

**UNION RADIO-SCIENTIFIQUE INTERNATIONALE
INTERNATIONAL UNION OF RADIO SCIENCE**



Comptes Rendus des Assemblées Générales de l'URSI

Proceedings of URSI General Assemblies

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**XXIII Assemblée Générale
XXIII General Assembly**

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INTRODUCTION

ACKNOWLEDGEMENT

The XXIII General Assembly of URSI was held at the Technical University in Prague, Czechoslovakia, from 28 August to 5 September 1990. In introducing this account of the proceedings, it seems appropriate to offer the warmest thanks of the Union to :

- the URSI Committee in Czechoslovakia, under the auspices of the Czechoslovak Government and the Czechoslovak Academy of Sciences;
- the Czechoslovak Organizing Committee, who was responsible for the detailed planning and local arrangements in Prague;
- the Technical University in Prague, which provided the accommodation for lectures and meetings;
- the Coordinator and the Associate Coordinator of the Scientific Programme.
- the Chairmen and Vice-Chairmen of URSI Commissions, who planned the scientific sessions, and to the session chairmen and the speakers;
- the organizers of the Symposium on Interaction of Electromagnetic Fields with Biological Systems;
- the organizations which provided funds in support of the URSI Young Scientist Programme : ICSU, the URSI Member Committee in Czechoslovakia, the Royal Society of London, the Member Committees in the U.S. and Japan, the Commonwealth Science Council, the Indian National Science Academy, the Indian Council of Scientific and Industrial Research and the Canadian International Development Agency.
- 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 Prague on five occasions between 26 August and 6 September 1990. 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, an important Symposium on Bioeffects of Electromagnetic Fields was organized, from 28 to 31 August, by URSI in cooperation with the Bioelectromagnetics Society (BEMS), the WHO Collaborating Centre for the NIR, the Czech Technical University and the J.E. Purkyne Czechoslovak Medical Society.

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

- Electromagnetic fields and the essence of living systems;
- Scientific and technological research from manned space platforms;
- Revealing the invisible universe.

For the XXIII 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 :

- Electromagnetic quantities, units and standards in a changing SI;
- Solution techniques in electromagnetic field problems;
- Nonlinear networks and chaos;
- New bio-information from ultraweak photon emission in life and biological activities;
- What is the scientific approach to EMC Control and vulnerability;
- Global climate change;
- The Ionosphere from Space;
- Simulation Technology for Plasma Wave Research;
- Polarization.

Eight special sessions, held on 29 August, were arranged for the young scientists who attended the General Assembly under the Young Scientist 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 XXIII General Assembly in Prague, Czechoslovakia, 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.

HONORARY PRESIDENTS

Sir Granville Beynon (U.K.)
Prof. W.N. Christiansen (Australia)
Prof. W. Dieminger (Germany)
Prof. W.E. Gordon (U.S.A.)
Prof. F.L.H.M. Stumpers (Netherlands)

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President :	Prof. E.V. Jull (Canada)
Past President :	Prof. A.L. Cullen (U.K.)
Vice-Presidents :	Prof. J. B. Andersen (Denmark)
	Dr. P. Bauer (France) (Treasurer)
	Prof. R.L. Dowden (New Zealand)
	Prof. T. Okoshi (Japan)
Secretary General :	Prof. J. Van Bladel (Belgium)

URSI SECRETARIAT

Secretary General :	Prof. J. Van Bladel
Assistant Secretary General :	Prof. P. Lagasse
Administrative Secretary :	Miss I. Heleu

OFFICERS OF COMMISSIONS AND COMMITTEES

Commission A : Electromagnetic Metrology

Chairman : Dr. J. Vanier (Canada)
Vice-Chairman : Dr. P.I. Somlo (Australia)

Commission B : Fields and Waves

Chairman : Prof. F. Gardiol (Switzerland)
Vice-Chairman : Prof. D. Olver (U.K.)

Commission C : Signals and Systems

Chairman : Prof. P.A. Matthews (U.K.)
Vice-Chairman : Dr. A.D. Wyner (U.S.A.)

Commission D : Electronics and Photonics

Chairman : Dr. J. Hénaff (France)
Vice-Chairman : Dr. T. Itoh (U.S.A.)

Commission E : Electromagnetic Noise and Interference

Chairman : Dr. J. Hamelin (France)

Vice-Chairman : Dr. V. Scuka (Sweden)

Commission F : Wave Propagation and Remote Sensing

Chairman : Prof. G. Brussaard (Netherlands)

Vice-Chairman : Prof. R.K. Moore (U.S.A.)

Commission G : Ionospheric Radio And Propagation

Chairman : Dr. A.W. Wernik (Poland)

Vice-Chairman : Dr. K. Schlegel (F.R.G.)

Commission H : Waves in Plasmas

Chairman : Dr. R.F. Benson (U.S.A.)

Vice-Chairman : Dr. F. Lefevre (France)

Commission J : Radio Astronomy

Chairman : Dr. R.D. Ekers (Australia)

Vice-Chairman : Prof. Y.N. Parijskij (U.S.S.R.)

Commission K : Electromagnetics in Biology & Medicine

Interim-Chairman : Prof. J.Bach Andersen (Denmark)

Interim-Vice-Chairman : Dr. M.A. Stuchly (Canada)

Scientific Committee on Telecommunications

Chairman : Dr. L.W. Barclay (U.K.)

Vice-Chairman : Prof. P. Delogne (Belgium)

Inter-Commission Working Group on Time Domain Waveform Measurements

Chairman : Dr. T.K. Sarkar (U.S.A.)

Standing Finance Committee

Chairman : Prof. K. Géher (Hungary)

Standing Publications Committee

Chairman : Prof. P.J.B. Clarricoats (U.K.)

Standing Committee on URSI Membership

Chairman : Prof. T.B.A. Senior (U.S.A.)

Standing Committee on Future General Assemblies

Chairman : Prof. T. Okoshi (Japan)

Standing Committee on Developing Countries

Chairman : Prof. S. Radicella (Argentina)

Standing Committee on Young Scientists

Chairman : Prof. E.V. Jull (Canada)

Committee on the Future of URSI (Long Range Planning Committee)

Chairman : Prof. E.V. Jull (Canada)

Secretary : Prof. P. Lagasse (Belgium)

Committee on the International Geosphere/Biosphere Programme

Chairman : Prof. G. Brussaard (Netherlands)

ad hoc Group on Environmental Consequences of Nuclear War
Chairman : Mr. M. Wik (Sweden)

Scientific Programme for XXIV URSI General Assembly
Coordinator : Prof. J. B. Andersen (Denmark)
Associate Coordinator : Prof. H. Matsumoto (Japan)

URSI REPRESENTATIVES ON OTHER SCIENTIFIC ORGANIZATIONS

- COSPAR (Committee on Space Research) :
Dr. P. Bauer (France)
- COSTED (Committee on Science and Technology in Developing Countries) :
Prof. Feng Shizhang (China, CIE)
- CPEM (Conference on Precision Electromagnetic Measurements) :
Dr. J. Vanier (Canada)
- FAGS (Federation of Astronomical and Geophysical Data Analysis Services) :
Prof. R. Gonze (Belgium), Dr. R. Wielebinski (Germany)
- ICSU (International Council of Scientific Unions) :
Prof. E.V. Jull (Canada)
- ICSU Committee on the Free Circulation of Scientists :
Prof. W.E. Gordon (U.S.A.)
- ICSU Panel on World Data Centres (Geophysical and Solar) : :
Prof. H. Rishbeth (U.K.)
- IGBP (International Geosphere-Biosphere Programme) :
Prof. G. Brussaard (Netherlands)
- IUCAF (Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science) :
Dr. B. Robinson (Australia), Dr. B.H. Grahl (Germany), Ir. H.C. Kahlman (Netherlands), Prof. R.M. Price (U.S.A.)
- IUWDS Steering Committee (International Ursigram and World Days Service) :
Dr. R. Thompson (Australia)(Director), Dr. B.M. Reddy (India)
- SCAR (Scientific Committee on Antarctic Research) :
Dr. G. Pillet (France)
- SCOR (Scientific Committee on Oceanic Research) :
to be designated by Commission F
- SCOSTEP (Scientific Committee on Solar-Terrestrial Physics) :
Dr. A.P. Mitra (India)
- STEP (Solar-Terrestrial Energy Programme) :
Dr. S. Kato (Japan)

URSI MEMBER COMMITTEES

ARGENTINA	President : Prof. V.H. Padula-Pintos Secretary : Ing. A. Garbini
AUSTRALIA	President : Prof. J.G. Lucas
AUSTRIA	President : Prof. S.J. Bauer
BELGIUM	President : Prof. P. Delogne Secretary : Prof. A. Laloux
BRAZIL	President : Prof. P. Kaufman
BULGARIA	President : Prof. K. Serafimov Secretary : Dr. Spasov
CANADA	President : Prof. P.H. Wittke Secretary : Mr. R.F. Clark
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CIE (Beijing)	President : Prof. Feng Shizhang Secretary : Prof. Sha Zong
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Associate member :

PERU	President : Dr. R. Woodman
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OPENING MEETING

Tuesday, 28 August 1990

The Opening Meeting was held at the Palace of Culture, in Prague. The first part of the meeting was chaired by Professor Zima, Vice-President of URSI and Chairman of the Organizing Committee. Were also present the following distinguished personalities:

Messrs. Jaroslav Koran	Mayor of Prague
Petr Lukas	Vice-President of the Czechoslovakian Academy of Sciences
Ivan Laska	Deputy Minister of Communications
Stanislav Hanzl	President of the Czech Technical University
Jan Hlavicka	Dean of the Faculty of Electrotechnical Engineering.

Professor Zima first welcomed the participants in the following terms :

WELCOME BY THE CHAIRMAN OF THE CZECHOSLOVAK ORGANIZING COMMITTEE

by Professor V. Zima

It is our pleasure to cordially welcome all distinguished participants of the 23rd URSI General Assembly in Prague. We are very pleased that the main hall of the Palace of Culture is nearly full. We wish you cordially to enjoy not only the forthcoming Opening Ceremony, but also the many scientific, cultural and social events accompanying our important meeting.

The International Union of Radio Science (URSI) is one of the scientific bodies which adhere to the International Council of Scientific Unions (ICSU). The object of the URSI is to stimulate and coordinate research requiring international cooperation in the fields of radio, telecommunications and electronic sciences. The members of URSI are the Committees established by Academies of Sciences or similar bodies in their respective territories.

At present, Member Committees have been formed in 39 countries. URSI was founded as early as 1919 and has strongly influenced many major developments in Communications, Wave propagation in ionized and non-ionized media, Electronics, Radio Astronomy, Remote Sensing etc. It successfully participated in large international scientific programmes, such as the Geophysical Year, and intends to participate in the

Telecommunication Union (ITU) and the latter's advisory committees, the CCIR and the CCITT. It has also good contacts with several Space Agencies.

We are proud that Prague was selected as the venue of the 23rd URSI General Assembly. We consider the event as the most important scientific meeting organized in our country after the revolution of November 1989. We hope that we won't disappoint your expectations and that the Prague Assembly will be a great scientific success. We are sure that it will help open the doors and windows of Czechoslovakia to Europe, America, Asia, Africa and Australia.

Our staff will try to make your stay in Golden Prague, one of the pearls of Central Europe, as pleasant as possible.

V. ZIMA

Professor Zima's address was followed by a message from Mayor Koran.

WELCOME ADDRESS BY THE MAYOR OF PRAGUE

Ladies and gentlemen, honourable guests. Good afternoon.

Allow me to welcome you here on behalf of the city which has been honoured by providing a harbour to your Assembly. Your Congress will probably be the largest international scientific meeting in Czechoslovakia and in Prague after the November events.

I have been informed that even in the course of the history of your honourable scientific society, this congress will hold an important place, in particular because of the number of participants.

Allow me to say that this event is a great honour for our city, which considers your meeting to be one of the steps on the way of seeking its future profile, its new place and mission in Europe. As its Mayor I feel competent to tell you that Prague is at your disposal during your work here. When you get exhausted after long days of proceedings and discussions, and would like to find some refreshment in the city, Prague is open to you, and offers you all its beauty and treasures.

If the creative spirit of this magic city - its Genius loci, formed and nurtured during centuries in the unceasing clashes of spiritual currents - manages to stimulate you too, it will be the assurance for me that it is high time Prague becomes what she used to

be and what according to my opinion it should be in the future, i.e. an intellectual, cultural and scientific centre of European importance.

For the city of Prague to meet the challenge of entering the battle field of Europe, and to try seriously to take part in the strong inter-European competition, it is not enough to refer to the bequest of history whatever precious the values of the latter may be.

If Prague does not want to become a museum, a Skansen for tourists and competitors, it must first of all master high technologies. It is only after the spirit of our magic city has come to terms with those technologies, that Prague will safely enter the all-European competition. I think that the spirit of the city showed many times in our history its creative potential. The Prague panorama provides tangible proofs of such potential, at least as far as architecture is concerned. I therefore look at the future in an optimistic - though cautious - way, also in the sphere of high-technology, notwithstanding the heavy problems which confront us.

We have been given an unfortunate inheritance, are being blamed for faults which are not ours, and have taken over debts which we have not incurred. We are responsible to our descendants for overcoming all this as quickly as possible.

We know that what awaits us is hard work, and only hard work. I hope I am not speaking only for myself when I say at the end of my speech that we are not afraid of work - because we all know our objectives.

I wish you all good luck in your activities, which I hope will be creative and fruitful. From myself, and my city, ladies and gentlemen, many returns, and a hearty "au revoir".

The President of URSI subsequently replied in the following terms :

REPLY BY THE PRESIDENT OF URSI

Professor A.L. Cullen

Lord High Rector, Professor Zima, colleagues and friends,

I want first to express the very sincere thanks of all of us to Professor Zima and Professor Prokop, joint Chairmen of the Organizing Committee for this XXIII General Assembly of URSI. Only those who have had the experience of organizing a major event such as this can know exactly what is involved. Those of us who have not had that experience can imagine well enough what an immense amount of hard work the organization of a major event such as this entails. We owe a deep debt of gratitude to Professors Zima and Prokop and to the members of the Organizing Committee for all their hard work over many months.

I must also express on behalf of us all, our gratitude to the Czechoslovak Academy of Sciences and to the Czech Technical University for providing the accommodation for our lectures and meetings during the Assembly, to all the other Institutions represented on the Honorary Committee, and above all, to the Czechoslovak Government under whose auspices this General Assembly is held.

URSI is of course a non-political organization, but all of us are aware to varying degrees of the great changes that have been taking place in Czechoslovakia since the decision to hold the General Assembly here was taken. Changes of this scale must inevitably have complicated the work of the Organizing Committee, and I simply want to say that we appreciate all the more all that they have done for us.

We are extremely grateful too to the City of Prague for receiving us. Many of you here will be visiting Prague for the first time. I can assure you, if you need any assurance, that you will find much to please and interest you in this historic city. There is so much of architectural interest, so much fine art, both visual and musical, that we shall all regret having so little time to enjoy it - especially that large majority of us who are really here to work. Lord High Rector, we are delighted and honoured to be received so kindly in your beautiful city of Prague.

If it is the choice of Prague as the venue for this Assembly that has enabled a greater number than usual of our colleagues from Eastern Europe to attend, then that is just another piece of our good fortune in being here. I am personally delighted to see a

better geographical balance on this occasion, and I know it will add both interest and value to our scientific discussions.

Next, and very importantly, I want to thank the Bio-Electromagnetics Society, or BEMS as we affectionately call it, for joining in with URSI once again to form a major part of the scientific programme of the Assembly. You are most welcome, and we are grateful for what you bring to URSI. On this occasion we also have the advantage and pleasure of the co-operation of several other organizations. I shall return to this later, in the meantime our gratitude to all concerned.

Of our Honorary Presidents, Professor Dieminger had expected to be with us; most unfortunately illness prevented him from attending. Sir Granville Beynon and Professor Christiansen were also unfortunately unable to come to Prague, but send their best wishes for a successful General Assembly.

At one time one could be almost sure that all of the ladies present at an URSI General Assembly were there because their husbands were scientists; I am glad to say that assumption is no longer safe. Let me mention in particular that Professor Anna-Maria Scheggi is now President of the Italian Member Committee of URSI. This is the first time that a lady has held this high office. But I am old-fashioned enough still to offer a special welcome to all the ladies, scientists and non-scientists alike. In any event I welcome most warmly all accompanying persons, male or female.

Finally, I welcome Mr. Schuster, representing the Secretary General of the International Telecommunication Union, Mr. Pekka Tarjanne, and Mr. Kirby, Director of the International Radio Consultative Committee. The relationship between URSI and CCIR has existed for many years, and I know that Mr. Kirby shares with me the conviction that the link between radio science and radio engineering is an important one which URSI/CCIR co-operation can help to foster.

Other organizations represented at this General Assembly include :

Bureau International des Poids et Mesures : Dr. C. Audoin

International Electrotechnical Commission Measurement Committee, (IEC TC 66) :
Professor P.O. Lundbom

Committee on Space Research (COSPAR) : Professor W.I. Axford

International Astronomical Union (IAU) : Dr. J. Baldwin

International Ursigram and World Days Service (IUWDS) : Dr. B.M. Reddy

Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science (IUCAF) : Dr. B.J. Robinson

International Association of Geomagnetism and Aeronomy (IAGA) : Professor J. Taubenheim

Professor Cullen then took the chair to preside over the second part of the Opening Meeting. He subsequently gave the floor to the Secretary General, followed by Mr. Kirby, and concluded the Opening Meeting with his Presidential address.

REPORT OF THE SECRETARY GENERAL

Professor J. Van Bladel

Ladies and gentlemen,

It is the traditional duty of the Secretary General to give a brief report on the scientific activities, the finances, and the general administrative situation of the Union.

URSI sponsored 51 meetings in 1987-1990, of which 21 were URSI generated, the rest being organized by external Societies. This level of activity is slightly lower than in the previous triennium. Particularly noteworthy is the initiative of Commissions C and D to organize a joint meeting in Erlangen last year, hopefully the first of a recurrent series similar to those already sponsored by our Commissions B, E and F. President Cullen, who attended the meeting, will give us his personal impressions of this important event. Plans are underway to repeat this effort in France in 1992.

Our Young Scientist Programme progresses extremely well. It was given a new impetus in 1981, and since that time has helped some 200 young colleagues attend our meetings and General Assemblies. They are distributed almost equally between industrialized and developing countries. Thanks to the generosity of our Czechoslovakian hosts, an all-time high of 100 Young Scientists have been given material support to attend the present Assembly. About a third will come from Eastern Europe, a third from Developing Countries, and another third from the rest of the world. Special financial support, in the form of travel grants, is given to those coming from Developing Countries. This particular aspect of the programme has been supported by various organizations such as ICSU, the Royal Society of London, the Member Committees in the U.S. and Japan, the Commonwealth Science Council, the Indian National Science Academy, the Indian Council of Scientific and Industrial Research and the Canadian International Development Agency. We thank these organizations most warmly for their wise investment in the future of Radio Science on a world-wide scale. A special set of Young Scientist sessions has been ably organized by Prof. Jull for tomorrow afternoon. The URSI community is urged to attend these sessions in order strongly to encourage our young colleagues.

A number of international bodies pay special attention to the development of Science and Engineering in Developing Countries. Two of these are the International Center for Theoretical Physics and the Third World Academy of Sciences, both located in Trieste. URSI increasingly collaborates with these institutions. In January 1989 our Union co-organized a 4 week course on Basic Telecommunication Science in Trieste.

followed by Prof. Radicella's College on Theoretical and Experimental Radio Propagation Physics, a 3-week effort. Some 80 Third World Scientists attended these courses, which will be repeated, in modified form, in January 1991.

Le programme de publication de l'URSI s'est développé de façon satisfaisante au cours du triennium qui vient de s'écouler. Une lettre trimestrielle, initiative du Prof. Dowden, a été insérée dans le Bulletin de l'URSI. Elle a connu des débuts difficiles, mais semble bien avoir atteint sa vitesse de croisière. Elle se transformera probablement en une publication autonome, séparée du Bulletin.

Le projet de lancer un périodique patronné directement par l'URSI, et de contenu axé sur les Commissions C et D, est venu à maturité. Nous avons tous reçu son numéro de lancement, *Kybernetika*. Le Prof. Zima s'est chargé de la lourde tâche de préparer cette initiative difficile et courageuse.

Cette année encore, nous saluons la parution, sous la baguette de Mr. Hyde, de la Revue Radioscientifique triennale. Cette Revue est basée sur des données en provenance des Comités Membres, par l'entremise des Membres Officiels des Commissions. L'abondance des matières a traditionnellement forcé le coordinateur à faire une sélection assez rigoureuse, avec perte résultante d'informations souvent très valables. Ce problème sera examiné en profondeur à cette Assemblée, une des possibilités étant de mettre la totalité des données sur disquette, et de constituer ainsi, au fil des années, une mine de références techniques véritablement unique.

Nous avons cette année encore réuni les trois Conférences Générales et la majorité des neuf Exposés Synthétiques des Commissions en un volume intitulé "Modern Radio Science" édité par le Prof. J. Bach Andersen. Cette initiative a été bien reçue en 1987 et, si elle est à nouveau encouragée par la Communauté URSI, sera répétée en 1993.

En plus des Comptes Rendus de l'Assemblée de Tel Aviv, le triennium précédent a vu sortir deux ouvrages d'un grand intérêt. Sous l'égide de Mr. Mitra la liste des spécialistes ès disciplines de l'URSI résidant dans les Pays en voie de développement, et sous celle de Mr. Bailey, le Registre des Laboratoires Nationaux d'Etalons. Le volume 2 du "Manuel de Propagation Radio dans les Pays Tropicaux et Subtropicaux" est en voie de réalisation, et nous espérons le voir sortir au cours du triennium prochain.

Ladies and gentlemen, I have just given a short report on the Publication effort of URSI, in which I mentioned the start of a Newsletter, an initiative of Prof. Dowden,

Science, under the editorship of Dr. Hyde, and Modern Radio Science, edited by Prof. J. Bach Andersen. We all received a copy of these important documents. During the triennium, we saw the publication of the Proceedings of the Tel Aviv General Assembly, prepared by Mrs. Stevanovitch, the Register of National Standards Laboratories, edited by Mr. Bailey, and the Register of Radio Scientists in Developing Countries, produced by Past-President Mitra.

The URSI finances are generally healthy. They are dominated by the conversion rate of the US \$ - the currency in which the unit contribution is expressed - to other international currencies. The Belgian Frank, strongly linked to the DM, plays an important role here, since the expenses of the Secretariat, which is located in Belgium, are expressed in that particular currency. The high conversion rate of about BEF 60 per \$ in 1985 allowed us to build up a sizeable reserve at the time, but the present drop of the rate to about half that value obviously creates problems. Taking inflation into account, the assets in 1990, expressed in BEF, have decreased by some 12 % with respect to 1985. Our reserves, however, still represent about two years of operation. Currency problems are common to most Unions, but the prudent strategy of Dr. Albrecht, the URSI Treasurer, saw to it that no immediate danger developed for the discharge of our duties to the URSI Community. It is on these fairly optimistic remarks, Mr. President, that I conclude this brief report.

MESSAGE FROM THE INTERNATIONAL TELECOMMUNICATION UNION

Richard C. Kirby

Director, International Radio Consultative Committee

International Telecommunication Union

Geneva, Switzerland

It is my honour and privilege with Dr. Schuster to bring to the URSI General Assembly warm greetings and best wishes from Dr. Pekka Tarjanne, Secretary General of the International Telecommunication Union, and, of course, on behalf of the International Radio Consultative Committee.

URSI and CCIR relations have always been close ; if ancestry and history do not bestow sisterhood, they are surely first cousins. Scientific leadership of URSI was for decades active leadership in CCIR studies. It remains so today in wave propagation, metrology, electromagnetic noise and interference. URSI has evolved broadly in science, CCIR in telecommunications.

Telecommunications is undergoing dramatic change, as it becomes an integral element of information technology. New techniques, new services and new entities erase old concepts and distinctions, and challenge former structures. The rate of change is rapid, with a race for new Recommendations, Standards, and provisions for frequency spectrum. ITU is reexamining profoundly its whole structure and working methods. New methods of allocating the frequency spectrum are to be studied.

In an atmosphere clearly reflecting the changing telecommunication environment, the CCIR XVIIth Plenary Assembly, held at Dusseldorf three months ago, reassessed CCIR's programme, and introduced the most far reaching changes in 25 years in its organization and work. Decision-making procedures were streamlined and provision was made for approval of Recommendations in the interval between Plenary Assemblies.

Besides reforms, nearly 200 new or revised Recommendations were adopted. Obstacles to global agreement on standards are well known, but it is encouraging that five Recommendations on High Definition Television were adopted which can provide a foundation for a worldwide studio standard. A Recommendation was adopted on future public land mobile telecommunications, or personal telecommunications. This is a fast growing technology, which could well lead to radio access to telecommunications networks becoming as common as fixed terminals. Important Recommendations were

adopted dealing with utilization of the frequency spectrum and geostationary satellite orbit.

