c) les importantes contributions apportées pendant de nombreuses années par la station ionosphérique de De Bilt, Pays-Bas;

(d) la nécessité que toutes les parties du monde soient couvertes par le réseau d'ionosondes,

exprime son inquiétude suite aux propositions de fermer les stations ionosphériques du réseau néo-zélandais et la station ionosphérique de De Bilt,

demande instamment

1. aux autorités responsables de Nouvelle Zélande de revoir leur décision et d'assurer le fonctionnement continu des stations;

2. aux autorités responsables des Pays-Bas de revoir leur décision et d'assurer le fonctionnement de la station de De Bilt et de l'observatoire de Wileveen qui lui est associé,

encourage les autorités du Chili à installer une ionosonde dans l'Ile de Pâques, ce qui constituerait une contribution considérable à l'Etude mondiale Ionosphère-Thermosphère (WITS), comblerait une des lacunes importantes du réseau mondial d'ionosondes et fournirait ainsi un apport essentiel à la base des données scientifiques et relatives aux communications servant à l'élaboration des prévisions.

II.21 Installation en Antarctique d'un radar strato-troposphérique et à diffusion incohérente

Le Conseil de l'URSI,

notant la recommandation conjointe de la Commission G (Radioélectricité ionosphérique et propagation) et de la Commission H (Ondes dans les plasmas),

considérant

(a) que, dans le passé, l'URSI a encouragé l'installation de grands systèmes de recherche (tels que les grands radars à diffusion incohérente) lorsqu'elle estimait ceux-ci susceptibles de produire des résultats importants et originaux;

(b) que la possibilité existe actuellement d'installer un radar moderne strato-troposphérique et à diffusion incohérente dans l'Antarctique;

(c) que les résultats scientifiques escomptés d'un tel système comprendraient: comblement du vide existant dans les recherches menées dans l'hémisphère Sud sur les différences dans le bilan des transferts d'énergie et de moment critique et dans la réponse de l'atmosphère; détails sur le système couplé thermosphère-ionosphère; données sur la dynamique de la troposphère-stratosphère affectant les variations dans la concentration d'ozone dans la basse stratosphère ainsi que les asymétries géographiques-géomagnétiques;

(d) que, si le système dans l'Antarctique était situé en un point magnétique conjugué par rapport à un grand système de l'hémisphère Nord, il permettrait l'étude approfondie de la conjugaison magnétique, et donc aussi de la topologie des particules et

champs de la magnétosphère,

recommande que l'installation d'un système de radar strato-troposphérique et à diffusion incohérente dans l'Antarctique soit encouragée.

U.22 Risques de brouillages pour les systèmes à diffusion incohérente

Le Conseil de l'URSI,

notant la recommandation conjointe des Commissions G (Radioélectricité ionosphérique et propagation) et H (Ondes dans les plasmas),

considérant

(a) que le radar à diffusion incohérente constitue un outil très approprié pour l'étude de la haute atmosphère terrestre, en particulier dans les régions polaires;

(b) que le système européen EISCAT constitue l'un des chaînons essentiels du réseau global des radars à diffusion incohérente;

(c) que les données en provenance du réseau de radars à diffusion incohérente sont fournies à la communauté scientifique internationale par l'intermédiaire de la base de données établie au Centre National de Recherche Atmosphérique (NCAR) à Boulder;

(d) que la congestion croissante du spectre, entraînée par l'expansion grandissante des services radio existants et le développement de nouveaux systèmes de communication pourrait provoquer des brouillages nocifs à ces précieux instruments scientifiques;

(e) plus spécifiquement, que la mise en oeuvre imminente, dans les pays nordiques, de services de radiotéléphonie cellulaire dans les bandes de fréquence débordant sur la bande du système EISCAT aura, selon toutes probabilités, des conséquences critiques sur le fonctionnement du système,

décide de porter ce problème à la connaissance des organismes internationaux (Union Internationale des Télécommunications (UIT), Comité International d'Enregistrement des Fréquences (IFRB), Comité Consultatif International des Radiocommunications (CCIR)), mais aussi des administrations nationales des télécommunications des pays nordiques, et de les inviter instamment à prendre les mesures appropriées pour éliminer, ou tout au moins atténuer, les problèmes de brouillage concernant EISCAT et les autres systèmes de radar à diffusion incohérente de façon à assurer la continuité de leur fonctionnement.

U.23 Expériences actives

Le Conseil de l'URSI,

notant la recommandation conjointe des Commissions G (Radioélectricité ionosphérique et propagation) et H (Ondes dans les plasmas),

considérant

(a) que le COSPAR et l'URSI ont tous deux des Groupes de travail sur les expériences actives, lesquels font double emploi dans de nombreux domaines et assurent des services analogues (notification des expériences actives à l'intention des scientifiques

faisant des observations);

(b) qu'un Groupe de travail commun au COSPAR et à l'URSI remplirait cette mission de façon plus efficace que les deux Groupes séparés actuels et permettrait de mieux coordonner les colloques sur ce sujet,

décide d'inviter le COSPAR à former en commun avec l'URSI un Groupe de travail sur les expériences actives, lequel comprendrait 4 co-présidents, dont deux désignés par le COSPAR et deux par l'URSI (co-présidents pour l'URSI: W.E. Gordon (EUA), Santimay Basu (EUA)).

U.24 Mesures de l'intensité du bruit solaire sur 10,7 cm

Le Conseil de l'URSI,

notant la recommandation de la Commission G (Radioélectricité ionosphérique et propagation),

considérant que la décision du Conseil National de Recherches du Canada de mettre fin à la longue série de mesures de l'intensité du bruit solaire sur 10,7 cm porte une atteinte sérieuse aux travaux de prévision et d'élaboration de modèles ionosphériques,

invite instamment l'Administration canadienne à renouveler son soutien aux mesures régulières de l'intensité du bruit solaire sur 10,7 cm.

U.25 Hommage au Professeur V.V. Migulin

Le Conseil de l'URSI,

considérant

(a) le rôle important joué par le Professeur V.V. Migulin dans les activités de l'URSI, aussi bien sur le plan administratif en tant que membre du Bureau que sur le plan scientifique, au sein de la Commission G;

(b) le grand succès rencontré par les colloques sur la Modification artificielle de l'ionosphère qu'il a organisés à Suzdal en 1983 et en 1986;

(c) la décision de la Commission G de tenir à l'avenir une série de colloques consacrés à ce même sujet,

notant que l'URSI pourra continuer de bénéficier de l'assistance et des conseils du Professeur Migulin sous différentes formes et, notamment, pour l'organisation de cette série de colloques,

décide de conférer au Professeur V.V. Migulin le titre de Président d'honneur de la série de colloques sur la Modification artificielle de l'ionosphère.

U.26 Subventions de l'UNESCO

Le Conseil de l'URSI,

considérant que les subventions annuelles accordées par l'UNESCO, par l'intermédiaire du CIUS ou sous forme de contrats directs, ont grandement contribué au succès du Programme des Jeunes Scientifiques

de l'Union, ainsi qu'à ses activités dans le domaine des publications et de l'assistance aux pays en développement,

décide de transmettre à l'UNESCO ses plus vifs remerciements pour l'appui considérable qui lui est ainsi fourni.

U.27 Programme des Jeunes Scientifiques

Le Conseil de l'URSI,

notant que l'Union a pu inviter 40 jeunes scientifiques, dont 11 venant de pays en développement, à participer aux travaux de l'Assemblée générale en Israël,

décide de transmettre l'expression de sa gratitude aux organisations qui ont si généreusement contribué à ce Programme par leur appui financier:

le Conseil International des Unions Scientifiques (CIUS),
le Comité du CIUS pour la Science et la Technologie dans les pays en développement (COSTED),
l'Organisation des Nations Unies pour l'Education, la Culture et la Science (UNESCO),
la Royal Society de Londres,
le Comité israélien de l'URSI.

U.28 Remerciements au Comité israélien de l'URSI

Le Conseil de l'URSI,

notant que le Comité organisateur israélien n'a pas épargné ses efforts pour assurer le succès de la XXIIe Assemblée générale de l'Union,

décide de transmettre l'expression de sa gratitude

1. au Comité israélien de l'URSI et à l'Académie des Sciences et Humanités d'Israël pour leur invitation à tenir la XXIIe Assemblée générale à Tel Aviv et, en particulier, au Dr. J. Shapira, Président du Comité israélien;

2. aux membres du Comité organisateur pour la qualité des dispositions pratiques mises en oeuvre pour cette Assemblée.

RÉSOLUTIONS ET RECOMMANDATIONS DES COMMISSIONS ET COMITÉS

COMMISSION A - METROLOGIE ELECTROMAGNETIQUE

A.1 Comparaisons de temps

La Commission A,

considérant

(a) qu'il est nécessaire, du point de vue scientifique, de procéder à des comparaisons de précision supplémentaires en temps et en fréquence entre les échelles de temps nationales et les nouveaux étalons de fréquence en cours de développement;

(b) qu'il y a une inadéquation entre la précision des comparaisons qu'on peut effectuer et les possibilités des meilleurs étalons de fréquence et horloges atomiques, lesquels pourraient être accessibles à tout laboratoire intéressé;

(c) qu'il est procédé actuellement à l'évaluation d'un certain nombre de méthodes de comparaison de temps et de fréquence, y compris l'interférométrie à très grande base, la transmission de signaux de bruit pseudo-aléatoires sur trajet simple et aller-retour, et les techniques LASER au sol et par satellite,

recommande

1. que les études sur toutes les méthodes de comparaison de temps, déjà proposées ou nouvelles, soient activement poursuivies;

2. que des campagnes de comparaisons mutuelles simultanées soient organisées;

3. que ces activités soient coordonnées et que les résultats en soient publiés sous les auspices du Bureau International des Poids et des Mesures (BIPM).

A.2 Editions futures du Registre de l'URSI des Laboratoires nationaux d'étalons

La Commission A,

considérant que le Registre de l'URSI des Laboratoires nationaux d'étalons fournit des informations utiles sur les établissements qui, de par le monde, s'occupent de systèmes d'étalonnage des quantités électromagnétiques;

recommande que les futures éditions du Registre soient considérées comme des documents officiels de l'URSI (et non pas seulement propres à la Commission A) et qu'elles soient imprimées et distribuées par une firme d'édition commerciale,

charge le Président du Groupe de travail sur les Laboratoires nationaux d'étalons de négocier les termes d'un contrat approprié avec une

Maison d'édition, pour approbation par le Conseil de l'URSI

Note: Cette recommandation est renvoyée au Comité permanent des publications.

A.3 Mise à jour du Registre de l'URSI des Laboratoires nationaux d'étalons

La Commission A,

considérant les nouveaux arrangements proposés pour la publication du Registre de l'URSI des Laboratoires nationaux d'étalons, lesquels découlent des Recommandations A.5 (Florence 1984) et A.2 (Tel Aviv 1987);

recommande que la prochaine édition révisée du Registre soit publiée en 1988 et qu'il soit ensuite procédé à sa mise à jour à intervalles de quatre ans,

invite ses Membres officiels à communiquer au Président du Groupe de travail toutes informations utiles (ou un état néant) pour la mise à jour de la rubrique concernant leur pays, et cela pour le 31 décembre 1987 et, ultérieurement, à intervalles de quatre ans.