The URSI General Assembly programme, besides its coverage of the vast scope of radio science, reflects many scientific advances important to future telecommunications and use of the frequency spectrum. I look forward to continued and strengthened cooperation between URSI and ITU.

PRESIDENTIAL ADDRESS

by Professor A.L. Cullen

Ladies and Gentlemen,

I now have the honour as President of URSI to present my address to this XXIII General Assembly of URSI. There is much good news to report, but I must begin by reporting the very sad news of the passing away of a number of our distinguished colleagues and friends. May I suggest that we pay tribute to their memory by standing in silence for a moment after I have read their names.

- Dr. V.I. Aksenov, of the U.S.S.R., active in Commissions E and H.
- Professor Harold Barlow, a former Chairman of the U.K. Member Committee of URSI and a holder of the J.H. Dellinger Gold Medal.
- Professor Mario Boella, a former Vice-President of URSI and President of the Italian URSI Committee for many years.
- Professor Henry Booker, Honorary President of URSI.
- Dr. Jack Gledhill, Chairman of several Commission G groups.
- Dr. Dyfrig Jones, Vice-Chairman of Commission H.
- Monsieur Pierre Misme, successively Secretary, Vice-Chairman, and Chairman of Commission II/F.
- Mr. Jack Ratcliffe, onetime Chairman of Commission IV/E, and a former Chairman of the U.K. Member Committee.
- Professor Saul Rosenthal, formerly Chairman of the Commission A Working Group on the Interaction of Electromagnetic Fields with Biological Systems.
- Dr. Frederick Scarf, past Chairman of Commission IV.
- Professor Dr. Christian-Ulrich Wagner, President of the URSI Member Committee in the German Democratic Republic since 1987.

Time permitting, I would very much have liked to say something about the work of each of those I have just named; collectively it will be recognized as a roll of honour of absolutely outstanding people, and of course properly detailed accounts of their work will be found in the URSI Bulletins.

As Professor Zima has said, URSI was created in 1919, and is therefore in the eighth decade of its existence. As a matter of fact, so am I! URSI seems to me to be as full of vigour as ever it was, and there are many important tasks ahead which URSI is uniquely fitted to undertake. Many of these are long term tasks, which are likely to be

with us as long as radio techniques continue to develop, and to find new uses. It is all the more important and encouraging that our Young Scientist Programme is flourishing, as you have heard from the Secretary General. When I look at the achievements of some of our young scientists, I am lost in admiration, and it is obvious that this group of exceptionally talented young people could make a major contribution to the solution of many of the problems which the world faces today. To the young scientists here today I want to offer a special welcome, and I look forward to meeting you personally during the course of this General Assembly. There are more of you than ever before - by a factor of two - and this is a most welcome development. There are a number of ladies in this group of course. Perhaps you know that as part of the welcome which URSI gives to its Young Scientists an URSI tie has been presented to each. Now not all young ladies wear ties - though some do - and we felt that the time had come to make a more appropriate gift. The URSI scarf is the result. But if a tie is your choice you have only to say the word!

I want next to say a word or two about the organization of the Scientific Programme of this General Assembly. The planning began in 1988, and was made easier by the fact that Professor Zima, one of the two Chairmen of the Organizing Committee in Prague, is also Vice-President of URSI, and so is a member of the Board of Officers. The detailed scientific planning was carried out by the Coordinating Committee, including the Chairmen of the URSI Commissions, under the Chairmanship of Dr. P. Bauer, Coordinator of the Scientific Programme. This is the second time that Dr. Bauer has undertaken this task; a glance at the programme, with the large number of Joint Symposia, Commission Symposia, etc., shows what a tremendous task it is. On this occasion, Professor J. Bach Andersen, as Associate Coordinator, provided valuable assistance, in particular by taking on the responsibility for the General Lectures and Tutorials.

The end result of all this work first became visible to us when the Second Announcement of the General Assembly appeared, and is now impressively apparent in the books of abstracts, and in the book "Modern Radio Science", in which most of the Tutorial Lectures and General lectures appear. To Dr. Bauer and Professor Bach Andersen a hearty vote of thanks for the highly efficient way they carried out their onerous duties, and for the very pleasant way in which they did so. Next, we must warmly thank the Chairmen of Commissions who have planned the sessions for their Commissions, including Tutorial Lectures of top quality. We must equally thank the many Conveners of Symposia for much hard work. Next, I want to thank Dr. Larry Anderson, President of the Bioelectromagnetics Society, and all the members of that Society for their cooperation in organizing the extraordinarily impressive Symposium on Interaction of Electromagnetic Fields with Biological Systems, together with the World

Health Organization Collaborating Centre for the NIR, Kiev, U.S.S.R., the Czech Technical University and the J.E. Purkyne Czechoslovak Medical Society, through its Biomedical Engineering and Industrial Medicine Societies. The Programme Committee includes scientists from sixteen countries. The Steering Committee, chaired by Dr. J. Musil, includes Professor Bach Andersen as URSI-BEMS coordinator. I mentioned earlier in my address that one of URSI's sad losses is that of Professor Rosenthal, who was a powerful advocate of the importance of studies of biological effects. His work was taken over by Professor Romero-Sierra, but unfortunately ill-health prevented him from continuing. We are most grateful to Dr. Stuchly for providing at rather short notice the details on bio-effects needed for the Review of Radio Science.

There is now a final additional vote of thanks that I am very happy to propose. For the first time, the local Organizing Committee took over the responsibility of collecting all the Abstracts. In addition, Dr. Cizek and Mrs. Vichova, members of that Committee, set up a highly efficient data base which proved to be a great asset. Thanks to the people I have mentioned, and to many I have not, the scene is now set for the biggest and best General Assembly we have ever had. At the end of the Assembly session chairmen will be asked to fill in a simple questionnaire on this General Assembly. May I urge you to make any comments you may have to the session chairmen, so that when the time comes for them to fill in their questionnaires, they have a fuller understanding of what should be done to make future General Assemblies even better.

Those of you who were present at the XXII General Assembly in Tel Aviv will remember Dr. Mitra referring in his Presidential Address to the Corsendonk meeting, at which URSI examined in great detail its activities up to that time, and made a number of proposals for improving its effectiveness and its value to the scientific community. One of these was that URSI should orientate itself more in the direction of Telecommunications - advocated long ago by Professor Booker, and powerfully presented in Corsendonk by Professor Gordon. As a major step in that direction, Professor Geher, then Chairman of Commission C, proposed - and I quote - "Triennial conferences in Signals and Systems between the General Assemblies", analogous to the Fields and Waves Symposia of Commission B. This proposal was strongly supported by Professor Zima at the Board of Officers, where it was unanimously approved. It was recognized from the first, however, that to do justice to the Telecommunications orientation, it would be essential to include Electronics. This of course involved the collaboration of Commission D, the latter bringing in Electronics as the hitherto missing element. As you have already heard, in September 1989 in Erlangen, Germany, the first of these meetings took place with the title International Symposium on Signals, Systems and Electronics. The organization was carried out very efficiently by a Steering

Committee chaired by Professor Schussler, and a Scientific Committee chaired jointly by Professor Saal and Professor Okoshi. I was present, took part in the opening ceremony, and attended many of the lectures. In my opinion, and in that of the people I spoke to, the Symposium went very well, and set a very satisfactory pattern for its successors. Thirty-four countries were represented, so it was genuinely international, and I am glad to say that 14 Young Scientists attended. A very impressive 832 page publication of the Proceedings provides an important permanent record of the many excellent papers presented. I am personally delighted with this important development, since I was once Chairman of Commission VII, the forerunner of Commission D, and so have a special interest in things happening in that area. I think Professor Booker would have been pleased, and I hope Professor Gordon and all those associated with the original moves towards Telecommunications will approve. Certainly those responsible for organizing ISSSE'89 deserve our warmest thanks. The next ISSSE will be held in France in 1992.

It must not be forgotten, of course, that the other Commissions have been as active as ever in organizing their well-established Symposia. These activities, old and new alike, make extra demands on the member committees in the countries concerned, and those Committees deserve our sincere thanks.

Another matter of importance to URSI was raised at the Corsendonk meeting; the question of Membership of URSI. This matter was discussed in the Council at Tel Aviv, when a Committee was set up under the Chairmanship of Dr. Michel Petit. Dr. Petit's report discusses with characteristic clarity the merits and demerits of new categories of membership. I shall say no more than that, in considering this question, Council will have in mind the changing environment in which URSI will operate in the future, and is already considering the possible need for a further change in the Statutes.

Next, I want to mention briefly a matter which is of very great importance to all users of the radio part of the electromagnetic spectrum. In 1992 the next World Administrative Radio Conference will take place. This decides on a global basis the allocation of frequencies for different purposes, for civil and military communications, for radar, for terrestrial and satellite broadcasting, and for scientific purposes such as radio astronomy. The impact that the decisions might have on the interests of URSI are obvious. It is good to know that there are powerful voices, such as those of the Director General of the ITU and of the Director of CCIR, which are sympathetic to URSI's interests, but many of us here present have some influence additional to that which URSI can exert through IUCAF, the Inter-Union Commission on Allocation of Frequencies, and it is exceedingly important that we do all we can to ensure that a proper balance is struck between the legitimate claims of so many would-be users of a very scarce resource. I am an engineer, and I have always felt that we engineers must never forget the

huge debt we owe to the radio astronomers for the valuable and technical advances they have made, from which we all benefit professionally. And of course, like everyone else, we benefit from the cultural advantages of learning more and more about the wonderful universe in which we live.

Finally, I shall spend a minute or two on a research programme set up by the International Council of Scientific Unions on Global Change, and I cannot find adjectives powerful enough to indicate the importance of that topic. It is in two main parts, the World Climate Research Programme (WCRP) and the International Geosphere-Biosphere Programme (IGBP). The IGBP is concerned, amongst other things, with trace gas exchanges in the atmosphere, ozone content and cloud formation, and global data collection, for example, of vegetation images. URSI has a number of areas of expertise which are relevant to the IGBP, and consequently has set up an ad hoc group on the IGBP under the chairmanship of Professor Brussaard, to advise URSI on the best way forward. Professor Brussaard has already produced an interesting report for the URSI Council, in which he makes a number of proposals for future URSI activities. He suggests, most importantly, that it is not only in the IGBP part of the Global Change programme that URSI could usefully contribute, but also in the WCRP. Already, URSI is making significant contribution through, e.g. IGARSS and COSPAR; the question to be addressed is whether additional contributions can be made by URSI, and how best to plan future URSI work in this area.

This brings me to the end of my address. In a moment I shall be introducing the speakers who will present the URSI Awards to four very distinguished scientists. Before I do so, however, the Awards Committee has asked me to tell you about a problem they had at the outset. Two of those nominated for awards had passed away before the Awards Committee met. After a full discussion, the Committee decided reluctantly that, given the circumstances, these two candidates should not be considered. They recognized however, the great merits of both, and asked me to name them, and to say a brief word about each. The candidates were Dr. Dyfrig Jones, and Professor Lev Weinstein. Dr. Jones worked at the Cavendish Laboratory in Cambridge, England, then at the European Space Agency in the Netherlands, and then at the British Antarctic Survey. He was renowned for his work on non-thermal radiation in the earth's magnetosphere, which he later extended to Jupiter and other planets. He was a world authority on planetary radiation, on which he continued to work until a few months before his death at a tragically early age. A commemorative talk on his work will be given by Dr. D.A. Gurnett later in this General Assembly. Professor Weinstein was an internationally renowned expert on scalar and vector diffraction problems, providing elegant analytical solutions to many intractable problems. His book on open resonators is a classic treatise

on this important area of study, and has been the starting point for much subsequent work.

It goes without saying that the fact that these two scientists were not considered for URSI Awards in no way reflects on their great distinction, nor, of course, does it reflect on the great distinction of the four scientists who will receive their Awards this afternoon.

AWARDS CEREMONY

The presentation of the Awards took place right after the Opening Ceremony, under the chairmanship of Professor A.L. Cullen, President of URSI and Chairman of the Awards Panel.

PRESENTATION OF THE BALTH. VAN DER POL GOLD MEDAL

by Professor F.W. Sluijter,
President of the URSI Committee in the Netherlands

Professor Oliner, Ladies and Gentlemen,

The official citation for the award of the van der Pol Gold Medal to Professor Oliner reads as follows :

"For major and outstanding contributions to the theory of guided waves, especially leaky waves where he (i.e. Professor Oliner) analysed the basic properties, discovered new physical effects and invented novel radiating structures."

Hence three elements : analysis, discovery and invention. As a matter of fact your work on leaky waves did not come out of the blue. You started your career as a Physics major in Brooklyn College, after which you obtained a PhD in Physics at Cornell. All of your subsequent scientific career was at the Polytechnic University where you rose through the ranks from Research Associate to Professor. While you made your name in science and engineering in microwave research you also did your share in administrative duties. Witness of the first are your fellowships of several learned societies and a large list of awards, citations and even, a rare distinction, a special session in your honour at the IEEE International Microwave Symposium, two years ago. You also gave lavishly of your time and talents to URSI.

A tremendous list of publications is at the basis of all this. And that your work met appreciation from everywhere is proved by your visiting positions at the University of Washington, the Catholic University in Rio de Janeiro, the Tokyo Institute of Technology, the Huashong Institute of Technology and the University of Rome.

Witnesses of your administrative abilities are your years as Head of Department and as Head of the Microwave Research Institute.

Nevertheless, the Gold Medal is awarded to you for your contributions to leaky waves and now I cite the arguments that convinced the URSI Board of Officers :

"Oliner's contributions to leaky waves can be divided into three phases. The first phase applied the leaky wave concepts, new at the time, to a large class of leaky-wave antennas, extended the concepts to open periodic structures and subsequently examined in detail the basic properties of this type of wave. The second phase showed that many interesting physical phenomena would best be explained in terms of leaky waves, and in the process you developed new and improved theories for the basic phenomena. The third phase, almost all of which occurred during the past six years, was especially productive in two different categories. The first of these is the discovery of new physical effects involving power leakage, which are very important at the higher frequencies and which were totally unknown until your investigations. The second category is that of novel leaky wave antennas and arrays at millimetre wavelengths, which address important needs and which are attracting significant attention. These recent achievements are a logical continuation of a career-long activity, but they are also clearly noteworthy and important in themselves."

REPLY BY PROFESSOR ARTHUR A. OLINER

The first URSI General Assembly that I attended was held at Boulder, Colorado, in 1957. I was very excited by the opportunity to see and hear the many distinguished scientists in URSI, which I appreciated even then as the most prestigious organization in the radio science field. Prominent among those distinguished individuals was the legendary Professor Bathasar van der Pol, whose name was well known to me for the fundamental oscillator named after him and for his pioneering study, with Professor H. Bremmer, on the propagation of electromagnetic waves over a spherical earth. Professor van der Pol had an impressive bearing, with a strong personality and a clear voice, and I remember distinctly that he participated actively in technical discussions. In view of the many highly significant technical contributions made by Professor van der Pol, his very active and influential role in URSI over the years, and the many well-deserved recognitions that came his way, I am deeply honoured to be receiving the award that bears his name.

One's accomplishments must always be taken in the context of the professional community of which one is a part. We learn from and build upon the work of our predecessors and colleagues. There are many fine individuals to whom I owe thanks for their challenging discussions and valuable support, but I wish to express particular gratitude to two colleagues at the Polytechnic Institute of Brooklyn who were instrumental in the early phases of my career. The first is Professor Ernst Weber, who provided me with important early guidance and help in launching my career, and the

second is Professor Nathan Marcuvitz, my principal mentor, from whom I learned not only the content of electromagnetics but also how to address the essence of any problem.

I have always felt, from my first General Assembly in 1957 to the present day, that my colleagues in URSI represent the very best in our field. In receiving the van der Pol award, I take particular pride in being recognized by those very people whom I have respected and admired throughout my career.

PRESENTATION OF THE JOHN HOWARD DELLINGER GOLD MEDAL

by Professor S.A. Bowhill,
President of the URSI Committee in the United States.

Dr. Govind Swarup has had a long and distinguished career in radio astronomy, dating back to 1953 when he was a Colombo-Plan Fellow at CSIRO in Australia. In 1956 he came to the United States and worked with Dr. Alan Maxwell of Harvard at the Fort Davis, Texas site. With him, he discovered the Type II Solar Radio Burst. In 1957 he joined Dr. Ronald Bracewell at Stanford University as a graduate student, his major Ph.D. work being the design and construction of the Stanford Microwave Spectroheliograph Antenna (sometimes called "Heliopolis"). He devised a novel method of adjusting the phase of the corporate-structure feed, involving the measurement of transit time. This method has been widely adopted. After some postgraduate work at Stanford, he returned to his native India in 1963, at the Tata Institute. He established a radio-astronomical research laboratory that has attained international renown, attracting back to India many radio astronomers who had moved overseas.

Using only resources available in India, he conceived, designed and built the Ooty Lunar-Occultation Radio Telescope. This 16,000 m² cylindrical reflector is placed on a hill, whose slope is parallel to the polar axis, and it has full steerability in hour angle. Using this telescope, in the period 1970 - 1979, the lunar-occultation technique enabled him to observe 1,200 extra-galactic radio sources with 1 to 4 arc sec resolution at meter wavelengths, for the first time. These observations led to 40 research papers and 5 Ph.D. theses in such areas as pulsars, interplanetary scintillation, radio galaxies, quasar and instrumentation. Altogether, the Ooty group has published over 200 research papers on radio astronomy in the past 20 years. Dr. Swarup's own contributions have included establishing a key relationship between the angular size of extra-galactic radio sources and their flux density, which supports the "Big Bang" evolutionary model of the universe.

Most recently, Dr. Swarup has been working on the construction of a new instrument, the GMRT (Giant Meter-Wavelength Radio Telescope), to be set up near Puni. It will consist of 30 fully-steerable paraboloidal antennas, each 45 m in diameter, extending in a Y-shape array over a distance of 25 km. The total collecting area, 50,000 m², is larger by an order of magnitude than any other existing or planned radio telescope in the frequency range 30 - 1500 MHz.

Dr. Swarup has given his time unstintingly for national and international science. He serves on the Inter-Union Commission for Allocation of Frequencies

(IUCAF) and the Committee for Science and Technology for Developing Countries (COSTED). He has been President of the IAU's Commission on Radio Astronomy and Chairman of the URSI Committee in India.

Dr. Swarup, on behalf of USNC, the URSI Committee in the United States, it is my pleasure to award you the Dellinger Medal for pioneering contributions to radio astronomy and cosmology, both in observational research and in conceiving and building radio telescopes.

REPLY BY PROFESSOR GOVIND SWARUP

I am greatly honoured to receive the prestigious John Howard Dellinger Award today and I am grateful to URSI for the recognition of the work done by us in India over the last 25 years in the field of radio astronomy.

John Howard Dellinger made many pioneering contributions in the early years of ionospheric research and inspired many research workers throughout the world. In my own case, I started working in the field of radio astronomy in 1953 in Australia when there were only a few dozen papers to read. How fortunate it was. I would like to take this opportunity to express my deep gratitude to those who provided close guidance to me during my early years of research, particularly to Sir K.S. Krishnan of the National Physical Laboratory, New Delhi; Dr. J.L. Pawsey and Dr. W.N. Christiansen of CSIRO, Australia, and Professor R.N. Bracewell of Stanford University.

One of my interests has been to achieve high resolution combined with high sensitivity for exploring the distant parts of the Universe by building our own instruments and not being fashionable. During the 1960s we built in India the 530 m long and 30 m wide Ooty Radio Telescope by utilizing India's advantage of close proximity to the earth's equator, as referred to by Professor Bowhill. We are now constructing a Giant Metrewave Radio Telescope consisting of thirty 45 m diameter dishes of a novel design using rope trusses for the back-up structure to minimize wind loading. It will become the world's largest instrument in the frequency range of about 30 to 1500 MHz when completed by 1993. India's low radio noise environment will be valuable for the purpose.

Finally, I would like to thank the organizers of URSI for bringing together scientists from diverse fields, a policy which has been much beneficial to radio astronomy.

PRESENTATION OF THE APPLETON PRIZE

by Professor P.J.B. Clarricoats,
President of the URSI Committee in the United Kingdom (U.K. Panel for URSI)

It is a great pleasure to be asked to present the Appleton Prize to Professor A.V. Gurevich of the Lebedev Institute on behalf of the Council of the Royal Society. Before I say a few words about the work of Professor Gurevich, 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.

Mr. J.A. Ratcliffe, who worked with Appleton, prepared the biographical memoirs of Appleton for the Royal Society, and I should like to quote briefly from these.

"What part did Appleton play in laying the foundations of our knowledge of the ionosphere? He once said that it was a region of the universe which had been both invented and discovered. It was true that when he started work it had been invented as a theoretical idea, but there was no proof that it really existed ; it was left to him to discover it experimentally. When he started nothing was really known about it, it was a suggestion and no more. Did it exist even? Were the charge carriers ions or electrons? How many were there? How did their number vary over the earth with the day, the season and the solar cycle? How frequently did they collide with neutral molecules? Did the solar radiation which produced them consist of photons or of charged particles? How did it vary throughout the solar cycle? He answered these questions, and several others, and found, quite unexpectedly, that there were two layers with quite different behaviour, that the atmospheric density and hence the temperature in the higher one was greater than in the lower and that the upper part was strongly controlled by the earth's magnetic field."

Appleton was elected a Fellow of the Royal Society in 1927 and received the Nobel Prize for Physics in 1947. Beside his momentous scientific achievements, he 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 one or 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 greatest scientists.

Professor Gurevich, who is Chief of the Division of Plasma and Radiowave propagation at the Lebedev Institute in Moscow, is a most distinguished ionospheric physicist. He has contributed in many fundamental ways to the understanding of the ionosphere as a non-linear medium; his scientific papers number more than 250. He is the author of seven books and his monograph, Long Distance Propagation of HF Radio Waves, is a standard reference. Readers of English in this audience will be pleased to know that English editions of two of his works are in preparation, namely "Artificially ionised layers in the atmosphere" and "Physics of the Pulsar magnetosphere".

His early work on satellite interactions with plasmas, followed by his papers on inhomogeneities, are also noteworthy.

His recent prediction of artificially produced ionization of the atmosphere by intense radio waves is causing excitement among experimenters.

Professor Gurevich's achievements have been widely recognized through the Landau Prize of the U.S.S.R. Academy of Science in 1980, corresponding Membership of the Academy of Sciences of the U.S.S.R., 1984, Membership of numerous Scientific Councils and Chairmanship of the Nonlinear Phenomena Council of the URSI Committee in the U.S.S.R. Professor Gurevich has also been recognized by the Max Planck Institute of Aeronomy, where he has served as a member since 1982.

Ladies and Gentlemen, I could go on, but I think that already I have amply demonstrated that Professor Gurevich 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 A.V. GUREVICH

Thank you very much Professor Clarricoats for the warm words. I unfortunately never had the possibility to meet Sir Appleton personally, but we all know him as the discoverer of the ionosphere. A smooth "Appleton layer" served for many years as a very good reflector for various kinds of radiowaves. Now by powerful radiowaves we can essentially change the ionosphere, reconstruct it, and even destroy it. I consider this award as given to the whole community of scientists and engineers from the Soviet Union, the United States and Europe, who constructed a number of special powerful radiostations with specially designed antennas, and developed a large variety of complex

and sophisticated diagnostic techniques. By joint efforts of experimenters and theoreticians for more than 20 years, the nonlinearity of the ionosphere became recognized as a widely developed region of radio and plasma sciences, rich of beautiful and exciting physical effects.

I hope that in the nearest future not only the ionosphere, but the magnetosphere and the upper atmosphere also will be modified by powerful radiowaves. New unexperienced discoveries await us there.

Let me finally add that my personal scientific life was strongly influenced by the personality of Professor Vitalii Ginzburg.

Thank you.

PRESENTATION OF THE ISSAC KOGA GOLD MEDAL

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

It is my great pleasure and honour to present, as the President of the URSI Committee in Japan, the 1990 Issac Koga Gold Medal to Dr. Michael Lockwood of the Rutherford Appleton Laboratory in The United Kingdom.

I would like to start with describing briefly the rules for the Issac Koga Gold Medal, as well as the career of the late Professor Koga, because this is a relatively new award.

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 outstanding contributions to any of the branches of science covered by the ten 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.

He was born in Japan in 1899, at the end of the last century. He studied at the University of Tokyo, and became first Professor at the Tokyo Institute of Technology, later Professor at the University of Tokyo, and finally 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 invention, in 1932, of a piezo-electric crystal oscillator having almost zero frequency-temperature coefficient. This is widely known as the Koga-cut crystal, and has been used in a variety of applications, in particular to international radio-communications and broadcasting.

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 URSI Committee in Japan proposed 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 awarded six years ago at the General Assembly in Florence, and this is the third award.

Let me now mention the distinguished scientific achievements of Dr. Michael Lockwood, for which he receives the 1990 Issac Koga Gold Medal today. The citation for the award mentions that he has made a highly significant contribution to the

understanding of non-thermal ionospheric plasma and ionospheric convection, through his interpretation of radar and satellite data.