A.4 Etalons de métrologie quantique et constantes fondamentales

La Commission A,

considérant

(a) que les étalons de mesures physiques, en particulier les étalons relatifs aux unités électriques fondamentales et dérivées, constituent le fondement de la mesure précise de paramètres importants en radioélectricité scientifique;

(b) que l'utilisation des phénomènes quantiques entraîne actuellement des changements dans la réalisation de ces étalons;

(c) qu'il est nécessaire de connaître la valeur exacte de certaines constantes fondamentales en vue de la réalisation de ces étalons;

(d) qu'il est nécessaire de concrétiser le mètre selon la définition qui en est donnée dans le Système International à partir des fréquences de la gamme visible;

(e) que les mesures de fréquences optiques sont importantes pour la détermination des constantes fondamentales et que seul un nombre restreint de laboratoires pratiquent ces mesures;

(f) que le Comité International des Poids et Mesures (CIPM) doit prendre dans un proche avenir des décisions sur les unités électriques,

recommande que tous les laboratoires nationaux d'étalons soient encouragés

1. à poursuivre activement leurs travaux sur la détermination exacte des constantes fondamentales,

2. à poursuivre activement leurs travaux en vue de la réalisation

d'étalons de métrologie quantique pratiques,

3. à favoriser le développement de méthodes permettant la mesure des fréquences visibles avec une précision équivalant à celle qui est actuellement atteinte par les étalons de fréquence primaires,

4. à communiquer leurs résultats aux autres organisations intéressées, et plus spécialement au Bureau International des Poids et Mesures (BIPM).

A.5 Amélioration des étalons de fréquence radioélectrique dans la région allant des longueurs d'onde millimétriques aux longueurs d'onde submillimétriques

La Commission A,

considérant

(a) l'importance croissante que la région allant des longueurs d'onde millimétriques aux longueurs d'onde submillimétriques revêt pour diverses applications scientifiques et techniques, telles que la communication et le transfert de données, le radar, la télédétection, la recherche sur l'environnement, la radioastronomie et la fusion nucléaire, ainsi que pour la compatibilité électromagnétique;

(b) la nécessité de disposer de meilleurs étalons et méthodes métrologiques pour ces applications, afin de réaliser des mesures fiables

(i) des quantités de base aux radiofréquences: puissance, température de bruit et coefficients de diffusion,

(ii) de la permittivité et de la perméabilité des matériaux utilisés aux radiofréquences,

(iii) tant pour l'utilisation de modes guidés que de modes libres,

recommande de consacrer une attention accrue aux recherches fondamentale et appliquée sur les étalons de fréquence radioélectrique et les méthodes de mesure, ainsi que sur les méthodes de mesure des matériaux, des longueurs d'onde millimétriques aux submillimétriques.

A.6 Groupe de travail sur les Interactions entre champs électromagnétiques et systèmes biologiques, et mesures correspondantes

La Commission A,

considérant les recommandations adoptées lors des XVIIIe, XIXe, XXe et XXIe Assemblées générales de l'URSI, lesquelles expriment l'intérêt de l'Union pour les effets des champs électromagnétiques sur les systèmes biologiques, et soulignent la nécessité de la collaboration internationale des physiciens, des biologistes et des médecins et de leurs organisations pour améliorer la connaissance des interactions entre systèmes biologiques et champs électromagnétiques,

notant que cette discipline présente de l'intérêt pour plusieurs autres Commissions de l'URSI,

recommande

1. que le Groupe de travail sur les Interactions entre champs électromagnétiques et systèmes biologiques, et les mesures correspondantes soit maintenu avec, à sa tête, un Président et deux Vice-Présidents, dont l'un représentant la Commission A l'autre les autres Commissions de l'URSI;

2. que les membres du Groupe de travail soient désignés par son Président, en consultation avec les Comités Membres de l'Union;

3. que les autres Commissions de l'URSI soient invitées à désigner chacune un représentant au sein du Groupe de travail;

4. que le Groupe de travail soit invité à poursuivre ses efforts

   (i) pour organiser des colloques ayant pour sujet les interactions entre les champs électromagnétiques et les systèmes biologiques,

   (ii) pour collaborer avec d'autres organismes dans la planification et l'organisation de ces colloques,

   (iii) pour fournir un appui actif aux organisations internationales qui s'occupent des influences des champs électromagnétiques sur la santé et des problèmes de sécurité qui s'y rattachent,

   (iv) pour promouvoir les activités scientifiques dans son domaine d'intérêt.

COMMISSION B - ONDES ET CHAMPS

B.1 Colloque sur la Théorie des ondes électromagnétiques

La Commission B,

considérant

(a) que les colloques de l'URSI sur la Théorie des ondes électromagnétiques se sont succédé à intervalles de trois ans depuis plus de 30 ans;

(b) que ces colloques revêtent une importance majeure et représentent l'essentiel des activités de la Commission B entre les Assemblées générales,

confirme que le prochain colloque de cette série aura lieu à Stockholm (Suède) en août 1989.

B.2 Copatronage de conférences internationales

La Commission B,

considérant que certaines conférences internationales à venir présent un intérêt direct pour la Commission,

recommande que l'URSI accorde son copatronage aux conférences

suivantes:

1. les trois Conférences européennes annuelles sur les Hyperfréquences en 1988, 1989 et 1990 (la Conférence qui se tiendra à Stockholm, Suède, du 12 au 17 septembre 1988 sera la 18e de la série),
2. le Colloque sur les Antennes et la théorie des champs électromagnétiques, Shangai, Chine 29 août - 1er septembre 1989,
3. le 9e Colloque sur les communications en hyperfréquences (MICROCOLL), Budapest, Hongrie, 1990,
4. la Conférence internationale sur les antennes et la propagation (ICAP 1989).