Dr. Lockwood is an enthusiastic, energetic, and creative scientist who has gained an international reputation for his work in ionospheric physics and ionospheric-magnetospheric interactions. His particular contributions have been in the area of non-thermal ionospheric plasma and ionospheric convection. His great strength lies in his exceptional ability to analyse and interpret diverse geophysical data and then develop new scientific theories to explain the observations, or propose further innovative experiments. He has made pivotal contributions to the collaborative research programme of the Rutherford Appleton Laboratory and Imperial College on the ionospheric plasma convection and non-thermal plasmas.

Dr. Lockwood has played a leading role in initiating specific research topics, analyzing the data, interpreting the results and writing the papers. He has published 32 papers in the 12 months preceding the nomination, and has a total of 70 publications to his name. He will undoubtedly continue to bring great credit to both his organization and science in general, and is considered to be a highly eligible recipient of the Issac Koga Gold Medal.

Dr. Lockwood, would you please come up to the podium and accept our hearty congratulations?

REPLY BY DR. MICHAEL LOCKWOOD

Naturally, I feel very proud and honoured to receive this award from URSI. Indeed, I have always felt very privileged to be able to work in the field of radio science. I am very proud of the scientific discoveries made possible by remote sensing with radars and of the many benefits which applications of radio technology bring to so many areas of today's society. In addition, when I think of old friends in remote parts of New Zealand, who gain so much from talking, or even playing chess, via HF radio, I am reminded that radio can bring a lot of fun into peoples' lives. So has it for me, because using radio to study one of nature's most enchanting phenomenon, the aurora, has been, quite simply, a delight.

There are a great many people to whom I owe a great debt and without whom I would not have been able to carry out the research which brought me this award. I would like to record my special thanks to the staff of the Rutherford Appleton Laboratory, and in particular pay tribute to my colleagues in the EISCAT Section for their outstanding support. I also thank present and past staff and students at the Space and Atmospheric

Physics Group at Imperial College, London, for the many exciting discussions I enjoy as a Visiting Lecturer there.

Much of my research has used the European Incoherent Scatter (EISCAT) radars in northern Scandinavia, and there are two groups of people involved with these systems to whom I am also greatly indebted. The first is the Director and staff of the EISCAT Scientific Association, which provides such a wonderful facility. Observations of the ionosphere by incoherent scatter radars at auroral latitudes give a view of dynamical processes taking place much further out into space, in the Earth's outer plasma environment. The so-called "incoherent scatter" technique (strictly, the term is a misnomer, but is used for historical reasons) involves the transmission of megawatt radar pulses, but the reception of mere femtowatt echoes : it is often said that the signals received from the ionosphere are the same strength as for a hard target the size of a small coin at a distance of 300 km. As scientists, we have been able to plan ever-more adventurous and novel experiments as the efforts of the EISCAT staff have inexorably improved the signal-to-noise ratio. But also I wish to give special mention to the scientists from many countries who nurtured EISCAT from a concept to a reality. Only now, as we younger scientists make use of the special and unique features of the systems they bequeathed us, do we appreciate just what vision they had.

All the above ingredients, however, would have come to nothing for me without the constant encouragement and support which my wife has provided throughout my academic career. My thanks go to her, to all the others that I have mentioned and to URSI for his generous award.

The Awards Ceremony concluded the Opening Session of the General Assembly, but not before the Symphony Orchestra "Bohemia", conducted by Jan Herzl, gave a spirited performance of the Symphonic Poem Vltava - from the Bedrich Smetana Cycle My Country - and of Antonin Dvorak's Slavonic Dances 10 and 15.

CLOSING MEETING

Wednesday, 5 September 1990

CLOSING REMARKS BY THE SECRETARY GENERAL

by Professor J. Van Bladel

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 1990-1993. He also made a few additional announcements concerning decisions made by the Council :

- (a) The Council accepted the invitation of the Member Committee in Japan to organize the next General Assembly. The venue will be Kyoto, in August 1993.
- (b) The Council has accepted, pending the usual commitment to ICSU rules and the URSI Statutes, the application to membership of the King Abdulaziz City for Science and Technology (Saudi Arabia), and the application to associate membership of the Scientific Research Council of Jamaica, the National Science and Technology Council in Grenada and the Scientific and Technical Research Council of Turkey.
- (c) The Council created a new Commission, with the temporary title "Electromagnetics in Biology and Medicine". The first steps of this Commission will be guided by the interim officers Professor J. Bach Andersen (Chairman) and Dr. M.A. Stuchly (Vice-Chairman).
- (d) The Council also created a Scientific Committee on Telecommunications, a Standing Committee on Young Scientists and a Standing Long-Range Planning Committee.

CLOSING REMARKS BY THE OUTGOING PRESIDENT

by Professor A.L. Cullen

In my opening remarks to the first Council meeting of this General Assembly, I said that I had read in a highly-regarded British magazine that Prague was the most beautiful city in Europe. Now that we have all had the opportunity to test that opinion, you may agree that it would be a very bold European who would wish to challenge it. But it is also a city of culture. Good examples were the superb music at the Opening Ceremony, and the last night's excellent concert by the Scientists' Chamber Orchestra. After the concert, having a drink in our hotel with the two violin soloists and Jan Hrdlicka (a member of the orchestra, but also a key member of the Organizing Committee for the General Assembly) we noticed a Latin tag on the tapestry by our table which we cleverly translated "Prague, Queen of Music". If anyone wishes to challenge that statement, I suggest that they wait until they hear the complete set of Mozart symphonies

which the Prague Chamber Orchestra, of which last night's violin soloists are members, is now in process of recording.

But the beauty and culture must be supplemented by the human touch, and the warmth of the welcome we all received from our hosts in Prague was deeply appreciated. But not only did they welcome us warmly, they did an immense amount of work before and during the General Assembly to ensure that we had the proper conditions for our work in the largest General Assembly in the history of URSI. Of course, I must first thank Professors Zima and Prokop, whose roles as Co-Chairmen of the Organizing Committee were obviously important. But in recognizing the team leaders we must not forget the team, amongst whom were Dr. Hrdlicka, who solved so many of our problems, and Dr. Kratena, who also managed to find the time to serve on the Council of URSI. I also mention particularly Mrs. Svandova, Mrs. Vichova, and Dr. Cizek, who have worked day and night throughout the Assembly to update the scientific programme, and to prepare the list of participants. I have invited all of this magnificent team to be with us this afternoon, and I suggest that we now show by acclamation our appreciation of all that they have done for us. Thanks to their efforts, we have had an excellent scientific and social programme, and I want here to thank Mrs. Zima for the vital part she played in making the ladies feel at home in Prague.

Referring briefly now to the scientific programme, I need only say that it has been well up to the high standards expected of URSI. The splendid General Lectures by Dr. Adey, Dr. Garriott, and Professor Ekers, coupled with excellent tutorial lectures in each Commission, were greatly appreciated.

URSI has never had so much change in mind ; I leave it to Professor Jull by whom these new developments will be guided to elaborate on this theme. For my part, I wish him and the new Board well in the major developments with which they have been entrusted.

To the Board of Officers in the past triennium I offer my most sincere thanks. I thank first Dr. Mitra for his wise advice and generous support in his role as Past-President. The two retiring Vice-Presidents have both made major contributions. Part of Professor Zima's work is visible to all of us, but he has done much more besides. That of Dr. Albrecht as Treasurer is the key to all our activities. As a former Treasurer, I know very well what a burden this is. I am most grateful to them both for all their help to me personally. I am sorry to say that this will also be the last URSI General Assembly in which Professor Delogne will be present in his capacity as Assistant Secretary General. He has made most valuable contributions in dealing with Symposia and in many other important ways, and his work has been of immense value to URSI. Finally, to Mrs.

Stevanovitch, who has been working literally into the early hours of the morning to complete her heavy workload, our most sincere thanks for her dedicated work. Her knowledge of URSI, and her sound advice have been invaluable, as always. I also know that the office of President is no sinecure. Professor Jull will be left with at least as many problems as I inherited, and perhaps in a moment he will tell us how he proposes to solve them. Before asking him to do so, however, I will give place to Professor Bowhill, leader of the USA delegation. Never at a loss for words of his own, he will now explain why on this occasion he proposes to use some of Professor Leo Felsen's words. (Professor Bowhill subsequently read a poem written by Professor Felsen in honour of the General Assembly.)

ADDRESS BY THE INCOMING PRESIDENT

by Professor E.V. Jull

Ladies and Gentlemen - Colleagues,

Let me first express our sincere appreciation for the contributions to URSI of the retiring members of the URSI Board : to Dr. Mitra, who committed URSI to a role in developing countries; to Dr. Albrecht, who expertly guided URSI finances for many years, making its operations and initiatives possible; and to Professor Zima, who gave us this splendid General Assembly.

Prague is a magic city of surprise and change and it has cast its spell on URSI. You now have an URSI Board as committed to change as surely as radio science and the world are changing.

URSI's changes have begun. We shall have a new commission on the biological effects of electromagnetic fields, a subject taking its place in the first rank of interdisciplinary research effort.

Through radio science and telecommunications URSI has quietly contributed to the dramatic political changes in the world. These changes have provided us with the best opportunity ever here for scientific cooperation with our colleagues from Eastern Europe and the Soviet Union. URSI should further encourage this global scientific cooperation by making its meetings accessible financially to as many radio scientists as possible. This means as well a larger young scientist programme, particularly oriented towards those from developing countries and non-convertable currency countries. To realize this a Young Scientist Committee is being formed.

URSI needs to find new ways to function efficiently, to interact with industry and to provide better services to radio scientists. A Long Range Planning Committee is being formed to address these issues.

URSI needs to renew and enhance its relationships with international consultative committees such as CCIR. A Telecommunications Committee is being formed for this purpose.

Mesdames et messieurs, chers collègues :

Au nom du nouveau bureau permettez moi de vous remercier sincèrement pour votre confiance. Nous espérons vous servir de notre mieux. Faites nous parvenir vos suggestions. Elles nous seront utiles.

Ladies and gentlemen, on behalf of the newly elected Board I wish to thank you for your confidence in us. We wish to serve you well and I invite your suggestions for ways which may help us to do this.

YOUNG SCIENTIST PROGRAMME

The Young Scientist Programme at Prague, with 96 official participants, was much larger than at any previous URSI General Assembly. This happened because our Czechoslovak hosts generously offered to provide accommodation and meals for 100 young scientists. At previous General Assemblies the numbers were : Washington (1981) : 24, Florence (1984) : 43, and Tel Aviv (1987) : 39. Application forms for these scholarships were distributed through the Member Committees, through the Third World Academy of Sciences at Trieste, and at various URSI sponsored scientific meetings throughout the world in 1989. Special efforts were made to solicit applications from developing countries. The result was 136 applications from 37 countries, most of a high standard.

Member Committees' ranking of their applicants was used where available. Ranking was also done by L. Zombory (E. Europe and the U.S.S.R.) and E.V. Jull, and selection by A.L. Cullen and J. Van Bladel. Of the 100 selected, 35 were from developing countries, 31 from E. Europe and the U.S.S.R. and 34 from the rest of the world. Scientific merit, geographical distribution and perceived need of support were factors considered. The geographical distribution of those who actually attended the General Assembly was as follows :

Argentina (1), Australia (1), Austria (1), Belgium (3), Bulgaria (2), Canada (1), China-CIE (3), China-SRS (2), Czechoslovakia (11), Finland (1), France (5), Germany (5), Hungary (2), India (6), Iran (2), Iraq (2), Israel (1), Italy (3), Japan (1), Kenya (1), Malaysia (1), Morocco (1), Nigeria (3), Poland (1), S. Korea (1), S. Africa (2), Sri Lanka (1), Sudan (1), Switzerland (1), Turkey (2), Uganda (1), U.K. (4), U.S.A. (7), U.S.S.R. (15), Vietnam (1).

These numbers include the 1990 Koga Gold Medal winner, Dr. M. Lockwood (U.K.) and the 1990 Booker Fellow, Dr. Y.E. Yang (U.S.A.).

All young scientist awardees receive free registration, accommodation and meals at the general assembly, provided by the host country. Travel grants for those from developing countries were also provided in amounts ranging from \$250 to \$1,600, depending on the distances travelled. Funds for this were provided by a grant from ICSU, by the Royal Society of London through the U.K. URSI Committee, by a private donation through the Japan URSI Committee and by URSI funds. In addition the Indian National Academy of Science and the Indian Council of Scientific and Industrial Research provided travel costs for the Indian young scientist awardees. The Canadian International Development Agency paid the fare of a Sri Lanka student in Canada.

Every young scientist delivered a paper. Forty-four of these papers were included in the regular sessions of the assembly and fifty-eight papers were scheduled in eight parallel special sessions. A programme booklet gave the details of these young scientist presentations. The commission areas, sessions titles, number of papers and session chairmen were as follows :

- A/B : Measurements, transients, waveguide devices (7) : K.J. Langenberg
- B1 : Rough surfaces, random media, asymptotics (7) : E.V. Jull
- B2 : Microstrip, numerical methods, waveguide analysis (8) : C.M. Butler
- C1 : Digital signal processing, communications, circuits (7) : B. Picinbono
- C2 : Information and communication theory (6) : P.H. Wittke
- D : Electronic and optical devices (8) : P. Weissglass
- F : Wave propagation and remote sensing (8) : P. Delogne
- G/H/J : Ionosphere, magnetosphere and radio astronomy (6) : R.L. Dowden

These presentations were generally of a high calibre and were well received by those attended. They were enhanced by the participation of a number of unofficial young scientists from the Soviet Union supported by the Czechoslovak Academy of Sciences. Following these presentations there was a party for the participating young scientists and their friends, also attended by members of the URSI Board, special session chairmen and a few other senior URSI people - in all about 240 attended. Later each awardee was presented with a young scientist diploma and an URSI tie or scarf (seven of the young scientists were women) by the President, Vice-President and Secretary General.

Arranging a young scientist programme on this scale requires extra sources on the part of the hosts and extra effort on the part of the URSI Secretariat, which handled virtually all of the voluminous correspondence. The general consensus seemed to be that it was very worthwhile. The Prague experience showed how important this support is not only for young scientists from developing countries, but also for those from countries with non-convertible currencies. A young Scientist Programme on this scale should continue to be a central feature of URSI General Assemblies, and an example for all the scientific unions of ICSU.

E.V. JULL

REPORTS OF MEETINGS

BOARD OF OFFICERS

Summary Report

The Board of Officers met on three occasions, respectively on 25 August, 5 and 7 September. During the first meeting, which lasted from 9.40 to 17.00 (with a short interruption for lunch) details of the organization of the coming General Assembly were discussed. A long exchange of ideas took place concerning the future of the Secretariat, and more particularly the transition period due to start after Prague. Professor Lagasse joined the meeting at 15.30 to participate in the discussion. The Board decided to propose the following scheme to the Council :

- Professor Van Bladel would continue as Secretary General during the triennium 1990-1993. His main task would be to organize the move of the Secretariat to the University of Ghent, and to ensure a smooth operation of the office by 1993, at which time a new Secretary General could take over without any serious problems.
- Professor Lagasse would devote the 1990-1993 triennium to conduct an analysis of URSI's long range planning, as part of a Committee of which he would be the Secretary. This would culminate in a proposal for action in 1993, at which time Professor Lagasse would be a candidate for the office of Secretary General.

The Board also gave preliminary consideration to the 1990-1993 budget, the future of "The Radioscientist" (an expanded URSI Newsletter), and the need to reevaluate the URSI-CCIR-CCITT relationship.

During the second meeting, which lasted from 15.40 to 17.00 on 5 September, responsibilities were distributed within the new Board. Alphabetically :

- (a) *Professor J.B. Andersen* : responsible for the Scientific Programme in Kyoto, with the assistance of Professor Matsumoto, Associate Coordinator. He will also lead the first steps of Commission K, as Interim Chairman.
- (b) *Dr. Bauer* : becomes Treasurer.
- (c) *Professor Cullen* : responsible for the Awards Panel.
- (d) *Professor Dowden* : responsible for Publications (but all financial and administrative matters remain the responsibility of the Board). Professor Dowden continues as editor of the "Radioscientist".
- (e) *Professor Jull* : responsible for the Young Scientist Programme.

- (f) *Professor Okoshi* : will act as liaison between the Board and the Organizing Committee in Kyoto. He will also chair the Committee on Future General Assemblies.

The Board, upon nomination by the Secretary General, appointed Professor Lagasse as Assistant Secretary General.

The Board reviewed possible nominations for membership of the various Standing Committees, i.e. Young Scientists, Future General Assemblies, Long Range Planning, Finances, Developing Countries, Publications, Membership.

During the Third Meeting, which lasted from 10.00 to 12.00 on 7 September, the Board decided to :

- (1) allot \$8,000 to each Commission for the 1990-1993 triennium, to be used for support of speakers and Young Scientists at their meetings, and in particular at the 1993 General Assembly.
- (2) limit the support given to an individual (e.g. a key speaker) to an amount of the order of \$500.
- (3) to support the activities of the Special Committee on Telecommunications by means of specific requests, and not through a fixed budget.

The Board also discussed, in a preliminary fashion, the organization of the Kyoto General Assembly, and in particular :

- (1) the general time-table (the General Assembly would start on Wednesday 25 August, and close on Thursday 2 September).
- (2) the agenda of the Council. There will be a Section A (for important items requiring discussion), and a Section B (for items presented as a matter of information).
- (3) the extent of the Young Scientist Programme.

The next meeting of the Board will take place in Brussels on 4, 5 and 6 September 1991.

COORDINATING COMMITTEE

Summary Report

The Coordinating Committee met on two occasions, on 26 August (before the official opening of the General Assembly) and on 6 September. Dr. P. Bauer and Professor J.B. Andersen, Coordinators of the Scientific Programme, attended the meetings.

First Meeting (26 August, 9.00 to 12.25)

Professor Cullen opened the meeting by requesting the attendees to observe a minute of silence in memory of Dr. D. Jones, Vice-Chairman of Commission G.

1. Arrangements for the Prague General Assembly

Details and instructions on various matters were given by Professor Zima, Dr. Albrecht and Professor Van Bladel.

2. International Geosphere - Biosphere Programme

Professor G. Brussaard, who was asked by the Board to set up and chair an ad hoc group on this matter, commented on his findings. Professor Crane expressed the opinion that the IGBP was not basically a radio science programme and that the subjects of interest to URSI were already adequately handled, namely through our participation in the IGARSS conferences.

Dr. Rishbeth said that, although the role of Commission F was dominant, Commission G and H could also contribute. In particular, the network of ionosondes could provide a global monitoring of the upper atmosphere. Dr Wernik noted that it was not obvious that global change did influence the upper atmosphere.

Dr. Mitra drew the attention on meetings organized by COSPAR and other bodies on global change, and suggested that URSI should participate in these meetings. He thought that, in addition to remote sensing activities developed in Commission F, there was work for Commissions G and H, namely in the observation of signals announcing changes in the atmosphere.

Professor Cullen summarized the discussion by stating that there was no need for URSI to set up new activities, but that our Union should carefully follow developments through its IGBP Working Group.

3. Bio-effects

Having heard Professor Bach Andersen, who underlined (1) that the area had grown in importance since several years (2) that URSI was the only international body active in this field and (3) that several Commissions were interested, the Coordinating Committee recommended transforming the Working Group into a Scientific Committee. Dr. Albrecht suggested that this Committee should organize a triennial conference between General Assemblies, to fill an existing gap.

4. Scientific Programme of the General Assembly

Dr. P. Bauer, Coordinator, reported to the Committee that there were some differences with the previous General Assemblies. The Open Symposia were suppressed, since they were too difficult to organize. The time slot on which the programme is based was reduced from 30 to 20 minutes. The deadline for the submission of abstracts of contributed papers was shifted from October 1989 (i.e. the year before the General Assembly) to February 15, 1990, and this caused no difficulty.

The work was shared with Professor J. Bach Andersen, Assistant Coordinator, who was in charge of the Bioeffects Programme, the General Lectures and the Tutorials. Lectures and Tutorials form the contents of the book "Modern Radio Science 1990", edited by Professor J. Bach Andersen.

Professor Jull organized the Young Scientist sessions. For the first time a programme booklet from these sessions was prepared and distributed to all participants.

Dr. Bauer stressed the excellent cooperation which existed between the Commission Chairmen, the Symposia Conveners and the local Organizing Committee. The abstracts were sent directly to Prague, where the processing was centralized. The team chaired by Dr. Cizek did a remarkable job. All papers were registered in a data base, and this allowed responding very quickly at all steps of the process. Furthermore, it was possible to detect and handle about 200 abstracts which had not been included in the programme during the normal procedure. The Committee congratulated Dr. Cizek and his team for their work. This type of collaboration and organization is strongly recommended for future General Assemblies.

Some problems were encountered with "closed" Symposia, since in a few cases the Conveners could not find enough speakers. Other problems arose when Conveners would not attend the Assembly, hence could not chair their Session.

Professor J. Bach Andersen regretted that two papers would be missing in the book Modern Radio Science 1990. In the future a firm commitment to produce a written paper will be requested from the authors of General Lectures and Tutorials.

In conclusion, Dr. Bauer recommended to leave the system unchanged, since it worked quite well. The use of a data base is extremely useful, and must be retained in the future.

5. Sponsorship of scientific meetings in 1987 - 1990

Professor J. Van Bladel called attention to the list of symposia sponsored by URSI during the last triennium. It appears that the Commissions used their budgets in quite different ways. Some used a large part of the available money before the General Assembly, while others reserved it for the Assembly itself. One Commission used half of its budget to support the author of a tutorial at the General Assembly, which seems somewhat excessive.

Upon a question of Dr. Albrecht, unanimity was found to recommend maintaining the system of the Commission budgets. The amount in 1990 - 1993 will be of the order of \$8,000-9,000 for each Commission.

Second Meeting (6 September, 9.05 to 12.30)

1. Sponsorship in 1990 - 1993

The proposals of the Commissions were approved, with the following comments :

- a. the dates of IGARSS'93 (in Japan), should not conflict with our General Assembly in Kyoto.
- b. the URSI logo should appear on the announcements of the meetings sponsored by our Union. Professor Vanier will try to get our logo on the CPEM pamphlets.
- c. meetings generated by our Union should include "URSI" in their title.

Professor Rishbeth thought that our support of COSPAR meetings should remain marginal, and limited to mode A.

The Committee recommended the possibility of carrying over up to 10% of a Commission budget to the next triennium (in case of a surplus). The point would be submitted to the Board.

2. Post-mortem of the Scientific Programme in Prague

2.1. General Lectures

The present arrangements were found quite acceptable. The time-schedule should free sufficient time for the audience to move from a General Lecture to the next scientific session. Professor Cullen mentioned that prospective General Lecturers and authors of Tutorials should be warned early of their duty to contribute a written text to "Modern Radio Science". Some of the contributors in Prague were not aware of that requirement.

2.2. Tutorials

Dr. Bauer, who gave the Tutorial of Commission G, noticed that most of the public belonged to that very same Commission, with little interest from the rest of the URSI community. Such a situation, which distorts the purpose of the Tutorials, arises because of competition with the regular Commission programmes. It would not be realistic to keep the Tutorials clear of other Sessions (a policy which is applied to the General Lectures), because such a move would block the equivalent of 1,5 days, i.e. 25% of the available conference time. A possible improvement would be to schedule the tutorials in parallel with Poster Sessions.

2.3. Posters

Professor H. Matsumoto intends to concentrate all posters in Kyoto in one big hall. Professor Ekers believes that authors of posters should be allowed to give a short talk (2 to 3 minutes) in order to present the essence of their contribution. A few Commissions applied this system in Prague, with commendable success. In an alternate system, a rapporteur would give an oral report summarizing the main results presented in various posters. Professor Crane mentions another method, in which each oral paper is accompanied by a poster, and possible questions are asked at the posters, and not during the oral session. According to Professor Ekers, the system requires very careful preparation, and can easily fail in practice. Professor Dowden proposes that posters be displayed for a full 24 hours.

2.4. Book of Abstracts

The half-page abstract has been criticized as being rather useless. A four-page summary, on the other hand, would generate voluminous Proceedings, and create problems of production and finance. It would also detract from the easy-going character of the General Assembly. A useful compromise would be to require a one-page abstract, containing a few crucial references. For more extensive information, authors would bring copies of their paper to the Sessions, and distribute them on the spot.

A member of the Committee proposed to print separate Books of Abstracts, one per Commission, and provide the delegates with the two or three books they are particularly interested in. This solution has several drawbacks : it is at variance with the multidisciplinary character of our General Assemblies, and it would require the production of separate volumes for Joint Scientific Sessions. The proposal also creates organizational and financial problems. Professor Okoshi does not intend to adopt it in Kyoto.

2.5. Scientific Sessions

Dr. Bauer asked whether the 20 minute basic slot was acceptable. The ensuing discussion shows that the rule should be applied in a flexible way, and that some latitude should be given to the Commission Chairmen to make small adjustments.

The Committee confirmed the desirability of Joint Sessions, but felt that a single Commission should be given unambiguous responsibility for the organization of such sessions. The other Commissions would simply collaborate with the main one. This system would limit the effects of possible divergences of opinion between co-sponsoring Commissions.