B.3 Groupe de travail sur l'inversion de la diffusion

La Commission B,

considérant

(a) l'intérêt sans cesse grandissant pour les problèmes d'inversion de la diffusion dans une vaste gamme de domaines;

(b) la nécessité de contacts appropriés entre les chercheurs qui utilisent les méthodes d'inversion pour différentes applications;

(c) le succès rencontré par le colloque sur l'inversion de la diffusion, qui s'est tenu pendant deux jours au cours de la présente Assemblée générale,

recommande que le Groupe de travail sur l'inversion de la diffusion soit maintenu, sous la présidence du Prof. D.L. Jaggard (EUA).

B.4 Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel

La Commission B,

considérant les activités développées par le Groupe de travail sur la mesure des formes d'onde dans le domaine temporel au cours des trois dernières années, et en particulier les deux séances communes à toutes les Commissions organisées au cours de la présente Assemblée générale,

recommande le maintien de ce Groupe de travail inter-Commissions pendant les trois années à venir.

COMMISSION C - SIGNAUX ET SYSTEMES

C.1 Publications de l'URSI

La Commission C

recommande

1. que le "Bulletin d'Information de l'URSI" continue de paraître sous sa forme actuelle;
2. que la "Review of Radio Science" continue d'être publiée à l'occasion des Assemblées générales de l'URSI;
3. que l'initiative concernant la revue de l'URSI sur les signaux, les systèmes et l'électronique soit soutenue.

C.2 Copatronage de conférences

La Commission C

recommande le patronage par l'URSI des conférences suivantes:

1. Colloque de l'URSI sur les Signaux, les systèmes et l'électronique, qui sera organisé en commun par les Commissions C et D en 1989,
2. le 9e Colloque sur les Communications en hyperfréquences (MICROCOLL), Budapest, Hongrie, en 1990 à la suite de la XXIIIe Assemblée générale de l'URSI,
3. les Conférences européennes sur les communications optiques (ECOC) en 1988, 1989 et 1990,
4. la Conférence européenne sur la théorie et la conception des circuits, Londres, Royaume-Uni, septembre 1989,
5. la Conférence sur le Traitement numérique des signaux, Florence, Italie, 1990,
6. les Séminaires internationaux de Zurich sur les Communications numériques en 1988 et 1990.

C.3 "Review of Radio Science 1987-1989"

La Commission C

décide de désigner le Prof. J.G. Lucas comme rédacteur de la Commission pour la prochaine édition de "Review of Radio Science".

C.4 Représentants de la Commission C

La Commission C

décide de désigner ses représentants comme suit:

1. le Prof. J.G. Lucas au Comité de liaison URSI-CCIR-CCITT,
2. le Prof. S. Halme au Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel,
3. le Prof. J.L. Lacoume au Groupe de travail commun des Commissions C et H sur l'Analyse des ondes.

COMMISSION D - DISPOSITIFS ELECTRONIQUES ET OPTIQUE ET APPLICATIONS

D.1 "Review of Radio Science"

La Commission D,

considérant qu'il est souhaitable de mettre au point un mécanisme qui permettra

(a) d'éviter les lacunes considérables qui interviennent lorsque certains Comités de l'URSI omettent d'envoyer leurs contributions aux rédacteurs des différentes Commissions;

(b) d'assurer la valeur de référence de la "Review of Radio Science",

recommande que, lors de l'appel aux contributions, la procédure adoptée à titre expérimental par la Commission D pour l'édition de 1981 de la "Review of Radio Science" soit appliquée, à savoir:

1. inviter d'éminents spécialistes à faire le point d'un certain nombre de sujets sélectionnés du domaine d'activité de chacune des Commissions,

2. selon la pratique actuelle, inviter les Membres officiels des Commissions à présenter les contributions de leurs pays, lesquelles seront envoyées aux spécialistes par le rédacteur de la Commission.

D.2 "Review of Radio Science 1987-1989"

La Commission D

décide de désigner Mme J. Hénaff comme rédacteur de la Commission pour la prochaine édition de la "Review of Radio Science".

D.3 Proposition relative à une nouvelle Revue sur les signaux, les systèmes et l'électronique

La Commission D,

ayant pris connaissance de la proposition de lancer une nouvelle revue sur les signaux, les systèmes et l'électronique,

recommande

1. qu'une analyse soigneuse des revues existant dans ce domaine soit effectuée avant toute prise de décision à ce sujet;

2. que, dans le cas où il serait décidé de lancer la nouvelle revue, celle-ci contienne principalement et dans un premier stade des articles de synthèse, et cela jusqu'à ce que la réputation de la revue soit bien assise.

D.4 Assistance aux pays en développement

La Commission D,

considérant la suggestion de fournir une assistance aux pays en développement en proposant des conférenciers et des programmes

pour des séminaires et ateliers,

recommande

1. que l'Académie des Sciences du Tiers Monde soit officiellement consultée à propos de cette suggestion, ainsi que sur les modalités de cette assistance;

2. que l'Union Internationale des Télécommunications soit consultée de manière analogue.

D.5 Copatronage des Conférences européennes sur les communications optiques

La Commission D

recommande

1. le copatronage par l'URSI des Conférences européennes sur les communications optiques (ECOC) en 1988, 1989 et 1990;

2. la désignation du Prof. W.A. Gambling, Vice-Président du Comité d'organisation, comme représentant de l'URSI pour la Conférence de 1988.

D.6 Groupe de travail commun des Commissions D et E

La Commission D

recommande la formation d'un Groupe de travail commun aux Commissions D et E sur la susceptibilité des circuits intégrés et des dispositifs semi-conducteurs aux dommages causés par les phénomènes transitoires, avec le Dr. T. Itoh (EUA) comme représentant de la Commission D.

D.7 Comité de liaison URSI-CCIR-CCITT

La Commission D

décide de désigner le Prof. T. Okoshi (Japon) comme représentant de la Commission au Comité de liaison URSI-CCIR-CCITT.

COMMISSION E - BRUITS ET BROUILLAGES ELECTROMAGNETIQUES

E.1 Groupes de travail

La Commission E

décide

1. de maintenir, pendant les trois années à venir, les Groupes de travail suivants:

   E.1 Bruits artificiels (Président: A.D. Spaulding, EUA)
   E.2 Bruits naturels (Président: J. Hamelin, France)
   E.3 Effets nocifs des phénomènes transitoires sur les équipements (Président: V. Scuka, Suède)

E.4 Fondement scientifique de la maîtrise des bruits et des brouillages (Président: C. Baum, EUA);

2. de former, en commun avec la Commission D, un Groupe de travail sur les Effets des phénomènes transitoires sur les circuits intégrés, les transistors, les ordinateurs, etc. (Co-Président pour la Commission E: V. Scuka, Suède, Co-Président pour la Commission D: T. Itoh, EUA) et d'organiser la première réunion de ce Groupe en conjonction avec le Symposium de Zurich sur la Compatibilité électromagnétique en mars 1989.

E.2 Colloques sur la Compatibilité électromagnétique des séries de Zurich et de Wrocław

La Commission E

recommande que l'URSI continue d'accorder son copatronage aux colloques sur la Compatibilité électromagnétique des séries de Zurich et de Wrocław, cette collaboration s'étant avérée fructueuse.

E.3 Bruits radioélectriques

La Commission E,

considérant

(a) que le Rapport 322 (1964) du CCIR, qui contient les cartes mondiales des niveaux de bruits atmosphériques dus aux orages, a été établi, et révisé en 1984, en l'absence d'un nombre suffisant de données de l'hémisphère Sud;

(b) que le Rapport 258 du CCIR sur les bruits artificiels a été établi sur base des données acquises aux Etats-Unis il y a plus de 20 ans,

recommande

1. que, dans le but de vérifier les prévisions du nouveau Rapport 322 du CCIR, il soit procédé à l'acquisition de données sur les bruits atmosphériques, et cela en des sites calmes et sur une période d'au moins deux ans, en utilisant les équipements du type spécifié par le Groupe de travail de la Commission E sur les bruits naturels, et que priorité soit donnée à l'hémisphère Sud;

2. qu'il soit procédé à l'acquisition de données sur les bruits artificiels dans les différentes régions du monde, et que priorité soit donnée aux sites autres que les Etats-Unis;

3. que le Comité permanent de l'URSI pour les pays en développement joue un rôle prépondérant dans la coordination des mesures de bruits dans les pays en développement, et que priorité soit donnée à l'hémisphère Sud pour ce qui concerne les bruits atmosphériques dus aux orages.

E.4 Gestion du spectre

La Commission E,

considérant

(a) qu'il est nécessaire d'informer les pays en développement sur les

aspects scientifiques et techniques de la gestion du spectre, sur les problèmes des bases de données, les mesures et l'établissement de modèles analytiques;

(b) que l'URSI jouit d'une certaine compétence pour ce qui concerne les aspects scientifiques et techniques de la gestion du spectre et les disciplines connexes;

(c) que le Comité Consultatif International des Radiocommunications (CCIR) et le Comité International d'Enregistrement des Fréquences (IFRB) poursuivent sans discontinuer leurs études sur la gestion du spectre,

recommande que l'URSI collabore avec le CCIR et les autres organes de l'Union Internationale des Télécommunications (UIT) pour rendre toutes les informations appropriées disponibles sous forme de cassettes vidéo, de conférences magistrales, de conférenciers itinérants, etc., et que cette collaboration soit coordonnée par le Comité de liaison URSI-CCIR-CCITT.

COMMISSION F - PROPAGATION DES ONDES ET TELEDETECTION

F.1 Collaboration avec l'IGARSS

La Commission F

décide

1. de continuer de collaborer activement à l'organisation des colloques internationaux annuels de Géoscience et de Télédétection (International Geoscience and Remote Sensing Symposia (IGARSS)), en invitant son Président à désigner un nombre adéquat de représentants de l'URSI, en consultation avec le Membre officiel du Comité Membre de l'Union dans le pays où se tient le colloque;
2. de faire en sorte que les résumés de l'URSI soient publiés dans un volume distinct de celui des Actes du colloque;
3. de restreindre son rôle à l'étude de l'interaction des ondes électromagnétiques avec le milieu (y compris les problèmes relatifs aux instruments).

F.2 "Review of Radio Science 1987-1989"

La Commission F

décide de désigner le Dr. G. Brussaard, Vice-Président de la Commission, comme rédacteur pour la prochaine édition de la "Review of Radio Science".

F.3 Comité de liaison URSI-CCIR-CCITT

La Commission F,

notant avec satisfaction la poursuite de sa collaboration traditionnelle avec le Comité Consultatif International des Radiocommunications (CCIR), en particulier avec la Commission d'études 5 de ce Comité,

décide de désigner les personnalités suivantes comme représentants au Comité de liaison URSI-CCIR-CCITT: A. Blomquist (Suède), L. Boithias (France), F. Fedi (Italie) et M.P.M. Hall (Royaume-Uni).

F.4 Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel

La Commission F

décide de désigner le Dr. Hans Liebe (EUA) comme représentant au Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel.