2.6. Proceedings of the Prague General Assembly

The Committee approves the proposal of the Secretary General, according to which :

- the Proceedings will only contain the skeleton of the scientific programme, i.e. a Table of Contents.
- the analysis of the main accents of the scientific programme would not appear in the Proceedings, but would be published in the URSI Bulletin. The publication of that analysis is left to the discretion of the Commissions, but the latter are strongly encouraged to react positively to this modest contribution to URSI's standing

3. Coordinators

The Committee unanimously nominates Professor J. Bach Andersen to be the Coordinator of the Scientific Programme in Kyoto, and Professor H. Matsumoto to be his Associate Coordinator.

4. The Kyoto General Assembly

4.1 Dates

Professor Okoshi proposed the period Thursday 26 August to Friday 3 September, 1993 for the Technical Programme. These dates take two factors into consideration :

- the wish of certain delegations, more particularly that from the U.S., to avoid extending the programme too deeply into September, because of the early start of the academic year in the U.S.. It would be desirable, in particular, to conclude the scientific activities of the General Assembly well-ahead of Labour Day, which is on 6 September in 1993.
- the need to stay clear from the weekend of 21 August, which coincides with the massive return of Japanese tourists from their vacation. As a result, airlines are congested, and cheap transportation is hard to come by.

The plan of Professor Okoshi concentrates the technical sessions in the periods 26 to 28 August and 31 August to 3 September. There would be a break on Sunday 29 August and Monday 30 August, with technical visits on 30 August. The plan respects the URSI tradition of giving a social dimension to the General Assembly by inserting a break into the programme. This break encourages professional contacts, and avoids a too-massive concentration of technical information.

The Committee fully supported the proposals of Professor Okoshi.

4.2. Structure of the Scientific Programme

Dr. Bauer thanked the Commission Chairmen, and the Czechoslovakian organizers, for the exceptionally good support they provided in the elaboration of the Programme. He thought that the format of the Sessions, the use of a prescribed time-slot, and the avoidance of parallel Sessions in any given Commission (except in the case of

Joint Sessions), should be reexamined carefully. He believes that the following time table should be considered :

- the list of Conveners should be ready around March 1, 1992.
- the meeting of the Coordinating Committee should be convened in April 1992.
- The first announcement, containing the full list of Symposia and Calls for Papers, should come out in the Spring of 1992 (and definitely not later than the early Fall).
- the deadline for contributed abstracts should be 15 February, 1993 (or 1 March, at the latest).
- the final inputs from Conveners should be available by the end of April 1993.
- the second announcement, containing the full programme, should be available in May 1993.

The Committee thanked Dr. Bauer for his comments, and congratulated him most warmly for his decisive contribution to the success of the Prague Assembly.

Concerning the problem of Open versus Closed Sessions, the general opinion of the Committee was that the evolution to an increased number of "Open" sessions should be sustained, but that the Commissions should have the final say there. The general level of the Sessions must, of course, remain as high as ever, whatever the option.

4.3. Young Scientist Programme

Professor Jull expressed the hope that the number of Young Scientists in Kyoto could be even higher than in Prague. The trend to incorporate Young Scientist papers in Regular Sessions should be encouraged. The Special Sessions, held between 5 and 7 p.m. in Prague, attracted only a meagre public, in particular because of scheduling conflicts with Business Sessions. To remedy this situation, various solutions were proposed :

- hold the Special Sessions in the afternoon.
- incorporate the Special Sessions in "Open" sessions of the Commissions. Such sessions, which are open in the sense that they don't carry any official title, were successfully organized by Commission G in Prague. The convener of these Sessions is normally the Chairman (or Vice-Chairman) of the Commission, and this choice ensures the desired flexibility.
- organize the Special Sessions in the form of poster presentations.

It was suggested that Commission Chairmen should increase their commitment to the Young Scientist Programme, e.g. by nominating worthwhile Young Scientists, and

proposing topics - and formats - of sessions in which Young Scientists are apt to make a worthwhile contribution.

4.4. Review of Radio Science (R.R.S.)

The Coordinating Committee agreed, on an experimental basis, with the plans proposed by the Publications Committee. The editor, Dr. R. Stone, promised to issue clear and concise rules of operation to the contributors. Some Commission Chairmen wondered whether the diskettes, with their extensive information, would not duplicate publications such as "Physics Abstracts". There is a difference, however, in that the R.R.S. obviously concentrates its efforts on a limited number of disciplines, and that Official Members do not send in every reference, but act as preliminary filters.

5. Election of Vice-Chairmen in 1993

The procedure used in 1990 has been found acceptable. A few improvements were suggested, to wit :

- each official member should indicate a first choice (which gets a "2") and a second choice (which gets a "1"). The scores are added up, and the top two names only are presented to the Council. This method will decrease the "randomization" and closeness which obtain when there are many nominees.
- the nominees should mention, on their biographical note, whether they seriously intend to be present at the Kyoto General Assembly, and whether they have previous experience in organizing scientific meetings, and, more generally, cooperative efforts on an international basis.

The problem of the geographical distribution of Commission officials was discussed at length. Some of the items mentioned in the discussion were :

- the desirability of having each Commission respect a suitable geographical rotation over a period of, say, 15 to 20 years. To that effect, the Secretary General will provide each Commission Chairman with the list of previous Chairmen, starting with 1975.
- the suggestion that, after the Commissions have made their choice, the Commission Chairmen should get together, and make collective adjustments to arrive at a better geographical spread, if needed. Such a method would greatly facilitate the work of the Council, and remove the source of possible frictions between that body and the Commissions.

- the wish that Commission Chairmen participate more fully in the discussions of the Council, e.g. by giving them the same observer status as that of the members of the Board (other than the President). They would have their own assigned chair, participate in informal votes (by show of hands) and, in general, fully participate in the discussions of the Council, particularly when items concerning Commissions work are under scrutiny.

6. Awards

A member of the Committee asked whether URSI Awards could not be given to teams, instead of being restricted to individuals. Such a change must obviously be cleared with the donors of the Awards. The Board was asked to look into that possibility.

COUNCIL

Summary Report

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

1. Membership of the Council

President : Prof. A.L. Cullen
Secretary : Prof. J. Van Bladel

Representatives of Member Committees :

Argentina : Prof. S. Radicella
Australia : Prof. J.G. Lucas
Austria : Dr. F. Leitinger
Belgium : Prof. P. Lagasse (alt. Prof. P. Delogne)
Brazil : Dr. I.J. Kantor
Bulgaria : Prof. K.B. Serafimov
Canada : Prof. P.H. Wittke
China CIE (Beijing) : Prof. Feng Shizhang
China SRS (Taipei) : Mr. Yu-Kai Chen
Czechoslovakia : Dr. L. Kratena
Denmark : Dr. E. Ungstrup
Egypt : Prof. I.A.M. Salem
Finland : Prof. V.I. Lindell
France : Dr. P. Bauer
German Dem. Rep. : Prof. D. Felske (alt. Dr. M. Förster)
Germany, F.R. of : Prof. H. Lindenmeier (alt. Prof. J.W. Klein)
Greece : Prof. J.G. Fikioris
Hungary : Prof. K. Géher (alt. Prof. L. Zombory)
India : Prof. A.K. Ghatak
Ireland : Prof. S.S. Swords
Israel : Prof. J. Shapira
Italy : Prof. A.M. Scheggi (alt. Prof. S. Leschiutta, Prof. F. Fedi)
Japan : Prof. T. Okoshi (alt. Dr. T. Oguchi)
Netherlands : Prof. F.W. Sluijter (alt. Mr. H.C. Kahlman)
New Zealand : Dr. W.J. Baggageley
Nigeria : Dr. H.A. Bello
Norway : Prof. D. Gjessing
Poland : Prof. S. Hahn (alt. Dr. T. Kosilo)
Portugal : Mr. J.F. Patricio
South Africa : Dr. A.W.V. Poole
Spain : Prof. J.L.S. Franco
Sweden : Prof. P. Weissglass (alt. Prof. P.O. Lundborn)
Switzerland : Prof. F. Gardiol
Thailand : Dr. T. Simtrakarn (alt. Mr. P. Chooncharoen)
United Kingdom : Prof. P.J.B. Clarricoats
USA : Prof. S.A. Bowhill
USSR : Prof. V.V. Migulin

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

2. Formation of Temporary Committees

2.a. Ad hoc Group to recommend final revision of the Statutes

Prof. P.J.B. Clarricoats (U.K.)
Prof. J.G. Lucas (Australia)
Dr. M. Petit (France)
The Executive Secretary (ex officio)

2.b. Drafting Committee

Dr. G. Pillet (France)
Prof. A.D. Olver (U.K.)
Prof. S.S. Swords (Ireland)
The Executive Secretary (ex officio)

2.c. Ad hoc Group to consider the future status of Commission A Working Groups on the Interaction of Electromagnetic Fields with Biological Systems

Dr. M. Stuchly (Canada)
Dr. J. Musil (Czechoslovakia)
Prof. P. Bernardi (Italy)
Prof. J. Lin (U.S.A.)
Dr. J. Jerabek (Czechoslovakia)
Prof. J.B. Andersen (Denmark) - Chairman

2.d. Ad hoc Group to consider the relations of URSI with CCIR and CCITT

Dr. L.W. Barclay (U.K.)
Prof. F. Fedi
Mr. R.C. Kirby (Director of CCIR)
Dr. R.D. Parlow (U.S.A.)
Dr. G. Pillet (France)
Dr. Struzak (CCIR)
Prof. P. Delogne (Belgium) - Chairman

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

The results of the elections were as follows :

Board of Officers :

President :	Prof. E.V. Jull (Canada)
Vice-Presidents :	Prof. J. B. Andersen (Denmark) Dr. P. Bauer (France) (Treasurer) Prof. R.L. Dowden (New Zealand) Prof. T. Okoshi (Japan)
Secretary General :	Prof. J. Van Bladel (Belgium)

Professor A.L. Cullen remains a member of the Board as Past President.

Chairmen and Vice-Chairmen of Commissions :

Commission	Chairman	Vice-Chairman
A	Dr. J. Vanier (Canada)	Dr. P.I. Somlo (Australia)
B	Prof. F. Gardiol (Switzerland)	Prof. D. Olver (U.K.)
C	Prof. P.A. Matthews (UK)	Dr. A.D. Wyner (U.S.A.)
D	Dr. J. Hénaff (France)	Dr. T. Itoh (U.S.A.)
E	Dr. J. Hamelin (France)	Dr. V. Scuka (Sweden)
F	Prof. G. Brussaard (Netherlands)	Prof. R.K. Moore (U.S.A.)
G	Dr. A.W. Wernik (Poland)	Dr. K. Schlegel (F.R.G.)
H	Dr. R.F. Benson (U.S.A.)	Dr. F. Lefeuve (France)
J	Dr. R.D. Ekers (Australia)	Prof. Y.N. Parijsky (U.S.S.R.)
K	Prof. J.B. Andersen (Denmark)*	Dr. M.A. Stuchly (Canada)*

* = interim officers

4. Honorary Presidents

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

- Professor F.L.H.M. Stumpers : former Chairman of Commissions B, C and E, and former Vice-President;
- Professor W.E. Gordon : Former Chairman of Commission F, former President of the Union, and laureate of the Balthasar van der Pol Gold Medal.

The official text can be found in Resolution U.5 (see p. 166).

5. Scientific Programme

Dr. P. Bauer, Coordinator of the Scientific Programme, referred to the following points :

- a) the role played by Professor J.B. Andersen, Associate Coordinator, who was responsible for arranging the General Lectures and Tutorials, and for editing "Modern Radio Science". In addition he had acted as Coordinator for the URSI/BEMS Symposium.
- b) the enormous task performed by the Czechoslovak Organizing Committee which accepted to collect all the abstracts in Prague and established a data base. Special thanks were due to Mrs. Vickova and Dr. Cizek.

He further referred to the increasing number of participants in the General Assemblies since 1984, and felt that one of the factors for this increase in Prague was the

early publication of the Scientific Programme, which may well have influenced potential participants. Another factor was the suppression of the Open Symposia, the purpose of these meetings being ambiguous. The present Programme identified clearly the Commissions and Conveners responsible for the various sessions. Also, it was to be noted that an increasing number of Commissions now accepted contributed papers (oral or posters), among them Commission B. There was a definite move toward opening the Symposia, a move which increases the supply of worthwhile scientific papers.

Dr. Bauer pointed out that 90% of the programme had been completed by 15 February, the given deadline, and expressed his gratitude to the local Organizing Committee, the Commission Chairmen and the Conveners of Symposia.

6. XXIV General Assembly

There were three invitations before the Council, from the Member Committees in India, China (Beijing) and Japan. As a result of the vote, the XXIV General Assembly will be held in Kyoto, Japan, from 25 August to 2 September, 1993. The relevant Resolution is U.28 (see p. 177).

7. Admission of Member Committees. Transfer of categories.

The Council unanimously accepted the application to membership of the King Abdulaziz City for Science and Technology (Saudi Arabia), and the applications to associate membership of the Scientific Research Council of Jamaica, the National Science and Technology Council in Grenada and the Scientific and Technical Research Council of Turkey.

The applications were accepted subject to these institutions meeting the criteria of the URSI Statutes (see Resolution U.6, page 167).

The Council accepted the transfer of the Member Committee in Peru to the Associate Member Category, and the transfer of the Member Committee in New Zealand from Category 2 to Category 1.

8. Standing Committee on Membership

Dr. Petit, Chairman of the Committee, reported on the enquiries made before the General Assembly, and mentioned that the Member Committees showed little enthusiasm for individual and affiliate (industrial and institutional) memberships. The Committee was asked to reconsider the problem during the General Assembly. The resulting report can be found on page 60.

The Council accepted the recommendations of the Committee on Membership, and expressed his thanks to Dr. Petit for the considerable amount of work he had put in conducting the enquiries among the Member Committees. The relevant resolutions are U.7 (see p. 167) and U.10 (see p. 169).

9. Finances

The Treasurer briefly presented his report, which had been circulated ahead of the Assembly. He expressed thanks to all Member Committees for the prompt payment of their dues, which was a great help to the Union. He reminded the members that the Council had authorized the Board to adjust the unit contribution, as expressed in dollars, in order to keep its purchasing power consistent with the budget. The wide fluctuations of the exchange rate of the dollar remain a major problem. The financial situation of the Union, and in particular its financial reserves, are nevertheless satisfactory.

The detailed triennial report on the finances of the Union, including the audited accounts for 1987, 1988 and 1989 was accepted by the Council on recommendation of the Standing Finance Committee (see Resolution U.8, p. 167). The report and recommendations of the Standing Finance Committee are reproduced on page 73. The Council approved the proposal of the Finance Committee that a shift from the US dollar to the Belgian franc should take place gradually over the next triennium, but not later than 1 January 1993. The Board should have authority to introduce the change earlier in the event of a further drop in the value of the US dollar. The Council approved, following the recommendations of the Finance Committee, Budget Scheme B of the Treasurer, the main feature of which is an unchanged unit contribution of \$860, based on the conversion rate \$1 = BEF 35.

10. Standing Publications Committee

The Council heard a report on the publishing activity of URSI in the 1987-90 triennium. The replacement of the Newsletter by a new Magazine, "The Radioscientist", which would have no formal connection with URSI, was discussed. The magazine would hopefully be self-supporting through advertising. This item, and other ones such as the Review of Radio Science, were discussed by the Committee, which submitted the report given on page 78. The Council accepted the recommendations of the Committee, and expressed its thanks to Professor Clarricoats and the members of his Committee for the very comprehensive report they had prepared. It approved Resolution U.9 (see p. 168).

11. Standing Committee on Developing Countries

The report of the Committee (see p. 81) was approved by the Council, together with the planned activities for 1990-1993. The relevant Resolution is U.11 (see p. 169).

12. Bioeffects

The ad hoc Group made recommendations to the Council in a report which can be found on page 145 under "Commission K". The Group concluded that the scope of URSI's involvement with bioeffects was much wider than the metrological aspects in which Commission A was interested. A consensus was found to make a step forward, and recommend starting a new Commission within URSI. The Council approved this proposal. The terms of reference were still to be defined, but should include the study of interactions between electromagnetic radiation and living systems from essentially DC to optical frequencies. This would include not only possible hazards and ensuing standards, but also beneficial medical applications. The name of the Commission was still to be decided, but "Electromagnetics in Biology and Medicine" was suggested as a good choice.

The Council decided to ask Professor J.B. Andersen and Dr. M. Stuchly to act informally as Chairperson and Vice-Chairperson, respectively. Their task would be to guide the first steps of the new Commission.

13. Time Domain Waveform Measurements

The Council heard the report presented by Professor Sarkar (see p. 149), and subsequently approved Resolution U.18 (see p. 173).

14. Relations with the ITU Consultative Committees

The structure of the URSI-CCIR-CCITT Liaison Committee was discussed extensively at several meetings of the Council. The ad hoc group chaired by Professor Delogne made several recommendations, the main one being the creation of a Scientific Committee. The role of the latter would not be restricted to addressing questions posed by CCIR and CCITT, but would also be to stimulate studies on topics which might be of interest to ITU in the long term. More broadly, the Scientific Committee should play an active role in the advancement of telecommunications in general, and should not just be waiting for questions from CCIR.

The ad hoc group was also of the opinion that a link with CCITT was necessary, considering the scientific expertise present in URSI Commissions C and D, but that a separate CCITT liaison group was not needed to perform this task.

The Council approved the creation of the new Scientific Committee, together with the latter's terms of reference. The details can be found in Resolution U.3 (p. 165).

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

The Council accepted the Report presented by Dr. B.J. Robinson, Chairman of the Commission (reproduced on p. 151 in this volume), and adopted Resolutions U.25, U.26 and U.27 (pp. 176-177), which stress the importance of the work of IUCAF.

16. Committee on the International Geosphere-Biosphere Programme

Professor G. Brussaard held an Open Meeting on the role of URSI in the IGBP, at which the following activities were recommended :

- (a) set up a permanent representation of the URSI Committee in Dr. Rasool's IGBP Working Group I (Data collection);
- (b) intensify the existing interaction with IGARSS (the International Geoscience and Remote Sensing Symposium);
- (c) encourage dissemination of information on IGBP and WCRP (World Climate Research Programme) e.g. through systematic use of the URSI Bulletin;
- (d) participate in (or be represented at) important meetings of the various high-level IGBP groups.

The Council approved these recommendations (see Resolution U.13, p. 170).

REPORT OF THE STANDING COMMITTEE ON URSI MEMBERSHIP

The Committee discussed four important items.

1. Affiliate Members

The Committee did not feel appropriate to recommend at this stage the creation of an affiliate membership category, although URSI could certainly take advantage of a closer relationship with large firms interested in radio science, and the Member Committees should be encouraged to develop such contacts on a national basis. The envisaged prospective study of the future of URSI should include this issue.

2. Individual Members

On the basis of a discussion on individual membership, the Committee proposed the creation of a network of correspondents. Any scientist attending a General Assembly could, by paying a slightly increased registration fee (e.g. 200 dollars instead of 160 dollars), be registered as a correspondent for a three-year period. A scientist not able to attend a General Assembly could also ask the URSI Secretariat to register as correspondent by paying the extra fee (e.g. 40 dollars).

Scientists belonging to developing countries could be exempted from such a fee, on the basis of a scheme involving the Third World Academy of Sciences (TWAS).

The correspondents would receive announcements for the General Assembly and Calls for papers for the Symposia organized or supported by URSI. The correspondents would have no voting rights. However, the Commission Chairmen would be invited to consult all participants attending the business sessions on matters of a scientific nature.

3. Associate Membership

Taking into account the discussions in the Council, the Committee proposed to replace, in Article 13 of the revised draft Statutes, the sentence reading as follows : "The duration of Associate Membership is not to exceed six years" by the following sentence : "Every Associate Membership will be reviewed at each General Assembly".

4. Terms of Reference

The Committee proposed to keep the present mandate, as defined in Lima Resolution C.7 : "... to request the Committee to propose ways of bringing URSI to the attention of radio scientists in territories which have not yet decided to adhere to URSI,

and to send its recommendation to the URSI Board of Officers", but to add the following :

- " - to consider all questions related to the membership structure of URSI, and to report on them to the Council,
- to examine at each General Assembly the status of the Associate Member Committees, and to submit recommendations for consideration by the Council".

M. PETIT, Chairman

TREASURER'S REPORT ON URSI FINANCES

1. General Comments

- 1.1 This report refers to URSI Finances during the past triennium, discusses the present situation, and contains recommendations; it is based on data available in May 1990.
- 1.2 Aims of financial strategy have remained unchanged. Its main objectives have been outlined before and may be summarized as follows :
 - In view of its principal aims of encouraging and supporting international activities in the field of radio science, URSI, as a non-profit organization, attends to its finances, on behalf of its committees and creditors, in such a way that losses in its assets are avoided, or are at least kept to a minimum. Investments thus concentrate on funds of relatively stable behaviour.
 - With respect to long-term financial management, continuous consideration is given to the maintenance of a healthy financial situation and, in particular, to the affordability of membership dues for member committees in any of the categories, 1 to 6. In this regard, it remains one of the main objectives to keep any increase in the unit of membership contribution generally affordable.
 - As in the past, financial support is provided for scientific meetings upon proper authorization of URSI sponsorship, financial planning has been directed at appropriate preparations to ensure a successful General Assembly in 1990.
 - As a special activity, URSI provides support for properly qualified Young Scientists at the General Assemblies and at scientific meetings between assemblies.
- 1.3 The major source of income is represented by membership contributions ; an appropriate acknowledgement is herewith expressed for their regular payment.
- 1.4 URSI finances continue to demonstrate a generally healthy picture. However, significant fluctuations and a general decrease in the BEF/\$ exchange rate occurred with respect to the situation in August/September 1987. Such variations have always been a major cause for concern with the finances of scientific unions, including URSI. The seat of the Secretariat is also the site of major administrative costs. Thus, for URSI, a decreasing exchange rate of the Belgian franc with respect to the US dollar (BEF/\$) remains a predominant problem requiring continuous scrutiny and flexible response.
- 1.5 This report refers to annual balance sheets for 1987, 1988, and 1989, appended at Annex 1; on the whole, a satisfactory balance is indicated with respect to the budget.
- 1.6 Following this section on General Comments, Trends in Finances (section 2), Income (3), Assets (4), and Expenditure (5) will be addressed. Sections 6 and 7 will discuss the Financial Situation and Possible Future Policy, respectively. The report will be completed by draft budgets (8, 9) for the XXIVth General Assembly, and for overall income and expenditure in 1991, 1992, and 1993, with an appropriate projection into 1994.

2. Trends in Finances

- 2.1 As has already been indicated, the BEF/\$ rate remains a significant "financial barometer". Its variation during the triennium showed a decrease from 38.5 in August/September 1987 to a minimum of 33.5 in January 1988, subsequently levelling at about 35.0 and later, during August to October 1988, at 39.0. In 1989, the BEF/\$ rate increased to a maximum monthly value of 41.5 and decreased again to a value of 35.0 early in 1990 (see figures 1 and 2).
- 2.2 The situation resulting from the low BEF/\$ values early in 1988 caused the Board in July 1988 to agree to a Re-Interpreted Budget 1988-91, as proposed by the Treasurer. It provided more realistic information on the range of income figures and thus represented an attempt of avoiding an otherwise probably necessary increase in membership contributions due to the low BEF/\$ rate ; the budget was based on two assumptions :
 - (a) BEF/\$ rate would remain at 38.0.
 - (b) Main income results from membership dues, an additional 20% of this amount represents an estimated sum of other income components.
- 2.3 The last-mentioned assumption serves as an estimate for income from sources other than that from membership contributions, in the absence of more accurate data. Such "other sources" comprise allocations, special contributions, gains from investment and exchange, and sales of publications. The triennial average of the percentage value amounted to at least 20 to 25% of that due to membership contributions for balance sheets from 1972 to 1987; both quantities seem to be related through general trends in finances. The approach appears to be generally helpful in estimating advance budgets, more accurate figures should be used as soon as they are available.
- 2.4 The BEF/\$ maximum in summer 1989 reached a value somewhat above the one assumed for the Re-Interpreted Budget 1988-1991. This situation caused the unit contribution for 1990 to be re-examined, the aim being a possible proposal of reducing it to a lower level. However, the subsequent decrease in the BEF/\$ rate later in 1989 confirmed the necessity of retaining the original budget values.

3. Income

During the triennium, the income from membership dues, the major component, showed the typical deviations from the predicted values. With k\$ 155.85, for example, the 1989 income from dues did not reach the target amount of k\$ 173.16. This item had also shown a deficit in 1987 but a surplus in 1988. Although such fluctuations seem to be unavoidable, they increase the difficulties in financial planning, prompt payment of membership dues would be very helpful.

4. Assets

- 4.1 As in previous balance sheets, the purchase value of assets is listed, according to common practice in Belgium. To document the appreciation in their values, appropriate figures are mentioned at the end of the accounts.

- 4.2 In 1987, 1988, and 1989, the net total values of assets in k\$ amounted to 387.5, 396.73, and 396.25, respectively. Assets are held in bank deposits and funds in Europe and in the United States. Funds and bonds used by URSI have been monitored continuously; they have displayed a satisfactory trend.
- 4.3 Already during the previous triennium, an adaptive response in investment policy had been used successfully to mitigate detrimental effects of fluctuations in the exchange rate. In other words, the ratio of \$ to non-\$ assets depends on the BEF/\$ rate; for example, a 40/60% ratio had been maintained during periods of a low BEF/\$ rate. This flexible response in investment policy has been adhered to; the relative amount of present \$-oriented assets has been fluctuating around 40% which is satisfactory in view of the value of the dollar.
- 4.4 The financial reserves actually required depend on a number of factors, such as legal requirements, planned special operations, other forthcoming costs.

5. Expenditure

- 5.1 With respect to valid budgets, total expenditures indicated by the balance sheets for 1987, 1988, and 1989 were less in 1987 by k\$ 3.5 (w.r.t. the budget revised at the Board Meeting in March 1987) and exceeded the anticipated figures in 1988 and 1989 by k\$ 41.94 and 14.4, respectively (w.r.t. the re-interpreted budget agreed by the Board in July 1988).
- 5.2 Highlights of the 1987 expenditure were the Corsendonk meeting and the General Assembly. The scientific expenditure exceeded the predicted one by k\$ 128.0 instead of 112.0 while other items displayed lower figures. Expenditure connected to the General Assembly and listed in 1987 remained within the predictions.
- 5.3 The discrepancy in 1988 was mainly caused by an additional sum of k\$ 29.19 to be paid for publications of the 1987 General Assembly (Review of Radio Science at k\$ 20.0 and Proceedings at 9.19), some other residual costs and expenditure due to routine meetings, administrative expenditure including ordinary publications agreed with the budget figure. Nevertheless, the overall deficit for 1988 was almost identical to the predicted one, due to the higher income level in that year.
- 5.4 There appear to be various reasons for the 1989 discrepancy, such as increasing costs as well as special expenditure generally connected to the preparations for a General Assembly, for example the meeting of the Coordinating Committee. Thus the overall surplus was less than expected; the difference is approximately equal to the deficit in the income of membership dues for this year. Total administrative expenditure, with routine meetings considered part of it, amounted to k\$ 138.02, including publications. Other items refer to first organizational preparations of the 1990 General Assembly and routine items, such as ICSU dues and loss on exchange (including bank charges).
- 5.5 During the triennium, actual support of scientific meetings, with the exception of the General Assembly, is listed with k\$ 88.0, the representation at meetings amounting to additional k\$ 21.38. Other items of scientific expenditure are grants to organizations (k\$ 16.9) and scientific preparation of the 1990 General Assembly.
- 5.6 Concerning administrative expenditures, it should again be emphasized that, in reality, they display a relatively constant and perhaps inflation-dependent behaviour, fluctuations indicated in the balance sheets are mainly due to the necessary conversion into US dollars on the basis of the appropriate BEF/\$ rate.

6. Financial Situation

- 6.1 The present financial situation of the Union is illustrated by the balance sheet of 31st December 1989. Satisfactory conditions are indicated, although the unpredictable fluctuations in the exchange rate of Belgian franc to US dollar (BEF/\$) and especially a rate considerably lower than the 1987 budget basis, represent the known difficulties. In October 1987, world economy had experienced dramatically sharp falls in bond and equity prices; the exchange markets were affected early in November 1987. In the meantime, the variations already discussed have continued and the level is again low at the time of writing this report.
- 6.2 On the other hand, the anticipated economic development in Europe promises a stabilization among European currencies and thus the possible introduction of a certain inertia in future fluctuations. Such reasons and the importance of the US dollar as the world-wide reference currency suggest that a change to another currency would not be profitable, which is also in accordance with opinions expressed at a meeting of the treasurers of all scientific unions early in 1989.
- 6.3 The development of URSI assets shows that the investment policy adopted a number of years ago and characterized by a flexible response to changes in the BEF/\$ rate has resulted in reserves well adequate for present financial requirements of the Union. During the last two triennia, the reserves amounted to at least twice the annual running costs, a factor between 1.0 and 2.0 is normal for scientific unions, it depends on a number of variable conditions which differ from union to union, for example local regulations for the employment of staff and similar legal requirements.
- 6.4 As the main area of the Union's financial obligations during the triennium 1987-1989, particular attention had again been given to the financial support directed at scientific meetings and, especially, at the all-important scientific preparation of the General Assembly. The Coordination Committee in 1989, but also other items such as the Young Scientist Programme, should here be mentioned.
- 6.5 In 1990, administrative costs will be higher than anticipated. The URSI Secretariat will be closed in Brussels and moved to the University of Ghent; these operations will lead to some special expenditure. On the other hand, the financial reserves have been set aside for such special purposes. Within limits of predictability, no substantial difficulties are anticipated with the deficit thus expected at the end of the triennium 1988-90.

7. Possible Future Policy Concerning Finances

- 7.1 An attempt will here be made to present some ideas on the possible future financial policy of the Union; they are based on the main objectives mentioned in section 1 of this report and refer to the Union's general image as compared to other scientific unions, as well as to the three main areas, viz. income, assets, and expenditure. Some of the items had already been addressed in the 1987 report and have also been used as a guiding line in the past, the present situation and predictions are taken into account as well as possible.
- 7.2 In an attempt to compare URSI operations with those of other Scientific Unions, suitable data have been extracted from Reports of ICSU General Assemblies and material made available at the meeting of Treasurers at ICSU, 26th April 1989.

Comparability of data is limited, mainly due to differences in categorisation of items and in financially significant operations, such as the frequency of general assemblies. The data show that URSI ranks low in the ratio of scientific expenditure to total income (about 35%), and correspondingly high in administrative expenditures.

- 7.3 There does not appear to be any doubt that the URSI income will continue to depend mainly on the contributions of member committees. However, the affordability with respect to increasing membership dues deserves continuous consideration. An excessive increase in dues may cause members to lower their categories, thus leading, in effect, to less income. A kind of elasticity range should be adhered to, in some analogy to the elasticity of demand used in economics to describe the limit to which price may be increased without substantial decrease in demand, and thus in net again.
- 7.4 There is a consistent problem with regard to predicting dues for periods of two or more years, which are usual intervals with URSI as with most of the other unions. Experience during the past two triennia has shown that all relevant factors, such as the BEF/\$ rate, the general economic development and resulting consequences, as well as the affordability of membership dues, do require continuous monitoring and an appropriate re-examination of the budget and thus of the dues at approximately annual intervals.
- 7.5 With further reference to fund-raising aspects, attention should also be directed at the reserves held with respect to the annual running costs, a detrimental influence of excessive reserves upon grants is possible, as may be derived from discussions within ICSU. A lower quotient of reserves/running costs, perhaps 1.5, is considered adequate to satisfy future financial conditions of the Union.
- 7.6 This opinion agrees with and is supported by an assumed improvement of the Union's operational expenditure due to the change in the location of the URSI Secretariat and in its organizational affiliation in 1990. Because of the appreciated values of URSI assets being higher than the formal purchase values (see balance sheets) the effective quotient will still be higher than the one just quoted. Even with a policy of reducing assets, a very gradual operation is suggested, taking into account the actual BEF/\$ rate when selecting the fund to be reduced.
- 7.7 Concerning the area of URSI Assets generally, the difficulty will continue to be represented by exchange-rate fluctuations of relatively short-term nature; they will have to be responded to in order to maintain asset values within satisfactory conditions and on a long-term basis.
- 7.8 The most promising approach seems to be the flexible response to varying exchange rates, defined by an appropriate change in the ratio of the \$- to non-\$-assets. A spread of assets to some predominantly non-\$ funds, in addition to the \$-investment, seems to remain a reasonable method. ECU-funds continue to be of special interest, they permit URSI assets to participate in the relative strength and the predicted improvement in stability of EMS currencies (ECU = European Currency Unit, EMS = European Monetary System).
- 7.9 Turning to expenditure, and keeping the general affordability of membership dues in mind, it may be advisable to charge an appropriate portion of costs to the reserves until the assets will level at about the quotient found to be appropriate for the eminent financial requirements of the Union.
- 7.10 In accordance with finance-oriented objectives of URSI listed in section 1, expenditure in support of scientific activities is of paramount importance. Guidelines and rules have been established for URSI support to scientific meetings. They

appear to function satisfactorily from a treasurer's point of view. Based on relevant and satisfactory results experienced so far, URSI Commissions and the scientific committee in bioeffects should regularly be allocated a given amount for their activities at the beginning of triennia, to cover support to their meetings during the subsequent three years.

- 7.11 These comments would be incomplete without a reference to the subject of administrative costs which are largely governed by the operating conditions of the Secretariat. Relevant costs represent a substantial amount of the overall expenditure. They are assumed to remain relatively high, in spite of an expected reduction (see 7.6). Every effort should be made to avoid any increase in administrative tasks.
- 7.12 Later this year, the Secretariat is to be closed in Brussels and moved to Ghent. Thus all expenditure connected to these operations would occur in 1990. At this juncture, only estimates are possible. Also due to the costs of the General Assembly, the reserves might be reduced to an amount unpredictable at the time of writing, in terms of running costs, a factor of 1.7 is assumed.

8. Budget for XXIVth General Assembly

- 8.1 Two versions of budgets for the XXIVth General Assembly are presented (I and II) for two feasible conditions of income from the registration fee and of two levels of subsistence.
- 8.2 With respect to previous budgets for General Assemblies the amounts set aside for scientific activities and particularly the Young Scientist Programme have been increased substantially. As is usual, details will have to be finalized after the venue has been decided upon by Council.

9. Budget 1991 to 1993 (1994)

- 9.1 Previous sections of this report have discussed in detail the major problem areas encountered in attempts of predicting financial situation and trends of interest to URSI. As has become a practice during pre-assembly preparations, several models have been calculated, here designated A, B and C.
- 9.2 There is no question that these models will have to be adjusted to allow for changes in input data which may become known between the time of writing this report and the General Assembly. Depending on such further development, a modified version may have to be presented to Council.
- 9.3 As another consequence of the continuing lack of predictability, the Board should again be entitled to change the unit of contribution during the forthcoming triennium 1988-1990 to cope with extraordinary financial emergencies.
- 9.4 To commence with a list of explanatory notes, the models may be characterized by emphasis being given to the various boundary conditions, such as affordability of membership fees, avoidance of step functions in dues, and an acceptable "image ratio" of scientific to administrative expenditure, as well as feasible operating conditions for the administration.
- 9.5 In view of comments made previously, financial operations connected with the closure of the Secretariat in Brussels should be finalized in 1990, and should assist

in reducing the reserves for reasons specified above. Budget models 1991 - 1994 are not considered to be affected.

- 9.6 No increase in membership dues is considered for models A and B, and only a slight one in model C. Income from dues is based in 234 units. The percentage approach (see section 2) has been used to estimate the income from other sources. However, as an additional safeguard, such income is only considered to amount to 16.8% of that from dues. As in the triennial budget 1988-1990, figures listed incorporate related interest indications, as for pension and van-der-Pol Gold Medal funds.
- 9.7 Beside the income, the administrative expenditure represents the major opposite boundary condition. Calculations used a long-term estimate provided by the Secretary General. Relevant figures in budgets assume a stabilization of the exchange rate BEF/\$ at about 35. As another safety measure, the assumed inflation rate of 7.5% is rather high for the economic conditions predicted for Belgium.
- 9.8 With respect to previous triennia, scientific expenditure is listed with substantially higher figures. These include the Young Scientist Programme with a basic triennial amount of \$40,000; at least this sum has been set aside as an additional fund for scientific expenditure. In the interest of flexibility, the sub-items of scientific expenditure should be considered interchangeable in an ad hoc basis.
- 9.9 Within relative limits discussed above, the following features become apparent :
- Model A - no increase in dues,
average "image ratio" of 0.7,
triennial surplus;
 - Model B - no increase in dues,
higher image ratio,
some overall deficit in 1993;
 - Model C - slight increase in 1993 dues,
image ratio as with model B,
lower overall deficit.
- 9.10 As has already been mentioned, emphasis is directed at reasonable funds for scientific activities. Any deficits are assumed to be covered by surplus reserves.
- 9.11 With respect to comments made before (see 7.10), triennial allocations to URSI Commissions and the Committee on Bio-effects are included in the figures for scientific expenditure; the estimates are, per Commission and triennium, \$8,000 for model A, and \$9,000 for models B and C.
- 9.12 In each of the budget models, scientific expenditure includes costs of scientific symposia, of special lecture series, such as the 2nd College on Radio Propagation Physics and Applications to be held in Trieste in 1991, and projects, subventions, in addition to costs of a Coordinating Committee meeting in 1992. ICSU dues have been calculated as 2.5% of the income from membership contributions.
- 9.13 As has become general practice, budget models include preliminary estimates for the year following the General Assembly (1994), to facilitate financial planning of member committees.

10. Concluding Remarks

Important conclusions and recommendations have been discussed in the appropriate sections of this report, particularly in sections 6 to 9. The scrutiny of financial characteristics and appropriate reaction remain essential requirements. It should be possible to carry out these tasks, within the continuous assistance of the Standing Finance Committee.

In particular, the Finance Committee is herewith asked to consider :

- (a) the accounts for 1987-1989
- (b) the future financial policy of URSI
- (c) the budget for the 1993 General Assembly
- (d) the budget for 1991-1993 (1994)

The undersigned wishes to acknowledge very helpful consultations with Professor A.L. Cullen, Professor J. Van Bladel, and Professor F. Gardiol, Chairman of the Standing Finance Committee.

25 May 1990
H.J. ALBRECHT

BUDGET MODELS 1991 - 1994

(all figures in k\$)

MODEL A	1991	1992	1993	TOTAL	1994
Unit of Contribution	0.86	0.86	0.86		0.86
<u>INCOME</u>					
Member Committees	201.24	201.24	201.24	603.72	201.24
Other Sources (estimated)					
<Allocations (ICSU etc.)					
+ Interests/Dividends					
+ Publications = 16.8%	33.8	33.8	33.8	101.4	33.8
<i>Total Income (approximately)</i>	<i>235.0</i>	<i>235.0</i>	<i>235.0</i>	<i>705.0</i>	<i>235.0</i>
<u>EXPENDITURE</u>					
Scientific Activities					
Meetings, Lectures, etc	45.0	60.0	45.0	150.0	50.0
XXIV General Assembly		20.0	70.0	90.0	
Young Scientists	10.0	10.0	20.0	40.0	10.0
XXIV G.A. Organization			50.0	50.0	
ICSU dues	5.0	5.0	5.0	15.0	5.0
Administration	105.0	112.9	121.3	339.2	130.4
Office Modernization	5.0			5.0	
Loss on Exchange	3.0	3.0	3.0	9.0	3.0
<i>Total Expenditure</i>	<i>173.0</i>	<i>210.9</i>	<i>314.3</i>	<i>698.2</i>	<i>198.4</i>

BUDGET MODELS 1991 - 1994

(all figures in k\$)

MODEL B	1991	1992	1993	TOTAL	1994
Unit of Contribution	0.86	0.86	0.86		0.86
<u>INCOME</u>					
Member Committees	201.24	201.24	201.24	603.72	201.24
Other Sources (estimated)					
<Allocations (ICSU etc.)					
+ Interests/Dividends					
+ Publications = 16.8%	33.8	33.8	33.8	101.4	33.8
<i>Total Income (approximately)</i>	<i>235.0</i>	<i>235.0</i>	<i>235.0</i>	<i>705.0</i>	<i>235.0</i>
<u>EXPENDITURE</u>					
Scientific Activities					
Meetings, Lectures, etc	55.0	65.0	55.0	175.0	50.0
XXIV General Assembly		20.0	70.0	90.0	
Young Scientists	10.0	10.0	20.0	40.0	10.0
XXIV G.A. Organization			50.0	50.0	
ICSU dues	5.0	5.0	5.0	15.0	5.0
Administration	105.0	112.9	121.3	339.2	130.4
Office Modernization	5.0			5.0	
Loss on Exchange	3.0	3.0	3.0	9.0	3.0
<i>Total Expenditure</i>	<i>183.0</i>	<i>215.9</i>	<i>324.3</i>	<i>723.2</i>	<i>198.4</i>
Surplus (+) / Deficit(-)	+52.0	+19.1	-89.3	-18.2	+36.6

BUDGET MODELS 1991 - 1994

(all figures in k\$)

MODEL C	1991	1992	1993	TOTAL	1994
Unit of Contribution	0.86	0.86	0.9		0.9
<u>INCOME</u>					
Member Committees	201.24	201.24	210.6	613.08	210.6
Other Sources (estimated)					
<Allocations (ICSU etc.)					
+ Interests/Dividends					
+ Publications = 16.8%	33.8	33.8	35.4	103.0	35.4
<i>Total Income (approximately)</i>	<i>235.0</i>	<i>235.0</i>	<i>246.0</i>	<i>716.0</i>	<i>246.0</i>
<u>EXPENDITURE</u>					
Scientific Activities					
Meetings, Lectures, etc	55.0	65.0	55.0	175.0	50.0
XXIV General Assembly		20.0	70.0	90.0	
Young Scientists	10.0	10.0	20.0	40.0	10.0
XXIV G.A. Organization			50.0	50.0	
ICSU dues	5.0	5.0	5.0	15.0	5.0
Administration	105.0	112.9	121.3	339.2	130.4
Office Modernization	5.0			5.0	
Loss on Exchange	3.0	3.0	3.0	9.0	3.0
<i>Total Expenditure</i>	<i>183.0</i>	<i>215.9</i>	<i>324.3</i>	<i>723.2</i>	<i>198.4</i>
Surplus (+) / Deficit(-)	+52.0	+19.1	-78.3	-7.2	+47.6

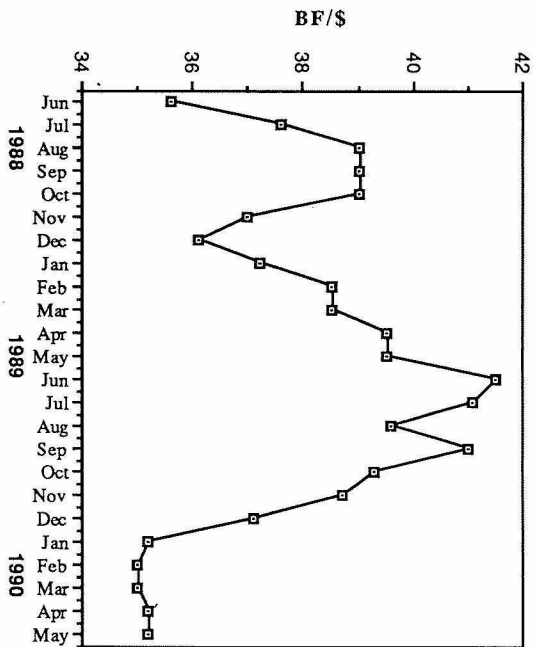


Fig. 1 : "BF/\$ Exchange Rates"

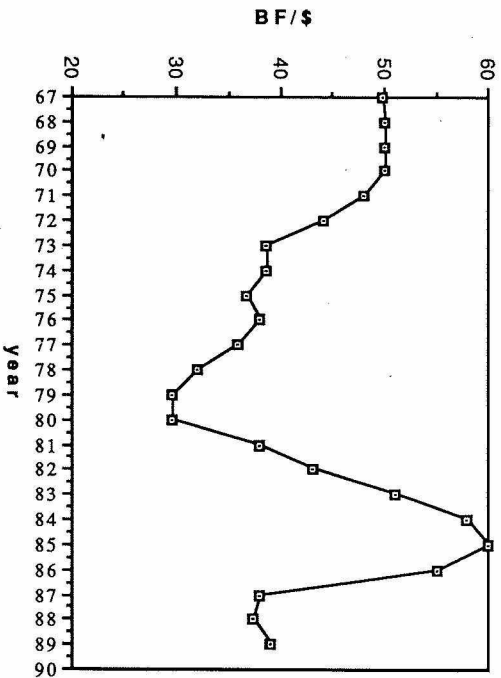


Fig. 2 : BF/\$ Exchange Rates 1967-89

REPORT OF THE STANDING FINANCE COMMITTEE

1. Accounts for the years 1987 - 1989

The Finance Committee examined the accounts of URSI for the period 1987 - 1989, as submitted by the Treasurer in his report of May 1990. The accounts were audited by Van Poyer and Cie., Réviseurs d'Entreprises, Brussels, at the end of March 1990. The members of the Committee were very impressed by Dr. Albrecht's work, and in particular by his very comprehensive report. They felt that the finances were handled with commendable prudence and that the proposals looked sound. They recommended that the Treasurer's Report be published in an official URSI publication (it can be found on p.62).

The Committee noted that the General Reserve Fund's level, showing reserves for about 2 years, somewhat exceeded usual ICSU's recommendations. This was done to permit a smooth transition of the URSI Secretariat. When the operation is completed, the Committee recommended that assets be stabilized at the level recommended by ICSU.

2. Long Term Finance Policy - Definition of the Unit Contribution

The finances of URSI present a basic anomaly in that the income is defined in terms of U.S. dollars, whereas the fixed costs of administration are incurred in Belgian Francs, since the Secretariat is located in Belgium. This means that input and output are at different impedance levels, with a ratio that is time-dependent in an unpredictable manner. Until 1967, the BEF/\$ ratio remained stable, so that this anomaly did not cause major problems to the URSI finances. This is no longer so since 1968, at which time the US dollar reference was modified. Since then, more or less continuous fluctuations have created a standing problem for successive URSI Treasurers, Board members and members of the Standing Finance Committee. In 1988, for instance, the operational budget had to be reinterpreted to take into account a drop in the value of the dollar. A move in the other direction was considered in 1989, but was finally not carried out.

Recurring readjustments actually imply additional work for the Treasurer, the Finance Committee and the Board, meaning ultimately an expenditure of URSI finances. All this is completely unnecessary, and results from a historical situation that no longer makes sense.

The Members of the Standing Committee unanimously recommend that this anomaly be definitely eliminated by specifying URSI dues in the currency in which the fixed administrative cost are incurred, i.e. in Belgian Francs, or a currency closely related to it, such as the European Currency Unit (ECU).

The change of reference standard could be carried out gradually over the 1990 - 1992 triennium, but not later than 1.1.1993. The Board should have the authority to select the proper time for the shift, and to introduce the change faster in the case of a further drop in the value of the US dollar.

It should be clearly indicated to all Member Committees that the change refers to the definition of the dues. The actual contribution is payable in any convertible currency, and the Secretariat can indicate the official exchange rates if necessary. The Committee also recommends that a deadline for the payment of annual dues should be set at the 31st of December.

3. Budget 1990 - 1992

The Treasurer proposed four possible budget schemes for the triennium. The Committee selected Budget Scheme B, i.e. a constant dues unit of \$860, based on a conversion rate of 35 BEF/\$. This scheme does not include an increase in dues with respect to the current budget, but provides a slight improvement in the scientific to administrative image factor (it must be noted that publication costs are included in the administrative costs). The budget should be revised when needed, taking into account recent financial developments, and gradually adapted to the transfer to European Currency as recommended under point 2.

The Committee agrees with the idea that Commission Chairmen should receive a financial allocation, of the order of 8 k\$, for the whole triennium. However, taking note that some Commissions did not make use of their allocation in the last triennium, it is recommended that the Commission Chairmen be requested to prepare a rough budget, indicating clearly whether they need financial support, and when it will be needed. Funds allocated, but not spent, during a given triennium cannot be extended to the next triennium. It is recommended that a similar allocation be made available, under the same conditions, to the Chairman of the Committee on Developing Countries and to the interim Chairman of Commission K on Electromagnetics in Biology and Medicine, which is presently being formed.

The Finance Committee consisted of : F. Gardiol (Chairman), C.M. Butler, K. Géher, J.G. Lucas, S.M. Radicella, F.W. Sluijter, S. Swords. The Finance Committee was assisted by H.J. Albrecht (Treasurer), J. Van Bladel (Secretary General) and P. Bauer (Scientific Programme Coordinator).