F.5 Colloques et Conférences 1988-1990

La Commission F

recommande l'organisation ou le copatronage, selon le cas, des conférences suivantes:

1. Colloque International de Géoscience et de Télédétection (IGARSS):

   1988 - 13-16 septembre, Edimbourg, Royaume-Uni
   1989 - 27 juin - 1er juillet, Vancouver, Canada
   1990 - Europe;

2. Symposium de la Commission F sur la Propagation des ondes et la télédétection, automne 1989, Nice, France (Président: J.P. Mon, France);

3. Problèmes de signature en télédétection, printemps 1990, Massachusetts, EUA (Président: C. Swift, EUA);

4. Ecole de radar atmosphérique (en commun avec la Commission G), novembre 1988, Kyoto, Japon (Président: S. Kato, Japon);

5. Méthodes radioélectriques pour l'étude du sous-sol terrestre (Président: D. Gjessing, Norvège).

COMMISSION G - RADIOELECTRICITE IONOSPHERIQUE ET PROPAGATION

G.1 Observations à haute résolution de la densité électronique de l'ionosphère

La Commission G,

considérant la nécessité d'acquérir des données exactes à haute résolution temporelle et spatiale de la densité électronique de l'iono-

sphère pour les prévisions de propagation des ondes radioélectriques,

notant

(a) que les radars à diffusion incohérente sont mis en service chaque année pendant plusieurs périodes de journées mondiales coordonnées et rassemblent des données sur la densité électronique et la température;

(b) que ces périodes de service des radars à diffusion incohérente font partie intégrante de programmes coordonnés dans le cadre de l'Etude mondiale Ionosphère-Thermosphère (WITS);

(c) qu'il existe un grand nombre d'ionosondes à incidence verticale susceptibles de fournir des séquences de profils rapides de la densité électronique, lesquelles permettent d'étalonner les profils obtenus au moyen des radars à diffusion incohérente installés dans les mêmes stations;

(d) que, pour l'étude des effets des ondes de gravité sur la distribution de la densité électronique, il est nécessaire de disposer de données plus exactes sur la "vallée" entre les couches E et F,

recommande que soient organisées des campagnes mondiales pour la production de séquences d'ionogrammes rapides (5 min.) qui couvriraient les périodes d'observations coordonnées prévues pour les radars à diffusion incohérente.

G.2 Système de surveillance par satellite

La Commission G,

considérant

(a) que la cartographie empirique des paramètres d'ionisation maximale de l'ionosphère terrestre présente un grand intérêt pour les prévisions de propagation des ondes radioélectriques, l'élaboration de modèles empiriques de la densité électronique dans le cadre de l'Ionosphère Internationale de Référence (IRI) et les recherches aéronomiques;

(b) que des cartes de ce genre, dérivées des observations par satellite, n'ont pu être obtenues que tout récemment par des observations directes à l'échelle mondiale, par exemple au moyen du satellite japonais ISS-b et du satellite soviétique Intercosmos 9,

notant que les cartes obtenues au moyen d'un satellite couvrent une longue période de temps de sorte que les variations saisonnières et les variations diurnes se trouvent entremêlées,

recommande l'établissement d'un système de surveillance par satellite, composé de plusieurs satellites en orbite polaire, qui pourra fournir un atlas global dans un bref intervalle de temps.

G.3 Mesures du champ et des bruits radioélectriques en ondes décamétriques

La Commission G,

considérant le programme d'activités proposé par le Comité permanent pour les pays en développement,

appuie la proposition de ce Comité d'organiser et de coordonner, dans différents pays tropicaux et subtropicaux, un programme de mesures du champ et des bruits radioélectriques en ondes décamétriques sur des fréquences sélectionnées,

exprime sa volonté de collaborer avec le Comité pour les pays en développement dans la planification de ce programme.

G.4 Groupes de travail

La Commission G

décide

1. de maintenir les Groupes de travail suivants:

   G.1 Groupe conseil du réseau d'ionosondes (INAG)
   (Président: J.A. Gledhill, Afrique du Sud),

   G.2 Etude de l'ionosphère au moyen de satellites à balise
   (Président: R. Leitinger, Autriche);

2. de former les Groupes de travail suivants:

   G.3 Elaboration de modèles ionosphériques
   (Président: C. Rush, EUA)

   Mandat: Promouvoir les méthodes d'élaboration de modèles physiques et empiriques de l'ionosphère à utiliser pour les communications et la radioélectricité scientifique;

   G.4 Informatique ionosphérique
   (Président: B.W. Reinisch, EUA)

   Mandat: Promouvoir l'application des méthodes de la théorie de l'information à l'acquisition, au traitement, au stockage et à la distribution des données ionosphériques;

   G.5 Etudes ionosphériques aux basses latitudes
   (Président: S.M. Radicella, Argentine)

   Mandat: Promouvoir la collaboration internationale dans l'étude de l'ionosphère de basse latitude, en particulier pour les applications dans le domaine des communications.

G.5 Groupes de travail communs aux Commissions G et H

La Commission G

décide de maintenir les Groupes de travail communs aux Commissions G et H comme suit:

GH.1 Diffusion incohérente
(Co-Présidents: V.B. Wickwar, EUA, K. Schlegel, RFA);

GH.2 Expériences, simulation et analyse par ordinateur des processus d'ondes dans les plasmas
(Co-Présidents pour la Commission H: H. Matsumoto, Japon,
M. Abdalla, EUA,
Co-Président pour la Commission G: S. Ossakow, EUA).

G.6 Groupe de travail commun à la Commission G et au COSPAR

La Commission G

décide de maintenir le Groupe de travail URSI-COSPAR sur l'Ionosphère Internationale de Référence (IRI) avec, comme Président, L. Bossy (Belgique).

G.7 Colloques 1988-1990

La Commission G

recommande que l'URSI accorde son patronage et son appui financier aux colloques suivants:

1. Colloque sur les Processus à grande échelle dans l'ionosphère et la thermosphère, décembre 1989, Boulder, Colorado, EUA (Organisateurs: V.B. Wickwar et A. Richmond, EUA), en commun avec la Commission H;
2. Colloque sur la Modification artificielle de l'ionosphère, 1988 ou 1989 (Organisateurs: V.V. Migulin, URSS et W.E. Gordon, EUA), en commun avec la Commission H;
3. Etude de l'ionosphère au moyen de satellites à balise, 18-22 avril 1988, Xinxiang, Henan, Chine (Organisateurs: Huang Xuegin et Gao Chong, Chine; Coordonnateur; R. Leitinger, Autriche);
4. Ecole internationale de radar atmosphérique, 24-28 novembre 1988, Kyoto, Japon (Organisateur: S. Kato, Japon, en commun avec la Commission F.