Statement of Income and Expenditure
for the year ended 31 December 1987

<u>I. INCOME</u>	\$	\$
Grant from ICSU Fund		11,000.00
Allocation from Unesco Subvention to ICSU		8,876.00
Unesco Contracts		2,700.00
Contributions from Member Committees		118,720.32
Special Contributions		4,322.76
Sales of Publications		306.31
Bank Interest and Gain on Exchange		21,891.46
Other Income		<u>10,713.72</u>
Total Income		<u><u>178,530.57</u></u>
 <u>II. EXPENDITURE</u>		
<u>a) Scientific Activities</u>		135,792.55
General Assembly - (XXII)	80,565.99	
Symposia/Colloquia/Working Groups	44,165.76	
Representation at Scientific Meetings	7,160.80	
Grants to Organizations	<u>3,900.00</u>	
 <u>b) Routine Meetings</u>		
Bureau		27,869.09
 <u>c) Publications</u>		20,903.71
 <u>d) Administrative Expenses</u>		128,054.25
Salaries, Related Charges	78,094.29	
Administrative Travel	7,098.10	
General Office Expenses	19,982.32	
Office Equipment	10,860.89	
Accounting and Audit Fees	9,103.77	
Bank Charges	<u>2,914.88</u>	
 <u>e) ICSU Dues</u>		<u>3,530.00</u>
Total Expenditure		<u><u>316,149.60</u></u>
 Excess of Expenditure over Income		(137,619.03)
Accumulated Balance at 1 January 1987		<u>479,792.30</u>
Balance at 31 December 1987		342,173.27
Appreciation of Belgian Franc		<u>45,322.94</u>
Accumulated Balance at 31 December 1990		<u><u>387,496.21</u></u>

Statement of Income and Expenditure
for the year ended 31 December 1988

<u>I. INCOME</u>	\$	\$
Grant from ICSU Fund		18,309.00
Unesco Contracts		300.00
Contributions from Member Committees		164,391.08
Special Contributions		4,155.12
Special Grants/Contracts		2,500.00
Sales of Publications		373.22
Bank Interest and Gain on Exchange		19,259.84
Other Income		<u>3,957.90</u>
Total Income		<u>213,246.16</u>

II. EXPENDITURE

<u>a) Scientific Activities</u>		39,466.33
General Assembly (XXII)	2,197.10	
Symposia/Colloquia/Working Groups	24,079.34	
Representation at Scientific Meetings	6,189.89	
Grants to Organizations	<u>7,000.00</u>	
<u>b) Routine Meetings</u>		
Bureau		18,201.40
<u>c) Publications</u>		49,539.92
<u>d) Administrative Expenses</u>		106,622.80
Salaries, Related Charges	84,111.94	
General Office Expenses	8,971.02	
Office Equipment	1,731.58	
Accounting and Audit Fees	8,174.89	
Bank Charges and Loss on Exchange	<u>3,633.37</u>	
<u>e) ICSU Dues</u>		<u>4,110.00</u>
Total Expenditure		<u>217,940.45</u>

Excess of Expenditure over Income	(4,694.29)
Accumulated Balance at 1 January 1988	<u>387,496.21</u>
Balance at 31 December 1988	382,801.92
Appreciation of Belgian Franc	<u>13,930.96</u>
Accumulated Balance at 31 December 1988	<u>396,732.88</u>

Statement of Income and Expenditure
for the year ended 31 December 1989

<u>I. INCOME</u>	\$	\$
Grant from ICSU Fund		11,420.00
Unesco Contracts		994.67
Contributions from Member Committees		155,846.00
Sales of Publications		475.33
Bank Interest and Gain on Exchange		29,817.28
Other Income		<u>4,606.32</u>
Total Income		<u>203,159.60</u>

II. EXPENDITURE

<u>a) Scientific Activities</u>		50,822.79
General Assembly - Organization	1,095.28	
General Assembly - Scientific	15,940.32	
Symposia/Colloquia/Working Groups	19,757.59	
Representation at Scientific Meetings	8,029.60	
Grants to Organizations	<u>6,000.00</u>	
 <u>b) Routine Meetings</u>		
Bureau/Executive Committee		19,545.38
 <u>c) Publications</u>		
		22,753.49
 <u>d) Administrative Expenses</u>		
		102,013.02
Salaries, Related Charges	80,511.60	
General Office Expenses	7,610.67	
Office Equipment	320.18	
Accounting and Audit Fees	7,278.15	
Bank Charges and Loss on Exchange	<u>6,292.42</u>	
 <u>e) ICSU Dues</u>		
		<u>2,968.00</u>
Total Expenditure		<u>198,102.68</u>

Excess of Income over Expenditure	5,056.92
Accumulated Balance at 1 January 1989	<u>396,732.88</u>
Balance at 31 December 1989	401,789.80
Appreciation of Belgian Franc	<u>(5,543.31)</u>
Accumulated Balance at 31 December 1989	<u>396,246.49</u>

REPORT OF THE STANDING PUBLICATIONS COMMITTEE

The Committee met on three occasions during the General Assembly, and discussed the following items :

1. Review of Radio Science

It was reported that, following a meeting of Commission Chairmen, the content of the Review of Radio Science should take the form of

- (i) a number of Review papers from each Commission
- (ii) a comprehensive bibliography on diskette.

The Committee recommend to Council that Dr. W.R. Stone be appointed Editor and that each Commission should provide Dr. Stone with the name of one person who would select the topics and authors of the Review papers. These persons would also be responsible for editorial supervision of the contributions from their Commissions and the collection of the references for the diskettes. Overall editorial responsibility would be vested in Dr. Stone.

The Committee also recommend to Council that an approach be made to Oxford University Press with a view to that organization taking over responsibility for publishing and distributing the Review of Radio Science including the diskette. This procedure would relieve URSI from the financial risk associated with the present mode of production and should ensure a flow of royalties to URSI, as is the case with the publication Modern Radio Science.

The Committee also suggests that Modern Radio Science might be subsumed into the new publication with a number of tutorial papers supplementing the Review papers referred to above.

The Commission propose that, subject to approval by Council and with assistance from the Secretary General, Professor Clarricoats should conduct preliminary discussions with Oxford University Press. Contractual responsibility for the new publication would rest with the URSI Secretariat reporting to the Board of Officers.

In the event that Oxford University Press be either unable or unwilling to enter into a satisfactory agreement to produce the publication, it is suggested that approaches be made to :

- (i) IEE Press
- (ii) IEEE Press
- (iii) the printers and distributors of the IEEE APS Magazine (Editor : Dr. W.R. Stone)

(iv) the AGU (Publishers of the journal Radio Science).

The Committee received (and approved) a proposal from an ad hoc Group chaired by Professor Van Bladel to consider the disposal of the residue of diskettes and copies of the Review of Radio Science arising from the 23rd General Assembly. After the Assembly, in particular, they should be :

- a) Offered to IEE for sale at the 1991 ICAP Conference.
- b) Offered to IEEE for sale through the APS Society.

Subject to the agreement of Council, surplus copies of the Review of Radio Science should be sold by :

- a) IEE Press : 250 copies
- b) IEEE Press : 500 copies

at a price to be negotiated and approved by the URSI Secretariat in order to ensure that URSI costs per copy are covered. In addition, it was noted that copies are provided gratis to the URSI Workshop in Trieste (300), Member Committees (100), CCIR (30), Subeditors (20) and the URSI Secretariat (100).

2. The Radioscientist

After an extensive discussion of the status and potential development of the publication "The Radioscientist", the Committee invites Council to approve the following resolutions :

- (i) That the Radioscientist should be published by URSI using a non-profit making company to be established in Belgium. This Company would have URSI Officers as Directors, who would exert financial control over the publication. The URSI Council would appoint the Editor and would provide broad recommendations regarding editorial policy.
- (ii) That the URSI logo be used to identify the Radioscientist as an URSI publication.

The Committee further recommends that Professor Dowden be invited to continue as Editor. Also, in order not to lose the momentum generated by the first issue of the Radioscientist, particularly with reference to advertising, it would be highly desirable for the second issue to appear before the end of 1990.

3. Proceedings of the URSI General Assembly

The Committee recognized that an exceptional role has been played by Madame Stevanovitch in the production of the URSI Proceedings over the years. It was noted that after 1993, new arrangements would have to be found to accomplish the translation into

French, but there was agreement that the contents should not be changed in general. However, it was felt that summaries of scientific sessions would be dropped from the Proceedings without significant disbenefit to the community.

The Committee asks the Council to resolve that Madame Stevanovitch be thanked for her exceptional contribution to the URSI Publications.

4. INAG Bulletin

The Committee recommend to Council that the grant to NOAA for the INAG Bulletin should be continued.

5. URSI Bulletin

The Committee recommend that Member Committees requiring a supply by AIRMAIL should be asked to pay the difference in cost.

6. Naming of Editors

The Committee recommend that the Editors of all URSI publications be named on the cover.

P.J.B. CLARRICOATS, Chairman

REPORT OF THE STANDING COMMITTEE ON DEVELOPING COUNTRIES

In the 1987-1990 period the Committee was instrumental in organizing, in January - February 1989, two major training activities at the International Centre for Theoretical Physics in Trieste. Both the Basic Course on Telecommunication Science and the College on Theoretical and Experimental Radio Propagation Physics were quite successful, especially as they created some sort of family feeling among young scientists from developing countries.

Support had been obtained from ICTP for the establishment of a Network of Radio Propagation Groups, and efforts were being made to implement a system of fast communication links among the groups connected with data bases.

A second biregional Latin American - African Conference was held in Ilorin in November 1989, with URSI support.

The Committee met in Prague on Monday 3 September 1990, at 1.30 p.m.. The following attended the meeting :

Professor S.M. Radicella : Chairman
Professor J. Voge : Member
Dr. B.M. Reddy : Member
Dr. S. Feng : Member

Training and publication activities were discussed at length. The following programme was envisaged for the next triennium :

- 1) Two meetings of the Committee (the first one in January 1991) to finalize the URSI Handbook on Earth-Space Propagation in the Tropics;
- 2) The organization of two Colleges on Radio Propagation in Trieste, Italy, with the assistance of ICTP, the first one to be held in January 1991, and the second in January 1993. These would be oriented towards practical aspects, and the lecturers would try to help the participants solve the problems they may have encountered in their work.

S.M. RADICELLA, Chairman

BUSINESS TRANACTED 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 : Professor S. Leschiutta (Italy)

Vice-Chairman : Dr. J. Vanier (Canada)

REPORT ON BUSINESS MEETINGS

The Commission held three Business Meetings, respectively on 28, 31 August, and 3 September 1990.

First Business Meeting (28 August, 14.00 to 15.20)

Twenty-five persons attended the meeting.

1. Chairman's report on the activities in the period 1987-1989

Professor Leschiutta discussed the following items :

- (a) Preparation of the Scientific Programme at the General Assembly.
- (b) URSI Register of National Standards Laboratories, available in printed form (Publisher A. Hilger) since the beginning of 1990.
- (c) Meeting of the "Comité Consultatif pour la Définition de la Seconde" (CCDS), at the Bureau International des Poids et Mesures (BIPM), Sèvres, in 1989. Resolutions and recommendations concerning the Universal Time Coordinated (UTC) (Report by Dr. Mc. Steele).
- (d) Conference on Precision Electromagnetic Measurements (CPEM), Ottawa, June 1990 (Report by Professor J. Vanier).
- (e) CCIR Plenary Assembly in Düsseldorf, June 1990, leading to the re-organization of the study groups. In particular study groups 2 and 7 will form a single group (7) "Science Services" (Report by Dr. Mc Steele).
- (f) Scientific meetings on "Time Domain Waveform Measurements" during the General Assembly (Report by Professor Sarkar).
- (g) International Electrotechnical Commission (IEC) Meeting in Beijing, October 1990, (Report by Professor Lundbom).

- (h) Giorgi Symposium in Turin, 1988.
- (i) 75 years of Bureau International de l'Heure (BIH), Paris, France, 1989.
- (j) International Electromagnetic Symposium, Beijing, 1989.
- (k) Nobel Prizes for Professors Ramsey, Dehmelt and Paul (report by Professor Lundbom).

2. Report of the Working Group on Interactions of Electromagnetic fields with Biological Systems

Professor Leschiutta summarized the development of this discipline in URSI, from 1969 up to 1987. He mentioned the decisions taken at the Tel Aviv General Assembly about this Working Group, the problems related to the death of Professor Rosenthal, the illness of Professor Romero-Sierra, and the work performed by Professor J. Bach Andersen to organize the URSI-Bioelectromagnetics Society (BEMS) Symposium in Prague. After a meeting devoted to the future of Bioeffects in URSI, Professor Andersen will present a proposal to the URSI Board and Council for the future activities of the Working Group.

3. Election of a Vice-Chairman

The following candidates were nominated : M. Kanda (U.S.A.), B.S. Mathur (India), P.O. Somlo (Australia), U. Stumper (Germany), R.W. Jell (U.K.).

Professor Leschiutta explained the rules for election, and announced that voting would take place in the next business meeting, on Friday 31 August. Professor Hahn raised the delicate problem caused by the non-secrecy of the present voting procedure.

4. Presentation of Recommendations

Two proposals of Recommendations were distributed. They concerned :

- Laser-Diodes-Pumped Solid-State Lasers
- Laser Diodes

The participants were invited to present other recommendations.

Second Business Meeting (31 August, 17.00 to 18.30)

Twenty-eight people attended the meeting. The minutes of the first meeting were approved.

1. Nobel Prizes 1989

Professor Lundbom reported shortly on the presentation of the 1989 Nobel Prizes for Physics, awarded to Profs. Ramsey, Dehmelt and Paul. He mentioned that, in the last few decades, the Nobel Prizes in Physics were associated three times with subjects of direct interest to Metrology, namely those assigned to Josephson, von Klitzing and, lately, to the 1989 awardees. Professor Lundbom, who attended the ceremony on behalf of Commission A, read the citations ; in the case of Professor Ramsey, for the separate oscillatory fields method, in the case of Profs. Dehmelt and Paul, for the ion trap techniques. He then read the letter of congratulation which he prepared, and which was signed by the Commission A Chairman and Professor Lundbom himself. This letter was delivered to the Nobel Laureates.

Professor Lundbom subsequently mentioned that, after more than thirty years of activity in URSI, and after attending eleven General Assemblies, he will no longer be the Swedish official member of Commission A. His successor from January 1991 will be Dr. Lars Erik Paulsson, National Institute of Radiation Protection, SSI, P.O. Box 60204, S-10401 Stockholm, Tel. (46) 8-729100, Fax (46) 8-7297108.

The Chairman thanked Professor Lundbom for his long-standing activity in URSI.

2. Election of a Vice-Chairman

Professor Leschiutta described the guidelines for voting, which were agreed upon at the meeting of the Coordinating Committee. He asked the voting delegates not to sign their ballot. Dr. Radechi was chosen as a teller. The vote resulted in the submission of the following two names to the Council (practically ex-aequo) :

1. U. Stumper
2. P.O. Somlo

3. The future of Bioeffects in URSI

Dr. Stuchly reported on the special meeting convened to discuss this problem. Two proposals were discussed there : the reorganization of the Working Group as a Scientific Committee, or as a new Commission. The final recommendation was to create a Commission K : "Electromagnetics in Biology and Medicine". The reasons for this choice were essentially :

- (a) that the discipline had become important, and was growing fast.

- (b) that a need existed for giving URSI's efforts in the area a solid structure, in order efficiently to cooperate with other international organizations.

Professor Andersen was given the task to present the proposal for a new Commission to the Council.

4. Resolutions and recommendations

Dr. Dorenwendt explained the aim of his proposal concerning "laser diodes". Laser diodes are largely produced in the spectral ranges conducive to direct applications. The needs for basic research are often ignored by the producers. The present proposal aimed at obtaining support for basic research in this field from International Organizations. It was decided that an expression of opinion was more suitable than a recommendation. Moreover, Dr. Dorenwendt was asked to merge, into a single document, the proposals concerning the Laser diodes and the laser-diodes-pumped solid-state lasers.

Professor Vanier made clear the motivation for the proposal concerning Accurate Time Comparison. Dr. Mc Steele pointed out that a degradation had already been introduced in the Global Positioning System (GPS). The participants supported the proposal, and decided to submit it to the Council. It should ultimately be printed in the URSI Bulletin.

Dr. Jones read a proposal of recommendation concerning Automatic Network Analyzers. These instruments are widely used in research and in industry, but the evaluation of the uncertainties in their performance leaves much to be desired. Extensive research and comparisons are needed. Professor Leschiutta reminded the audience that Commission A has taken many initiatives to promote international comparisons.

5. The new chairman

Professor Leschiutta introduced Professor J. Vanier as the new Chairman of Commission A. He expressed his best wishes to his successor, who will take the Chair in the next session, on Monday, September 3rd.

Professor Hahn mentioned that he would not be present at the next session, and that Dr. Radechi would attend on his behalf.

Professor Vanier thanked Professor Leschiutta for his dedicated work during the last triennium.

Third Business Meeting (3 September, 17.00 to 18.30)

The meeting, convened by Professor Vanier, was attended by seventeen participants. The minutes of the second Business Session were approved, after some amendments and adjustments.

1. Representation of the Commission

The Chairman enumerated the International Organizations with which Commission A has connections, and asked the participants to suggest names of potential representatives of Commission A on those bodies. In the case of the CCIR and CCITT, Professor Leschiutta mentioned that a proposal to create a "Scientific Committee on Telecommunications" was before the Council. The Commission Chairmen, or suitable substitutes, should be part of that Committee. After some discussion the following representatives were agreed upon :

CCIR	(International Radio Consultative Committee) - pending
CCITT	(International Telegraph and Telephone Consultative Committee) - pending
CPEM	(Conference on Precision Electromagnetic Measurements) - the Commission A Chairman
BIPM	(CCE, CCDS) (Comité Consultatif d'Electricité, Comité Consultatif pour la Définition de la Seconde) - the Commission A Chairman
IEC/ISO	(International Electrotechnical Commission / International Organization for Standardization) - Olof Lundén
IMEKO	(International Measurement Confederation) - S. Leschiutta

2. Working Groups

The meeting decided to continue the Working Group on Time Domain Waveform Measurements, in which Commission B also participates. It is expected that, whatever the decision of the Council may be concerning "Bioeffects", this discipline will not remain primarily within Commission A. However, there is a term of reference of the Commission which concerns the measurements of effects of electromagnetic fields on biological systems. After some debate it was agreed to modify this term to "Measurements of the Electromagnetic Quantities involved in the Interaction between Electromagnetic Fields and Biological Systems."

3. URSI Register of National Standards Laboratories

In order to nominate someone responsible for updating the Register, it was decided to write a letter to Dr. Bailey to obtain information on the relationship existing with the Publisher (A. Hilger).

4. Contacts with Commission D

Professor Vanier had talks with the Commission D Chairman, Dr. Hénaff. Both agreed on the desirability of some enhanced coordination between the two Commissions. Joint Sessions on electronic devices and related measurements were already organized at the Prague Assembly. There are plans to increase this collaboration in the future.

5. Resolutions and recommendations

Four resolutions were under discussion. Three of them, concerning Laser Diodes, Time Comparison and Automatic Network Analyzers, had already been discussed at the previous business meeting. They were adopted after some amendments. The fourth recommendation was presented by the Chairman. It concerns the encouragement of research in the area of physical constants related to the realization of standards. The importance of encouraging basic research in this field is evident in view of the possibility that, following the Comité International des Poids et Mesures (CIPM) recommendations on the use of Josephson and von Klitzing constants for the practical realization of Volt and Ohm, it could be assumed that there is no longer a need for research in that area. Because the texts of the CIPM recommendations were not available at the meeting, and since it is understood that they include an encouragement to continue research in that field, it was decided to present the recommendation as an opinion. The final text of recommendations and opinions is to be found under A1 to A4 on page 179.

6. Meetings of interest to Commission A

- Conference on Electromagnetic Measurements (CPEM), in June 1992, Paris, France.
- URSI Symposium on Signals, Systems and Electronics, in September 1992, Paris, France
- North American Radio Science Meeting (with IEEE), in June 1992, London, Ontario, Canada.

7. Miscellaneous

The nomination of a Commission editor for the Review of Radio Science is deferred until the format of that publication is better known. The Chairman takes this opportunity to express his congratulations to Dr. Kanda and Professor Leschiutta for their contribution to the 1987-9 Review.

The participants expressed the opinion that the Young Scientist Programme should receive more attention, and that presentations late in the afternoon, when very few people attend, should be avoided.

Finally, the Chairman introduced Mr. P.M. Herouni, the new official member of Commission A in the USSR.

SCIENTIFIC PROGRAMME

Commission A organized eight Scientific Sessions, namely

- A1. Optical fibres
(convener : R.C. Gallawa, U.S.A. and P. Di Vita, Italy)
- A2. Time and frequency standards
(convener : C. Audoin, France)
- A3. Special purity
(convener : V.F. Kroupa, Czechoslovakia)
- A4. Microwave standards
convener : R.F. Clark, Canada)
- A5. Millimetre standards
(conveners : U. Stumper, Germany)
- A6. Measurements on cryogenic materials
(convener : J. Hinken, Germany, and H. Seppo, Finland)
- A7. In-orbit communications satellite testing
(convener : G. Hyde, U.S.A.)
- A8. ISDN measurement problems for digital communication
(convener : G. Hyde, U.S.A.)

The Commission also participated in five Joint Sessions

- JS15. Measurement of man-made noise and of immunity to it (with E)
(convener : F.L.H.M. Stumpers, Netherlands)
- JS18. Nonlinear electromagnetics in Radio Science (with B and E)
(conveners : A. Hasegawa, and H. Kikuchi, Japan)
- JS21. Antennas : measurements of properties (with J)
(conveners : O.C. Jones, U.K., and D.H. Russell, U.S.A.)
- JS22. Time domain metrology (with B)
(conveners : N.S. Nahman and T.K. Sarkar, U.S.A.)
- JS24. Pulsar-timing properties and problems (with J)
(convener : A. Lyne, U.K.)

The tutorial of Commission A, entitled "Electromagnetic quantities, units and standards in a changing SI", has been given by B. Kibble (U.K.).

COMMISSION B - FIELDS AND WAVES

Chairman : Professor Thomas B.A. Senior (USA)
Vice-Chairman : Professor Fred E. Gardiol (Switzerland)

REPORT ON BUSINESS MEETINGS

The Commission held two Business Meetings, respectively on 29 and 31 August 1990.

1. Election of a Vice-Chairman

In accordance with URSI procedures, four candidates were nominated for the position of Vice-Chairman for the next triennium : T. Berceli (Hungary), H. Blok (Netherlands), A.D. Olver (U.K.) and S. Ström (Sweden). Ballots were mailed by the URSI Secretariat to all Official Members in late Spring, with instructions that they be completed and returned to the Chairman. At the first meeting any Official Member who was present and had previously voted was given the opportunity to change his vote, and any who had not voted were allowed to do so. W.R. Stone and R.E. McIntosh were appointed tellers to count the 30 ballots that had been cast. The following two names were submitted to the Council, in order of preference :

1. A.D. Olver

2. S. Ström

2. Terms of Reference and Mission Statement

At the previous General Assembly an ad hoc committee was established, consisting of F.E. Gardiol (Switzerland), Chairman, C.M. Butler (U.S.A.), and W.R. Stone (U.S.A.), to revise the Terms of Reference of Commission B and to develop an associated Mission Statement describing the interests. The report of this committee was mailed to all Official Members in May 1990, and additional copies were distributed at the first Business Meeting. In the subsequent discussion, a proposal to add "computer simulation of electromagnetic problems" to the Terms of Reference was narrowly defeated, since it was felt that this was embraced by the topic "computational electromagnetics" already present. The report was then approved in the form shown in the Appendix. It was noted that the new Terms of Reference are in the form recommended by URSI, which is seeking some consistency among the different Commissions.

3. 1992 Electromagnetic Theory Symposium

The 14th International Electromagnetic Theory Symposium will be held at the Convention and Exhibition Center, Sydney, Australia, 17-20 August 1992. A brief update was provided by Dr. G.L. James, Chairman of the Organizing Committee. First Announcements were distributed at the meeting. Subsequently, Professor Gardiol met with G.L. James (Australia), A.D. Olver (U.K.) and S. Ström (Sweden) to set up the Technical Programme Committee.

4. 1995 Electromagnetic Theory Symposium

The Chairman indicated that it was not too early to start thinking about the 1995 Symposium. The site must be selected at the 1992 Symposium, and proposals to host the meeting should be submitted to Professor Gardiol in time to be considered in Sydney.

5. Special issue of Radio Science

It has been the custom for the journal Radio Science to publish selected papers from each EM Theory Symposium in a special issue, and the issue containing papers from the 1989 Symposium will appear shortly under the guest editorship of Professor A. Ishimaru (U.S.A.). Professor D.C. Chang (U.S.A.) is the incoming editor of Radio Science, and he submitted a proposal to devote a special issue to papers from the 1992 Symposium, with Professor Ishimaru again serving as guest editor. The proposal was unanimously accepted by the Commission.

6. Review of Radio Science

The Chairman introduced Professor A.D. Olver (U.K.) who served as Commission B Editor for the past triennium, and expressed the Commission's thanks for all the work that he and his topic editors did. Professor Olver noted that in view of the work going on in the field, the page allocation for Commission B has always been too little, and too small a fraction in total. The imbalance this time was made worse by the fact that some commissions exceeded by a considerable amount the number of pages allotted to them.

Dr. W.R. Stone (U.S.A.), a member of the Publications Committee, reported on the changes being considered by the Committee to increase the utility and distribution of the Review while limiting the cost to URSI. It is proposed to replace the present Review with a set of review papers in specific topics selected by the Commissions, e.g. three or four for each Commission, and to combine these with Modern Radio Science in a book published commercially. In addition, all references presently being collected would be made available on a diskette, possibly with annotations and key words. In a show of

hand, it was found that most members use PCs and only about 20 percent use a MacIntosh. The overwhelming majority of the members expressed a preference for the new form of the Review, and in a subsequent action Professor S. Ström (Sweden) was appointed Commission B Editor for the next triennium.

7. Co-sponsorship of Meeting

The Chairman noted that the Commission is receiving an increasing number of requests to co-sponsor technical meetings. These are generally approved if the meeting is in accordance with URSI guide-lines and is in an area of interest to the Commission, and provided it does not conflict with or detract from the EM Theory Symposium or the General Assembly. In some cases, however, there is a conflict, or near conflict, and the Chairman then contacts the organizers to see if the time of the meeting can be changed. This points up the desirability of seeking co-sponsorship as early as possible while there is still a possibility of changing the time. Commission B co-sponsored meetings in 1990-1993 can be found in Recommendation B.2, p. 181. Others may be added at the Chairman's discretion.