COMMISSION H - ONDES DANS LES PLASMAS

H.1 Patronage de colloques et de conférences

La Commission H,

recommande que l'URSI accorde son patronage aux conférences suivantes:

1. Précipitation de particules induite par les ondes et interaction entre les ondes et les particules (URSI-WIPP 1989), Dunedin, Nouvelle Zélande, 5-11 février 1989 (Organisateurs: R.L. Dowden, Nouvelle Zélande, H. Matsumoto, Japon et U.S. Inan, EUA), Mode C;
2. 4e Ecole internationale pour les simulations dans l'espace, Kyoto, Japon, novembre 1989 (Organisateur: H. Matsumoto, Japon), Mode B;
3. 19e Conférence internationale sur les phénomènes dans les gaz ionisés, Belgrade, Yougoslavie, 10-14 juillet 1989 (Organisateur: J. Purić, Yougoslavie), Mode B.

H.2 Groupes de travail inter-Unions URSI-IAGA

La Commission H

décide

1. de maintenir le Groupe de travail URSI/IAGA.1 sur le Sondage électromagnétique passif de la magnétosphère (Co-Président pour l'URSI: U.S. Inan, EUA);

2. de maintenir, en commun avec la Commission G, le Groupe de travail URSI/IAGA.2 sur les Instabilités des ondes dans les plasmas (Co-Président pour la Commission H: T. Sato, Japon; Co-Président pour la Commission G: S. Ossakow, EUA).

H.3 Groupes de travail communs

La Commission H

décide de maintenir les Groupes de travail communs suivants:

CH.1 Analyse des ondes (Co-Président pour la Commission H: D. Jones, Royaume-Uni);

GH.1 Diffusion incohérente (Co-Présidents pour la Commission H: V.B. Wickwar, EUA et K. Schlegel, RFA);

CH.2 Expériences, simulation et analyse par ordinateur des processus d'ondes dans les plasmas (Co-Présidents pour la Commission H: H. Matsumoto, Japon et M. Abdalla, EUA, Co-Président pour la Commission G: S. Ossakow, EUA).

RESOLUTION CONJOINTE DES COMMISSIONS G ET H

GH.1 "Review of Radio Science 1987-1989"

Les Commissions G et H

décident de désigner un seul rédacteur pour la préparation du rapport comun des Commissions G et H qui sera inclus dans l'édition de 1990 de la "Review of Radio Science",

recommandent que le Rédacteur désigne sept rédacteurs adjoints qui prépareront des rapports de synthèse internationaux sur les sujets suivants:

(1) Techniques
(2) Plasmas environnant la Terre et les planètes
(3) Physique de la propagation des ondes
(4) Applications de la propagation des ondes
(5) Instabilités dans les plasmas
(6) Expériences actives
(7) Interactions entre les ondes et les particules.

COMMISSION J - RADIOASTRONOMIE

J.1 Télescope israélo-égyptien d'interférométrie à très grande base

La Commission J,

reconnaissant

(a) que l'interférométrie à très grande base revêt une importance considérable en astronomie et en astrophysique, ainsi que dans l'étude des mouvements de la Terre et de l'écorce terrestre;

(b) que la pratique des mesures radioastronomiques constitue une excellente base pour la formation des jeunes scientifiques et ingénieurs;

(c) que, par définition, l'interférométrie à très grande base est une activité internationale qui favorise les contacts et les échanges entre scientifiques de nombreux pays,

notant en outre

(d) que la communauté des radioastronomes israéliens a marqué son intérêt pour la construction et l'exploitation d'un télescope d'interférométrie à très grande base, et a proposé au Comité égyptien de l'URSI de s'associer à ce projet;

(e) que, de par sa situation géographique, ce télescope permettrait d'augmenter de manière significative le rendement du Réseau européen d'interférométrie à très grande base (EVN) en ménageant des lignes de l'ordre de 3000 km de long, lesquelles apporteraient une amélioration de la résolution et de la qualité des images des sources radioélectriques cosmiques;

(f) que ce télescope occuperait une position stratégique pour l'étude géodésique des plaques tectoniques fracturées dans la région de la Méditerrannée,

recommande les caractéristiques suivantes pour ce télescope:

(1) le diamètre serait de l'ordre de 25-40 m pour assurer une sensibilité satisfaisante,
(2) le télescope et les appareils de réception seraient compatibles avec les éléments du Réseau européen et des autres télescopes d'interférométrie à très grande base de par le monde,
(3) le télescope fonctionnerait sur des fréquences allant jusqu'à au moins 23 GHz,

invite instamment les agences concernées à fournir tout l'appui nécessaire à l'adoption et à la mise en oeuvre de ce projet.

J.2 Patronage de colloques

La Commission J

recommande que l'URSI patronne les colloques suivants qui seront organisés au cours des trois années à venir:

1. Ecole d'été d'interférométrie à très grande base pour jeunes scientifiques, septembre 1988, Bologne, Italie (Organisateurs: M. Felli, Italie et R.E. Spencer, Royaume-Uni);
2. "Radioastronomical Seeing", mai 1988, Beijing, Chine (Organisateur: J. Baldwin, Royaume-Uni);
3. Limites de l'astronomie observationnelle, août-septembre 1989, Sydney, Australie (Organisateur: R.H. Frater, Australie);
4. Radioastronomie en ondes submillimétriques, septembre 1988, Hawaii (Organisateur: T. Phillips, EUA).