8. Commission B Programme in Prague

The Chairman asked for reactions to the unusual format of the Commission B programme at the General Assembly, where most sessions focussed on two closely related topics, starting with a 30 minute review paper on one topic, followed by four of five "10-minute" contributed papers and a 10-minute discussion. A similar coverage was given to the second topic. The format allowed for the presentation of 106 contributed papers in addition to 26 invited ones, but even so there were over 150 contributed papers that were submitted that could not be included. As background the Chairman noted that at the 1989 EM Theory Symposium there was strong support for reducing or eliminating parallel sessions to avoid the General Assembly becoming just another technical meeting, and to enable delegates to attend some sessions of other commissions. There was also the desire to include review papers, while admitting the need to accomodate contributed papers so that as many scientists as possible could attend.

In the discussion that followed, the format received very mixed reviews. In some sessions it worked quite well, in others quite poorly, although all sessions appeared to have conformed to the times. It was generally agreed that postponing discussion of a paper was undesirable, and each paper should be followed immediately with a discussion period, no matter how brief. There was also agreement that the number of technical sessions should be limited, and that the Commission should continue to explore different formats for its sessions. Although poster sessions by themselves were not favoured (it was noted that travel support is sometimes unavailable for a poster paper), it was noted

that one way to accommodate many papers is to combine a poster session with an oral presentation, giving each author (say) 5 minutes to introduce his paper.

9. Commission B Working Group on Inverse Scattering

Professor D.L. Jaggard (U.S.A.), Chairman of the Working Group, submitted a written report detailing its activities. The Working Group was originally set up to foster inverse scattering within URSI, and is now completing its second three-year term. At the General Assembly in Tel Aviv it organized a successful open symposium consisting of three sessions and has planned the session (B7) devoted to inverse scattering at the present General Assembly. As a result of these and other activities, it is felt that the area is now established in URSI and can take care of itself. Accordingly, the Working Group does not recommend that it be continued. The Commission accepted this recommendation.

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

The Working Group is a joint activity of Commissions A and B, and Professor T.K. Sarkar (U.S.A.), present Vice-Chairman of the Working Group, reported on its work. He noted that interest in the area continues and, if anything, is increasing, as witnessed by the success of the session JS22 at the present General Assembly. Commissions D and J are also interested in signal processing techniques. He requested the continuation of the Working Group as an activity of Commission A, B and, possibly, others. The Commission accepted this recommendation, noted that Dr. Nahman, Chairman of the Working Group, had retired, and proposed that Professor Sarkar should succeed him.

11. 1993 General Assembly

The Chairman announced that Kyoto, Japan, had been selected as the site for the next General Assembly and that the proposed dates were 29 August - 8 September, 1993. Many members expressed concern at these dates. It was noted that since the 1984 General Assembly at least, the starting dates have been ever later in the month of August, and a meeting which extends into September is very difficult for academics from North America and elsewhere, due to the start of classes or the scheduling of entrance examinations. Indeed, many US attendees at the present General Assembly were having to leave half way through.

The Commission instructed the Chairman to report these concerns to the Board and request that every effort be made to bring forward the dates of the next General Assembly. The final dates can be found in Resolution U.28, p. 177.

12. Attendance of URSI Meetings

Scientists from countries with non-convertible currencies have great difficulty attending international meetings. Though they can usually cover travel costs using their own currency, they cannot obtain the local currency necessary for registration and accommodation. In the case of the General Assembly and other URSI Symposia, what is needed is some creative financial arrangement that would enable scientists who do not qualify as Young Scientists to use their own currency even though it is non-convertible, and it was agreed that this matter should be brought to the attention of the URSI Board.

13. Vote of Thanks

By acclaim the commission expressed its appreciation for the outstanding work done by the Czechoslovak Committee in organizing the General Assembly.

14. Remarks by the Incoming Chairman

Professor Gardiol expressed his thanks to Professor Senior for the particularly effective way in which he took care of the activities of the Commission during the past triennium, and the Commission supported this with acclaim. He looked forward to the support of all members of the Commission and asked that they send him their suggestions and proposals.

SCIENTIFIC PROGRAMME

Commission B organized eight Scientific Sessions, namely

- B1. Reflector antennas
(conveners : J. Rahmat-Samii, U.S.A. and A.D. Olver, U.K.)
- B2. Poster session
(convener : S.Y. Delisle, Canada)
- B3. Time domain fields
(conveners : E. Heyman, Israel and L.B. Felsen, U.S.A.)
- B4. Numerical solution techniques in scattering
(conveners : D.G. Dudley, U.S.A. and P.M. van den Berg, Netherlands)
- B5. Analytical and asymptotic techniques
(conveners : T.B.A. Senior, and P.H. Pathak, U.S.A.)
- B6. Microstrip and dielectric antennas
(conveners : F.E. Gardiol, Switzerland and M. Ando, Japan)
- B7. Electromagnetic inverse scattering
(conveners : K.J. Langenberg, Germany and P. Sabatier, France)

- B8. New developments in the electromagnetics of complex media : chirality and fractals
(conveners : D.L. Jaggard, U.S.A., and I.V. Lindell, Finland)

The Commission also participated in six Joint Sessions

- JS14. Electromagnetic coupling to systems in the presence of ground (with E and F)
(convener : P. Degauque, France)
- JS18. Nonlinear electromagnetics in Radio Science (with A and E)
(conveners : A. Hasegawa, and H. Kikuchi, Japan)
- JS19. Optical and microwave interaction (with D)
(conveners : T. Berceci, Hungary and P.R. Herczfeld, U.S.A.)
- JS22. Time domain metrology (with A)
(conveners : N.S. Nahman and T.K. Sarkar, U.S.A.)
- JS25. Scattering from random media and rough surfaces (with F)
(conveners : A. Ishimaru, U.S.A. and V.I. Tatarskiy, U.S.S.R.)
- JS27. New theoretical developments in millimetre-wave integrated circuits (with D)
(conveners : A.A. Oliner, U.S.A. and H. Shigesawa, Japan)

The tutorial of the Commission, entitled "Solution techniques in electromagnetic field problems", has been given by S. Ström (Sweden).

APPENDIX : COMMISSION B TERMS OF REFERENCE AND MISSION

Terms of reference

The interest of Commission B is *fields and waves*, encompassing theory, analysis, computation, experiments, and validation. Areas of emphasis are time-domain phenomena, scattering and diffraction, propagation and guiding, radiation and antennas, biological interaction, and inverse scattering. The Commission fosters the creation, development, and refinement of associated analytical and numerical tools to better understand these phenomena. It encourages innovation, and seeks to apply interdisciplinary concepts and methods.

Specific Interests

The Commission has historically been interested in electromagnetic theory, mathematical methods applied to wave propagation and field computations, and numerical and computer methods. Activities in analysis and methodology range from the general to the specific, and encompass the development of new analytical techniques and methods.

The interests of the Commission include optics, millimetre waves, and some aspects of acoustics. In all areas, the interests include both theory and experiment.

Under the broad areas above, specific interest areas include the following :

1. Scattering and Diffraction : interaction with perfectly conducting, dielectric, and coated bodies, frequency selective media and surfaces ; interaction with apertures and screens ; coupling and shielding ; radar cross sections. Low frequency, high frequency, optical and resonant regimes.
2. Propagation : general propagation ; propagation in complex, random, and non-linear media ; propagation in anisotropic and chiral media ; optical propagation.
3. Antenna Theory, Design and Analysis : linear antennas ; arrays ; reflector and waveguide antennas ; phased arrays ; signal processing antennas ; millimetre-wave and microstrip antennas.
4. Guided Waves and Guiding Structures : waveguides and transmission lines ; dielectric waveguides and optical fibres ; periodic structures ; layered media ; surface waves ; reactive surfaces ; microstrip circuits.
5. Inverse Scattering and Imaging : inverse source problems ; coherent RF imaging, including RADAR, SAR, and millimetre and microwave holography ; polarimetric effects on coherent imaging and inverse scattering ; diffraction tomography ; the basic theory of inverse problems ; inverse reconstruction algorithms and experimental techniques.
6. Numerical Techniques : computational electromagnetics ; method of moments ; integral equations ; finite-difference time-domain techniques ; other time-domain approaches ; finite element methods ; spatial-Fourier-transform-domain techniques ; integral- and partial-differential equation-based techniques ; iterative techniques.

In addition, the Commission encourages the exploration of new approaches to treating fields, waves, and their generation, propagation, radiation, and interactions with media. Recent topics in these areas have included the interrelationship of both hardware and software computer architectures with computational algorithms for electromagnetic problems ; the use of personal computers in computational electromagnetics ; the use of supercomputers and parallel architectures ; fractals ; catastrophe theory ; electromagnetic topology, solitons and slowly-decaying electromagnetic wave packets ; validation of electromagnetic software; computer applications in electromagnetics education ; and the generalized multipole technique.

The Purpose of the Commission, and Methods of Implementation

The Commission seeks to foster the invention, development, critical review, and dissemination of radio science in the above areas of interest, within the international community of scientists and engineers, and among related inter-commission areas of interest within URSI. The Commission implements this by means of the following vehicles :

1. Sponsoring technical sessions, open symposia, and joint symposia at the general assemblies of URSI.
2. Holding its triennial International Symposium on Electromagnetic Theory, and publishing the associated Proceedings.
3. Contributing a carefully-edited review of Commission-B areas of radio science research publications to URSI's triennial Review of Radio Science.
4. Sponsoring, co-sponsoring, and cooperating with scientific meetings and workshops in the areas of the Commission's interests, and encouraging other URSI Commissions to do likewise.
5. Establishing and supporting inter-commission working groups and committees within URSI in areas of overlapping interest, and fostering and coordinating such activities within URSI.
6. Providing forums where new ideas within the areas of interest shall receive a fair, open, and scientific airing and critical review.
7. Encouraging participation by new scientists, young scientists, and scientists from developing nations.

Commission B's historic role has been to nurture new disciplines, and to provide a forum for their development, until they have matured to the point where they become the active interests of other commissions and/or the bases for new commissions.

COMMISSION C - SIGNALS AND SYSTEMS

Chairman : Professor R. Saal (Germany)
Vice-Chairman : Professor P.A. Matthews (U.K.)

REPORT ON BUSINESS MEETINGS

The Commission held two business meetings, respectively on August 28 and 31. Dr. Lopes (English) and Mr. Bic (French) agreed to act as minute secretaries.

1. Election of a Vice-Chairman

The following candidates were nominated : I. Bar-David (Israel), V. Cappellini (Italy), J.G. Lucas (Australia), and A.D. Wyner (U.S.A.). Tellers were appointed to count the ballots, including postal ones. Postal ballots had been received from 18 Official Members : four more were received at the Business Meeting. The voting procedure resulted in the submission of the following two names to the Council, in order of preference :

1. A.D. Wyner
2. J.G. Lucas

2. Terms of Reference

The Vice-Chairman opened the discussion by suggesting that the present terms of reference were too succinct and required expansion. After considerable discussion a number of suggestions were made for topics to be explicitly mentioned. A new format was subsequently agreed on for presentation to the Council. The approved text can be found under Resolution U.1, on page 163.

3. URSI Support for meetings

The various modes of URSI support for meetings were clarified, including the level of support and the degree of URSI involvement. A list of meetings already enjoying some form of URSI support was compiled. However, the Vice-Chairman requested all members involved in such meetings to provide him with exact meeting titles and other relevant details, so that an up-to-date list could be submitted to Council. Continuing support should be subject to the provision by Conference Organizers of the information required by URSI. A report was also heard from Professor Schüssler on the first International Symposium on Signals, Systems and Electronics (organized jointly with Commission D). This had a total of 293 participants, and had been financially successful. URSI's financial contribution had been repaid, and some money was available for the organization of the next Symposium. It had been decided in advance which sessions to

have, and this seemed to work well, with a few exceptions, as some sessions had too few papers. It was stated that this could be explained by the fact that it was the first such symposium, and that work on publicity should improve the situation for the second symposium, to be held in Paris in 1992.

The list of meetings supported by Commission C in the 1990-3 triennium can be found in Recommendation C1, page 183.

4. Editor for the Review of Radio Science

A report was heard from Professor J.G. Lucas regarding preparation of this year's Review of Radio Science. This assignment took approximately five weeks of full-time work, and was made more complex by the fact that little selection or classification had been obtained from the Official Members.

There followed a discussion on the usefulness of the Review, and possible format changes. The discussion was of a preliminary nature, since it was announced that the overall structure of the Review was in any case to be amended by URSI. It is expected that each Commission will be asked to write four reviews of current "hot topics", plus one tutorial. In this case, it was agreed that the topics would be defined before references were requested from Member Committees. It was also agreed that the diskette containing all references would still be produced. The Vice-Chairman noted that four official sub-editors would be required. He stated that he would be writing to Official Members to ask for their current scientific interests.

5. Review of Topics for the General Assembly in 1993

The Vice-Chairman started the discussion by asking for suggestions concerning new topics for 1993, and mentioned "Signal Processing Antennas" and "Communication through ionospheric and UHF multipath channels" as possible topics for joint sessions. Members were also asked to volunteer to convene a session.

There followed a discussion on whether it was desirable to adopt an open call for Commission C papers. It was agreed that this would ultimately be the session convener's decision, but it was nevertheless recommended that open calls should normally be issued, with the possibility of organizing both oral and poster sessions.

6. Any Other Business

It was mentioned that written versions of General Assembly papers are not available, so that these cannot be consulted or referred to. Some discussion followed on the merits of publishing a complete set of Proceedings. It was generally felt that this would not be appropriate, but that it would be possible for Session Chairmen to select

high quality papers for future point publication in a specialist magazine. It was also suggested that Session Chairmen should in the future ask authors producing a written paper to bring a reasonable number of copies (e.g. 50) and/or a list of their own published references to the Assembly.

The Commission finally expressed its thanks to Professor Saal for his hard work as Chairman of the Commission during the last three years.

SCIENTIFIC PROGRAMME

Commission C organized eleven Scientific Sessions, namely

- C1. Digital communication systems and technologies
(convener : C.F. Kurth, U.S.A.)
- C2. Mobile radio-communication systems
(convener : P.A. Matthews, U.K.)
- C3. Information theory and coding
(conveners : I. Csiszar, and L. Györfi, Hungary)
- C4. Speech coding
(convener : D. Wolf, Germany)
- C5. Digital signal processing
(convener : H. Babic, Yugoslavia)
- C6. Spread spectrum techniques
(convener : A. Baier, Germany)
- C7. Neural Networks : analysis, synthesis and implementation
(conveners : A.N. Michel and Yih-Fang Huang, U.S.A.)
- C8. Image coding
(convener : H.G. Musmann, Germany)
- C9. Modern SC-networks in communication
(convener : G.S. Moschytz, Switzerland)
- C10. VLSI-CAD
(convener : E.S. Kuh, U.S.A.)
- C11. Simulation
(convener : J. Vlach, Canada)

The Commission also participated in five Joint Sessions

- JS1. Wave and turbulence analysis techniques (with G, H, J)
(conveners : F. Lefeuvre, W. Kofman, France, P. Thomasson, U.K. and S. Basu, U.S.A.)

- JS11. Communications in the presence of noise (with E)
(convener : A.D. Spaulding, U.S.A.)
- JS13. Spectrum management and advanced radio communication technology
(with E, J) (conveners : R.D. Parlow, and G.H. Hagn, U.S.A.)
- JS20. Coherent optical communications (with D)
(conveners : M.J. O'Mahony, U.K. and H.J. Grallert, Germany)
- JS26. Microwave solid-state devices for radio communications application (with D)
(convener : M. Akaike, Japan)

The tutorial of Commission C, entitled "Nonlinear networks and chaos", has been given by L. Chua (U.S.A.).

COMMISSION D - ELECTRONICS AND PHOTONICS

Chairperson : Professor T. Okoshi (Japan)

Vice-Chairperson : Dr. J. Hénaff (France)

REPORT ON BUSINESS MEETINGS

The Commission held three business meetings, respectively on August 28, 31, and September 3.

1. Election of a Vice-Chairperson

Four persons were nominated for the office of Vice-Chairperson, viz. T. Itoh (U.S.A.), B. Mrozwicz (Poland), A. Scheggi (Italy), and J. Slavova (Bulgaria).

The following two names were submitted to the Council, in order of preference :

1. Professor T. Itoh
2. Professor A. Scheggi

2. Terms of Reference

The draft of revised Terms of Reference was prepared by Professor Okoshi, and discussed at the second and third Business Meetings. Considering that the concern toward telecommunications is increasing within URSI, and that the area covered by Commission D is strongly related to telecommunications, it was decided

- (1) that the activities of the Commission be enhanced beyond their traditional "service commission" character,
- (2) that the terms of reference be changed accordingly, and
- (3) that the subject title of the Commission be changed from "Electronic and Optical Devices and Applications" to "Electronics and Photonics".

The new Terms of Reference, revised accordingly, were approved by the Council. They can be found under Resolution U.1, p. 163.

3. Review of Radio Science

The conceptual future of the Review of Radio Science was discussed at the second Business Meeting, with some stress on more comprehensive inclusion of the literature. Special attention was paid to the exceptionally wide area covered by Commission D. It was agreed that Professor T. Itoh (U.S.A.), succeeding Dr. Hénaff, would be the Commission-D Editor of the Review of Radio Science 1990-1992.

Extensive discussions showed that Commission D is in a somewhat special position among the nine Commissions of URSI, in that :

- (1) the possible reader of the Review of Radio Science in the Commission-D area can not be clearly identified;
- (2) the area covered by Commission D is particularly wide;
- (3) a satisfactory coverage of the entire area, within the presently given number of pages, is illusory.

The final position of the Commission is formulated in Resolution D.3, p.184.

4. Format of Scientific Sessions in Future General Assemblies

Professor Okoshi proposed to consider the inclusion of contributed papers in Scientific Sessions sponsored by Commission D in future General Assemblies, because he felt that the outside desire for sending papers was increasing. Some representatives opposed this proposal, because the authoritative character of the General Assembly Papers would be degraded, whereas other participants supported the proposal because it would attract more young researchers. After some discussion, it was finally decided to adopt the policy outlined in Resolution D.2, p. 184.

5. Symposia sponsored by Commission D in the triennium 1987-1990

Dr. Hénaff reported on the first Symposium to be co-sponsored by Commissions C and D, namely the International Symposium on Signals, Systems and Electronics (ISSSE'89), held at Erlangen, Germany, in September 1989. The Symposium, which attracted about 300 participants, was a success.

6. Scientific Programme at the 24th General Assembly in Kyoto

Dr. Hénaff distributed a questionnaire to all participants at the first Business Meeting. Possible subject titles for the sessions were discussed at the third Business Meeting, the replies having been reviewed and summarized by Dr. Hénaff. The programme will be finalized at the Brussels Meeting of the Coordinating Committee, to be held in the Spring of 1992. However, prior to that meeting, a second questionnaire will be sent to all representatives by the new Chairperson, Dr. Hénaff.

7. Sponsorship of International Conferences

The Commission decided to sponsor five Conferences in 1909-3. The list of these meetings can be found under Recommendation D.4, p. 185.

SCIENTIFIC PROGRAMME

Commission D organized eight Scientific Sessions, namely

- D2. Optical information processing
(convener : S. Ishihara, Japan)
- D3. High-frequency and high-speed integrated circuits
(convener : T. Itoh, U.S.A.)
- D4. Optical amplification and switching in telecommunications
(convener : R.D. Hall, U.K.)
- D5. Highly coherent lasers and their applications
(convener : M. Ohtsu, Japan)
- D6. Superconducting devices and circuits for microwaves
(convener : E.F. Belohoubek, U.S.A.)
- D7. Biophotonics and bioelectronics
(convener : H. Inaba, Japan)
- D8. Interconnections in VLSI, computers and networks
(conveners : J.-Y. Le Traon, and Van Tran N'Guyen, France)
- D9. Ultrafast phenomena and new effects in semiconductors
(convener : B. Deveaud, France)

The Commission participated in five Joint Sessions

- JS12. Lasting effects of transients on electronic equipment (with E)
(conveners : V. Scuka, Sweden, and T. Itoh, U.S.A.)
- JS19. Optical and microwave interaction (with B)
(conveners : T. Bercei, Hungary, and P.R. Herczfeld, U.S.A.)
- JS20. Coherent optical communications (with C)
(conveners : M.J. O'Mahony, U.K., and H.J. Grallert, Germany)
- JS26. Microwave solid-state devices for radio communications application (with C)
(convener : M. Akaike, Japan)
- JS27. New Theoretical development in millimeter-wave integrated circuits (with B)
(conveners : A.A. Oliner, U.S.A., and H. Shigesawa, Japan)

The tutorial of Commission D, entitled "New bio-information from ultraweak photon emission in life and biological activities", has been given by H. Inaba (Japan).

COMMISSION E - ELECTROMAGNETIC NOISE AND INTERFERENCE

Chairman : Professor H. Kikuchi (Japan)

Vice-Chairman : Dr. J. Hamelin (France)

REPORT ON BUSINESS MEETINGS

The Commission held three business meetings, respectively on August 28, 31 and 3 September. They were attended by a total of 36 delegates and members.

First Business Meeting (Tuesday, 28 August, 1990)

The Agenda was adopted as proposed by the Chairman. E. Söderberg and P. Degauque volunteered for the Secretariat of the Business Sessions.

1. Summary Report of Commission E Business and Related Meetings at the XIII General Assembly, Tel Aviv, 22 August - 4 September, 1987

The report was distributed to those present, including a questionnaire for comments on Commission E activity and structure, to be returned to the Chairman for the Second Business Meeting.

2. Commission E Sponsored Symposia after the Tel Aviv Assembly

Commission E sponsored the following symposia after the Tel Aviv Assembly :

- Wroclaw EMC Symposium, Wroclaw, Poland, 28-30 June, 1988. Three URSI sponsored sessions were organized.
- Zürich EMC Symposium, Zürich, Switzerland, 6-9 March, 1989. On this occasion, the URSI Commission E Business and Working Group meetings took place.
- URSI Symposium on Environmental and Space Electromagnetics, Tokyo, Japan, 4-6 September, 1989. The URSI Commission E Business meeting took place on 4 September.
- Nagoya EMC Symposium, Nagoya, Japan, 8-10 September 1989.
- Wroclaw EMC Symposium, Wroclaw, Poland, 26-29 June, 1990. Three URSI sponsored sessions were organized.

3. Reports of Working Groups

The activities of the four Working Groups were mainly carried out at the occasion of the Symposia mentioned in the preceding section. The groups were :

- a. Natural Noise (J. Hamelin);
- b. Man-made Noise (A.D. Spaulding);
- c. Effects of Transients on Integrated Circuits and Semiconductor Devices (V. Scuka);
- d. Scientific Basis of Noise and Interference Control (C. Baum);

Dr. Hamelin emphasized that more attention should be paid to new knowledge in the area of natural noise and to the necessity of improving official standards in noise measurements. He underlined the importance of defining limited objectives.

Dr. Spaulding reported the efforts of the Man-made Noise Working Group on the aspects of source characterization, noise control, the problem of excessive proliferation of standards, signal processing techniques, and models for the spatial processing of noise which is non-gaussian and highly correlated.

Dr. Scuka reported on the Working Group (c) activities. Topics covered the effects of lightning on communications systems, norms for electromagnetic equipments, mathematical methods of classification, physical effects on semiconductor components, protection of circuits, EM hardening, laboratory scale hardening, modelling, design of experimental methods, and full-scale tests using natural lightning by proper location of test sites. Dr Scuka said that he tried to increase the cooperation between Commissions D and E, but that he was not able to activate Commission D in this area. In another cooperative work, he said that there is a need to establish contact with the International Commission on Atmospheric Electricity, a Commission of the International Association of Meteorology and Atmospheric Physics (IAMAP) within the International Union of Geodesy and Geophysics (IUGG).

Dr. Baum reported on the Working Group (d) activities. He states that the theory is approaching a state of completion ; the architecture exists, but some of the spaces must be filled in. Test procedures are needed to establish methods to verify the approach ; this will in turn impact the standards.

Some comments were made on the Working Groups by a couple of attendees. Dr Baum stated that the present activity does not cover some aspects of study, e.g. high power electromagnetics/EMP and simulation, which should be incorporated in Commission E.

Dr. R.D. Parlow proposed to establish a new working group on spectrum utilization from operational aspects of natural and man-made noise and spectrum handling in the real world.

Professor R.G. Struzak supported this proposal, and added that Commission E should devote more attention to electromagnetic environmental problems, e.g. characteristics, classification, observation of global changes and trends, and prediction methods. Further discussions on the amendment and new inclusion of working groups were postponed to the second business meeting.

4. Terms of Reference

The terms of reference of Commission E were mentioned, but the discussion was deferred until the second business meeting in order to take into account any comments received in the completed questionnaires.