J.3 "Review of Radio Science 1987-1989"

La Commission J

décide que le rapport de la Commission pour la prochaine édition de "Review of Radio Science" sera établi par un groupe de rédacteurs, chacun traitant un sujet spécialisé, et le Président de la Commission comme Rédacteur en chef.

J.4 Commission inter-Unions pour l'attribution de fréquences à la radioastronomie et à la science spatiale (IUCAF)

La Commission J,

notant les sérieuses menaces qui pèseront sur la radioastronomie au cours des trois années à venir,

recommande

1. que le nombre de représentants de l'URSI au sein de la Commission inter-Unions pour l'attribution de fréquences à la radioastronomie et à la science spatiale (IUCAF) soit porté à quatre;
2. que l'URSI fournisse le plus large appui financier possible à l'IUCAF pendant cette période cruciale.

J.5 Comité de liaison URSI-CCIR-CCITT

La Commission J

décide

1. de désigner B.J. Robinson (Australie) comme représentant au Comité de liaison URSI-CCIR-CCITT;
2. d'inviter son Président à désigner un deuxième représentant à ce Comité.

COMITE DE LIAISON URSI-CCIR-CCITT

1. Collaboration avec le Comité permanent pour les pays en développement

Le Comité de liaison URSI-CCIR-CCITT,

considérant

(a) que le Comité permanent de l'URSI pour les pays en développement a pris l'initiative d'études et de recherches dont la première phase a produit les résultats suivants:

- "Handbook on Radio Propagation for Tropical and Subtropical Countries", 1987;
- Atelier birégional Amérique latine/Afrique sur la recherche en propagation des ondes et les applications (y compris la gestion du spectre), Buenos Aires, Argentine, 1987 (Actes comprenant 190 pages), lequel a recommandé de nouveaux domaines d'étude dont: acquisition des données ionosphériques, phénomènes de E sporadique, phénomènes de scintillation aux basses latitudes, réfractivité, atténuation due aux précipitations, compatibilité électromagnétique, gestion du spectre;

(b) que le Comité permanent pour les pays en développement a sollicité l'assistance du Comité de liaison URSI-CCIR-CCITT pour le seconder dans la mise en oeuvre de ces recommandations;

(c) que les résultats des mesures effectuées dans les pays en développement dans les domaines définis par le Comité permanent pour les pays en développement sont nécessaires au CCIR pour la conduite de ses travaux,

recommande

1. que les Commissions compétentes de l'URSI examinent chacun de ces sujets afin de recommander des priorités du point de vue scientifique, ainsi que les méthodes de normalisation des équipements et de mesure et la durée des observations nécessaire pour conférer une valeur réelle aux données;

2. que le CCIR soit invité à proposer des priorités à l'URSI;

3. que le Comité permanent pour les pays en développement et les Commissions appropriées de l'URSI collaborent avec les Commissions d'études du CCIR pour programmer les campagnes de mesures dans les pays en développement et, lorsqu'il sera jugé opportun, organiser des réunions ou des colloques communs sur des sujets d'intérêt courant (par exemple, taux des précipitations et atténuation);

4. que le Comité permanent pour les pays en développement établisse des contacts de travail avec les Groupes de travail intérimaires du CCIR et participe si besoin à leurs travaux pour faciliter la coordination des études;

5. que l'URSI fournisse au Comité permanent pour les pays en développement un appui financier pour lui permettre de prendre part

aux réunions de coordination et de programmation.

2. Collaboration avec l'Union Internationale des Télécommunications (UIT)

Le Comité de liaison URSI-CCIR-CCITT,

notant la recommandation formulée par la Conférence de Corsendonk (mars 1987) selon laquelle il est souhaitable de relancer la collaboration entre l'URSI et les Comités techniques de l'Union Internationale des Télécommunications (CCIR, CCITT et IFRB),

recommande la mise en oeuvre, au cours des trois années à venir, du programme d'activités ci-dessous:

1. l'organisation d'un atelier, dans le cadre du Colloque de Zurich sur la Compatibilité électromagnétique en 1989, pour passer en revue les documents du CCIR relatifs aux bruits et aux brouillages (F.L. Stumpers, Pays-Bas);
2. l'organisation éventuelle, dans le cadre du Colloque de Zurich sur la Compatibilité électromagnétique en 1989, d'une séance commune Commission E de l'URSI/CCIR consacrée à la gestion du spectre (R.D. Parlow, EUA);
3. l'organisation éventuelle d'une réunion, impliquant la Commission F, le Comité pour les pays en développement de l'URSI et le CCIR, pour examiner la question des données disponibles et la mesure du taux de précipitations et de l'atténuation (R.K. Crane, EUA, S. Radicella, Argentine);
4. l'organisation éventuelle d'un atelier consacré à la contribution scientifique de l'URSI dans le domaine des stratégies à appliquer pour la planification à long terme des télécommunications (J. Shapira, Israël);
5. la participation d'un représentant de l'URSI à l'Assemblée plénière du CCITT à Melbourne, Australie en 1988 (J.G. Lucas, Australie);
6. réunions du Comité de liaison URSI-CCIR-CCITT dans le cadre de colloques appropriés;
7. une contribution de la Commission E de l'URSI, à soumettre à la Commission d'études 6 du CCIR, sur les équipements qui sont recommandés pour la mesure des bruits radioélectriques;
8. une contribution commune des Commissions A et F de l'URSI, à soumettre à la Commission d'études 5 du CCIR, sur les données relatives aux constantes fondamentales en ondes décamétriques (G. Hagn, EUA);
9. encourager les scientifiques associés à l'URSI à soumettre des articles pour publication dans le "Journal des Télécommunications";
10. fournir aux Comités Consultatifs de l'UIT, aux fins de formation, des cassettes vidéo d'exposés sélectionnés faits par des conférenciers de l'URSI.