5. Election of Vice-Chairman

Three candidates were nominated : M. Hayakawa (Japan), V. Scuka (Sweden), E.K. Smith (U.S.A.). Votes from twelve Official Members were received by mail, while those from Sweden, Poland, and Canada were cast at the Business Meeting itself. The following two names were submitted to the Council, in order of preference :

1. V. Scuka
2. M. Hayakawa

6. International Geosphere-Biosphere Programme (IGBP)

It was generally agreed that Commission E should participate in this programme. Further discussions were deferred to the next meeting.

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

The Working group has involved Commissions A, B, and E with the Bio-Electromagnetics Society under the Chairman, Professor J. Bach Andersen. The discussion was focussed on whether this area deserves a separate Commission, or should continue as a working group.

8. Co-sponsorship for Future Meetings

Planned meetings are (see Resolution E.3 p. 187):

- Zürich EMC Symposium, Zürich, Switzerland, 11-14 March, 1991.
- International Commsphere '91 Symposium, Herzliya, Israel, 23-25 April, 1991.
- Beijing EMC Symposium, Beijing, China, May, 1992.
- Wroclaw EMC Symposium, Wroclaw Poland, June, 1992

- Zürich EMC Symposium, Zürich, Switzerland, March, 1993.

Second Business Meeting (Friday, 31 August, 1990)

1. Terms of Reference

The results of the questionnaires showed that most Member Committees (including U.S. and France) did not recommend any change, although there were some proposals for change from a few Members. It was finally decided to keep the terms of reference as follows (see Resolution U.1, p. 163) :

- a. Terrestrial and planetary noise of natural and man-made origin;
- b. The composite noise environment;
- c. Effect of noise on system performance;
- d. Lasting effects of transients on equipment performance;
- e. Scientific basis of noise and interference control;
- f. Spectrum utilization.

2. Working Group Proposals

From the results of questionnaires and after some discussions and exchanges of opinions among members and participants, it was decided to establish the following Working Groups (see Resolution E.2, p. 186) :

- Spectrum management and utilization (R.D. Parlow);
- Communication in the presence of noise (A.D. Spaulding) : the title was changed by the Council to "Non-gaussian noise in communication";
- High power electromagnetics (HPE) (R.L. Gardner)
- Terrestrial and planetary EM noise (M. Hayakawa and E.K. Smith);
- Interaction with, and protection of, complex electrical systems (C.E. Baum, P. Degauque, and M. Ianoz);
- Effects of transients on equipment (V. Scuka and B. Demoulin);
- Extra-terrestrial and terrestrial meteorologico-electric environment, with noise and chaos (H. Kikuchi).

3. Participation of Commission E Members in Liaison Committees

- Dr. Baum will continue as representative of the Commission on the committee on "Time domain waveform measurement".

- The discussion on IGBP, BEMS, and the URSI/CCIR/CCITT liaison committee was deferred to the next meeting.

Third Business Meeting (Monday, 3 September, 1990)

1. Proposals by Working Group Chairmen for Objectives and Enforcement Plans

Objectives of working groups and work methods were presented by the Chairmen of the working groups, viz. R.D. Parlow, M. Hayakawa and E.K. Smith, A.D. Spaulding, R.L. Gardner, P. Degauque, V. Scuka, and H. Kikuchi.

2. Resolutions and Recommendations

- A letter was received from Dr. G.H. Hagn, proposing that an international cooperative effort be encouraged to work toward developing a global model of the probability of occurrence of HF other-user interference. Dr. R.D. Parlow will expand and re-state this item. (see Resolution E.1, p. 186)
- Proposals for two resolutions to the URSI Council, to be directed to CCIR and ITU, were received from Dr. B.J. Robinson, Chairman of IUCAF. They concern the importance of the specific use of the radio spectrum. Commission E agreed to express its support for these two proposals (see Resolutions U.25 to U.27, p. 176).
- Dr. V. Scuka proposed a resolution on the satellite observation of lightning (see Resolution U.22, p. 174).

3. Review of Radio Science

Discussions were initiated on the choice of the next Commission E editor, and the editing method for Review of Radio Science. It was suggested that Working Group Chairmen assist the Editor as Sub-Editors. The Chairman asked for volunteers to serve as the Commission E Editor. Professor P. Degauque agreed to take over this task.

Thanks were expressed by the Commission to Professor Stumpers for his work in editing the Commission E Chapter for the Review of Radio Science 1987-9.

4. Recommendation for Tutorial and General Lectures at the 1993 General Assembly

Recommendations were received as follows :

- spectrum management (WARC'92);
- characterization of man-made noise or radio noise and their effects on communication;
- seismographic emission associated with earthquakes;
- nonlinear electromagnetics in radio science;
- planetary lightning and noise environment.

5. Others

It was suggested that Commission E hold a Working Group meeting on the occasion of the Zürich EMC Symposium, on 11 March, 1991, from 10.30 a.m. to 5.00 p.m..

SCIENTIFIC PROGRAMME

Commission E organized eleven Scientific Sessions, namely

- E1. EMC in electronic circuits
(convener : J. Perini, U.S.A.)
- E2. Lightning : predischage processes, associated radiation and modelling
(convener : E.P. Krider, U.S.A.)
- E3. High power electromagnetics
(convener : R.L. Gardner, U.S.A.)
- E4. Satellite observation of lightning
(convener : V. Scuka, Sweden)
- E5. Lightning interaction with aircraft
(convener : J.E. Nanevich, U.S.A.)
- E6. Scientific basis of noise and interference control
(convener : C.E. Baum, U.S.A.)
- E7. Spacecraft charging and electromagnetic environment
(convener : J. Hamelin, Netherlands)
- E8. EMC modelling
(convener : M. Ianoz, Switzerland)
- E9. Planetary lightning and noise environment
(conveners : H. Kikuchi, Japan, and E.K. Smith, U.S.A.)
- E10. Atmospherics (sferics)
(convener : H. Volland, Germany)
- E11. The composite noise and interference environment
(convener : E.F. Vance, U.S.A.)

The Commission also participated in nine Joint Sessions

- JS10. Attenuation and noise due to clouds (with F)
(conveners : E.K. Smith and E.R. Westwater, U.S.A.)
- JS11. Communications in the presence of noise (with C)
(convener : A.D. Spaulding, U.S.A.)
- JS12. Lasting effects of transients on electronic equipment (with D)

(conveners : V. Scuka, Sweden, and T. Itoh, U.S.A.)

- JS13. Spectrum management and advanced radio communication technology
(with C, J) (conveners : R.D. Parlow, and G.H. Hagn, U.S.A.)
- JS14. Electromagnetic coupling to systems in the presence of ground (with B, F)
(convener : P. Degauque, France)
- JS15. Measurement of man-made noise and of immunity to it (with A)
(convener : F.L.H.M. Stumpers, Netherlands)
- JS16. Radio noise associated with earthquakes (with H)
(conveners : T. Yoshino, Japan, and M. Gokhberg, U.S.S.R.)
- JS17. Characterization of terrestrial and power line sources (with H)
(conveners : M. Hayakawa, Japan, and K. Bullough, U.K.)
- JS18. Nonlinear electromagnetics in Radio Science (with A, B)
(conveners : A. Hasegawa, and H. Kikuchi, Japan)

The tutorial of the Commission, entitled "What is the scientific approach to EMC Control and vulnerability", has been given by C. Baum (U.S.A.).

COMMISSION F - WAVE PROPAGATION AND REMOTE SENSING

Chairman : Professor R.K. Crane (U.S.A.)
Vice-Chairman : Professor G. Brussaard (Netherlands)

REPORT ON BUSINESS MEETINGS

The Commission held two Business Meetings, respectively on 28 and 31 August 1990.

First Business Meeting (28 August, 13.45 - 14.50)

Fifteen official members attended the meeting.

1. Election of a Vice-Chairman

The candidates for Vice-Chairman of Commission F were introduced. Alphabetically they were : N.A. Armand (U.S.S.R.), M.P.M. Hall (U.K.), J.P. Mon (France), R.K. Moore (U.S.A.), T. Oguchi (Japan), A. Paraboni (Italy). The voting procedure was subsequently explained and paper ballots passed out to the official members who had not voted by mail, or who wanted to change their ballots. The paper ballots were collected at the end of the meeting.

2. Symposia held in 1987-1990

The Symposia sponsored by Commission F were reviewed :

- Professor J.P. Mon described the Open Symposium held in La Londe les Maures in Southern France, September 1989.
- Professor C. Swift described the Microwave Signatures Meeting held in Hyannis, Massachusetts, U.S.A., May 1990.
- The three IGARSS conferences held during the last triennium were identified :
IGARSS'88 Edinburgh, U.K.
IGARSS'89 Vancouver, B.C., Canada
IGARSS'90 College Park, M.D., U.S.A..

All these meetings were very successful.

3. Symposia for 1990-1993

Meetings scheduled for the next triennium were introduced.

- Dr. M.P.M. Hall discussed the Specialist Meeting, to be held in Rio de Janeiro in December 1990.
- Professor M. Hallikainen discussed IGARSS'91 in Helsinki.

Also mentioned was IGARSS'92 in Houston, Texas.

Members were invited to present proposals for symposia at the next Business Meeting.

4. Terms of Reference

A brief discussion was held on the Terms of Reference. Dr. M.P.M. Hall (U.K.) and Dr. G. Hyde (U.S.A.) volunteered to look over the Terms of Reference for presentation at the next Business Meeting.

5. Remote Sensing

Bulgaria asked whether Commission F could support a recommendation about inviting remote sensing overflights over developing countries. The Bulgarian Official Member was asked to prepare a statement that could be considered at the next Business Meeting.

Second Business Meeting (31 August, 17.05 - 18.15)

1. Election of a Vice-Chairman

The following two names were submitted to the Council (practically ex-aequo) :

1. R.K. Moore
2. M.P.M. Hall

2. Symposia for 1990-1993

The first point in the discussion was the selection of the venue for the next Commission F Open Symposium.

- i) It was decided that the sequence of Symposia should be maintained.
- ii) The proposal from Japan was withdrawn because the next General Assembly will be in Japan.
- iii) P. Watson (U.K.) presented a proposal to have the meeting in Malaysia.
- iv) The letter from Ajayi (Nigeria) inviting the Open Symposium to Nigeria was read.
- v) The meeting voted that the next symposium be held in Malaysia with Professor P.A. Watson acting as coordinator.

The list of meetings sponsored in 1990-1993 appears as Recommendation F.1 on p. 188. Coordination with IGARSS'93 (the International Geoscience and Remote Sensing Symposium) is the subject of Recommendation F.2 on p. 188.

3. Terms of reference

It was decided not to modify the Terms of Reference, which can be found under Resolution U.1, p. 163.

4. Review of Radio Science

Dr. G. Hyde presented the position of the Publications Committee on changes in the Review of Radio Science. After some discussion, the Commission voted to have the Session Organizers for the Invited Sessions of the next General Assembly serve as Associate Editor for the Commission. The subject for each Session will be selected to cover items of current interest to the Commission. The material submitted by the National Editors will be distributed to the Associate Editors (Session Organizers) for use in the preparation of a short (2-3 pages?) summary of the work in the area. The Associate Editor is also free to include material not submitted by the Official Members. The summary overview of work in the subject area for the General Assembly will be presented at the General Assembly to put the invited papers in the context of the work in progress in the subject area.

5. Recommendations to the CCIR

The Commission voted to support the proposals drafted by Dr. Robinson, which appear under U25 and U26 on page 176.

6. Remote Sensing

The Commission expressed support for the ideas expressed in the letter of the Bulgarian Official Member (see annex). The Commission also supported a suggestion that an edited version of the letter be published in the Newsletter distributed with the URSI Bulletin. The Newsletter should be expanded to include announcements of opportunities for participation in international remote sensing experiments.

The views of the Commission were supported by the Council, as shown in Resolution U.24, on p. 176.

7. Representation to the Scientific Committee on Oceanographic Research (SCOR)

The Commission decided that the Chairman and Vice-Chairman should jointly select a new representative to SCOR.

SCIENTIFIC PROGRAMME

Commission F organized eight Scientific Sessions, namely

- F1. Statistical models and prediction techniques
(convener : P.A. Watson, U.K.)

- F2. Interference
(convener : M.P.M. Hall, U.K.)
- F3. Propagation in urban and suburban environments
(convener : J. Goldhirsh)
- F4. Millimetre and submillimetre wave propagation
(convener : C. Gibbins, U.K.)
- F5. Remote sensing of clouds and precipitation
(convener : L.P. Ligthart, Netherlands)
- F6. Remote sensing of the earth's surface
(convener : R.K. Moore)
- F7. Attenuation and depolarization
(convener : D.V. Rogers, U.S.A.)
- F8. Model-oriented measurements and modal testing
(convener : Y. Hosoya, Japan)

The Commission participated in four Joint Sessions

- JS9. MST radar studies of the middle atmosphere and lower ionosphere (with G)
(convener : S. Fukao, Japan)
- JS10. Attenuation and noise due to clouds (with E)
(conveners : E.K. Smith and E.R. Westwater, U.S.A.)
- JS14. Electromagnetic coupling to systems in the presence of ground (with B and E)
(convener : P. Degauque, France)
- JS25. Scattering from random media and rough surfaces (with B)
(conveners : A. Ishimaru, U.S.A. and V.I. Tatarskiy, U.S.S.R.)

The tutorial of Commission F, entitled "Global climate change", has been given by G.R. North (U.S.A.).

Annex : letter from the Bulgarian Official Member

This letter is to bring to the attention of URSI Commission F some of the problems encountered by the remote sensing laboratories in the small countries, especially in the new East European democracies. Due to the inevitable difficulties during the transition period from planned to market-oriented economy the funding for such laboratories has dramatically decreased. At this moment even the very existence of our groups is uncertain.

A way out of this unfortunate and hopefully temporary situation is seen in more active participation in the international programmes, and cooperation with similar laboratories from industrialized countries. In particular, it would be helpful if the following items could be put up for consideration :

1. Receiving regular information about the proposed international programmes in which we would be welcome to participate.
2. Planning and performing international remote sensing experiments on the territory of the East European countries which are, for example, part of a common ecosystem. For this to be effective it might be necessary for URSI to propose to the political officials new regulations making the access of the various remote sensing laboratories to the different countries easier.
3. Lending old computers and other type of equipment which are rarely used.
4. Distributing on a regular basis scientific reports and newly published papers.
5. Informing concerned scientists about the visiting positions available in the Universities and Remote Sensing Laboratories.
6. Supporting the participation in the International Conferences of not only young scientists, but also some of the others, who often have particularly valuable contributions to make.
7. Increasing the number of graduate students from East European countries trained in the area of remote sensing at Western Universities and Laboratories.

COMMISSION G - IONOSPHERIC RADIO AND PROPAGATION

Chairman : Professor H. Rishbeth (U.K.)
Vice-Chairman : Dr. A. Wernik (Poland)

REPORT ON BUSINESS MEETINGS

The Commission held three Business Meetings, respectively on 28, 31 August and 3 September. The second meeting was held jointly with Commission H.

First Business Meeting (28 August, 13.30 - 15.15)

The agenda and the financial report of Commission G were circulated.

1. Finances

The Chairman explained that, of the budget of US\$6,500 allocated by URSI, approximately \$3,800 had been used to support seven URSI-sponsored symposia. The remaining \$2,700 were reserved to support the attendance of participants on the Commission's programme at the General Assembly. He said that, because of the difficulty of ensuring that all money allocated to General Assembly participants is actually spent, it might have been better to allot a higher proportion of the budget to the symposia. However, there was a prospect that URSI would allow the underspend to be carried forward to 1990-3.

2. Election of a Vice-Chairman

The Chairman explained the procedure that had been laid down by the URSI Board of Officers. Five candidates had been nominated, and the Chairman had received nineteen valid voting papers from Official Members before the General Assembly. Six further voting papers had been received in Prague. The candidates were N. Matuura (Japan), B.M. Reddy (India), K. Schlegel (Germany), K. Serafimov (Bulgaria), K.S. Jeh (U.S.A.). The votes were counted by D. Llanwyn Jones and A.W.V. Poole. They resulted in the submission of two names to the Council. In order of preference :

1. K.S. Yeh
2. K. Schlegel

The Chairman mentioned that the final choice rested with the URSI Council, who would take into account the matter of geographic distribution.

3. Terms of reference

The present terms of reference were circulated and a brief discussion followed. The Chairman asked that any proposed changes should be submitted in writing to A.W. Wernik, but gave a personal opinion that no change was needed. (Subsequently, the President of URSI asked every Commission to revise its Terms of Reference according to a standard format : this was done by A.W. Wernik and K.C. Yeh).

4. Working Groups

The Chairman reported that, following the death of the INAG Chairman (Jack Gledhill) in June 1988, he had appointed P.J. Wilkinson as Acting Chairman, with the concurrence of the URSI President.

The Chairman said that he had requested all working groups to submit written reports before the General Assembly, and, if they wished to continue during 1990-1993, to conduct an election of officers among their members. He reported that groups G1, G2 and G4 had done so. He thanked all the Working Group Officers for their work, and invited them to report briefly to the meeting.

G1 (INAG : Ionosonde Network Advisory Group)

Dr. Wilkinson presented his report, given in full in Annex 1. Professor Rishbeth reported that the INAG elections, supervised by A.S. Rodger (former Secretary of INAG) had produced a large response, approximately 80 votes. P.J. Wilkinson had been elected Chairman by a nearly unanimous vote, and R. Conkright as Secretary by a large majority. Professor Rishbeth thanked the outgoing Secretary of INAG, R. Haggard, and said that a request for continued financial support for the INAG Bulletin would be made to the URSI Council.

G2 (Beacon Satellite Group)

Dr. R. Leitinger presented his report, given in full in Annex 2. He mentioned the planned Symposium in Boston in 1992. The Group had re-elected the present officers : R. Leitinger, Chairman, J.A. Klobuchar, and T.R. Tyagi, Vice-Chairmen.

G3 (Ionospheric Mapping and Modelling)

Dr. Rush presented his report, given in full in Annex 3. It was felt that the group did not need to continue as a separate entity, but could merge with G4.

G4 (Ionospheric informatics)

Professor Reinisch presented his report, given in full in Annex 4. He said that good progress had been made with each of the three main tasks. Professor Rishbeth solicited opinions on the proposal to continue the group, combined with G3. There being no dissent, he asked Dr. Rush and Professor Reinisch to prepare terms of reference before the business meeting on 3 September.

G5 (Low Latitude Ionosphere)

Professor Rishbeth reported that there had been no activity, and the Chairman of the group (S.M. Radicella) felt that the objectives could be met in other ways. The Group G5 therefore lapsed.

5. Resolutions Committee

The Chairman proposed that the Committee be composed of W. Kofman, B.W. Reinisch, T. Turunen and P.J. Wilkinson. This was approved.

6. Miscellaneous

A preliminary discussion was devoted to the selection of Commission G representatives, and proposals for Symposia in the 1990-3 period were put forward.

Second Business Meeting (31 August, 17.00 - 18.00)

This meeting was held jointly with Commission H.

1. Review of Radio Science

URSI Vice-President R. Dowden explained the proposals for the Review. These were not final yet, so the question of the editors, and whether these should write a joint G+H review, was deferred. It was felt that the arrangement for a joint G+H review had been satisfactory.

2. Working Group G/H-1 (Incoherent Scatter)

The Chairmen of G/H-1, Dr. V.B. Wickwar, gave a summary of his Report, given in full in Annex 5. It was agreed to continue the group, with new officers to be elected at the Working Group's meeting, on 3 September.

3. Working group G/H-2 (Computer Experiments, Simulation and Analysis of Wave Plasma Processes)

It was agreed to reconstitute group G/H-2 on Computer Simulations and G/H-3 on Active experiments. The two Commissions were asked to confirm their representatives at the Third Business Meeting on 3 September, and notify the Secretariat accordingly.

Third Business Meeting (3 September, 17.00 - 18.50)

Chairman Rishbeth called the meeting to order at 17.00. He explained that all decisions would be taken by consensus - or, if necessary, by votes in writing - of the Official Members or their representatives.

1. Global Change

This item was taken first because Dr. A.P. Mitra had come from the Council Meeting for this purpose. He spoke briefly about the URSI involvement in IGBP. For Commission G this might include interpretation and modelling of long-term changes in the ionosphere and mesosphere, and exchange of data and information. Sa. Basu said that ionospheric measurements should be included in Global Change modelling. H. Rishbeth proposed that the incoming Chairman, A.W. Wernik, should be the Commission representative on the URSI-IGBP (International Geosphere Biosphere Programme) Committee, with the possibility of delegating the task to someone else later on. This was agreed.

2. Resolutions

The Chairman announced the procedure for voting on resolutions. Since it had unfortunately not been possible to complete the editing and distribution of the draft resolutions beforehand, he invited the official national members (or their authorized representatives) to come forward and collect a copy of the resolutions, and to study them during the course of the meeting. Voting would be conducted in writing. Thanks were due to the Resolutions Committee (W. Kofnar, B. Reinisch, T. Turunen, P. Wilkinson) for their work. For each resolution in turn, the Chairman invited comments and explanation from the proposer or sponsor of the resolution, and gave his comments as Chairman. A brief discussion was held in some cases. Official members recorded their votes in writing and (at the end of voting) placed them in sealed envelopes bearing their signatures. The approved resolutions and recommendations can be found under U1 (p.

162), U19 (p. 173), U21 (p. 174), U22 (p. 174), G1 to G8 (p. 189-191). A resolution on scientific terminology, proposed by J.W. Wright, was defeated.

3. Terms of reference

The Chairman explained that the task of revising the terms of reference, according to a prescribed format, had been imposed by the URSI Officers. A draft had therefore been prepared by K.C. Yeh and A.W. Wernik, to whom the Chairman expressed thanks. The draft was approved, after removal of the numbers that might be taken to indicate a ranking order of importance of the Commission's objectives. The relevant resolution in U1, on page 164.

4. Working Groups

The chairman reported the decisions at the First Business Meeting to constitute three Working Groups (G1 - INAG ; G2 - Beacon Satellites ; G3 - Informatics), and announced the proposed terms of reference of the new group G3. He reported that the Second Business Meeting (jointly G and H) had also constituted three Working Groups (GH1 - Incoherent Scatter, GH2 - Computer Simulation and GH3 - Active Experiments). The relevant resolution is G1 on p. 189.

5. FAGS (Federation of Astronomical and Geophysical Services)

The Chairman proposed that the Commission should recommend to Council that URSI continue its financial support of FAGS, to be divided between IUWDS (International Ursigram and World Days Service) and the SIDC (Sunspot Index Data Centre). This was agreed. See resolution G3 on p. 189.

6. Commission representatives

The three representatives are mentioned in Resolution G4 on p. 190. If needed, the representative to the URSI-CCIR Liaison Committee would be L.W. Barclay. No representative to the URSI Time Domain Waveform group was appointed because of lack of information as to whether this group would continue.

7. Programme for the 1993 General Assembly

A proposed list was displayed by A.W. Wernik, and comments noted. The list would be circulated to the Commission G mailing list during the next few months, before being finally settled.

8. Sponsorship of Symposia in 1991-3

The list of sponsored meetings is given in Recommendation G5 (see p. 190).

9. Review of Radio Science 1990-2

A.W. Wernik explained the new proposals. An informal vote (taken by show of hands among all present) favoured the existing format (+ disk references) (15 votes) compared to the proposal for a book of reviews (+ disk references) (8 votes). It was agreed that keywords should be included.

The meeting closed with a brief address by the incoming Chairman, Dr. A.W. Wernik.

SCIENTIFIC PROGRAMME

Commission G organized three Scientific Sessions, namely

- G1 Coherent and incoherent scatter radars - techniques and achievements
(convener : T. Hagfors, U.S.A.)
- G2 Ionospheric modelling
(convener : B.W. Reinisch, U.S.A.)
- G3 Open session and latest results
(convener : H. Rishbeth, U.K.)

The Commission participated in nine Joint Sessions

- JS1. Wave and turbulence analysis techniques (with C, H, J)
(conveners : F. Lefeuvre, W. Kofman, France, P. Thomasson, U.K. and S. Basu, U.S.A.)
- JS2. Radio Propagation in the ionosphere and magnetosphere : theory and application
(with H) (conveners : K.C. Yeh, U.S.A. and I. Kimura, Japan)
- JS3. Theory and Computer experiments of plasma processes (with H)
(conveners : B. Lembège, France and S.L. Ossakow, U.S.A.)
- JS4. VLF Triggered emissions (with H)
(conveners : Y. Omura, Japan and D. Nunn, U.K.)
- JS5. Predictability of Solar-terrestrial weather and its ionospheric impact (with H)
(convener : E.P. Szuszcwicz, U.S.A.)
- JS6. Effects of high power radio waves on the ionosphere and magnetosphere
(with H) (conveners : M.T. Rietveld, Norway and P. Bernhard, U.S.A.)
- JS7. The radio planets (with H, J)
(conveners : M. Kaiser and D.O. Muhleman, U.S.A. and I. Hanasz, Poland)

- JS8. Ionospheric and magnetospheric effects of lightning (with H)
(conveners : U.S. Inan, U.S.A. and H.J. Strangeways, U.K.)
- JS9. MST radar studies of the middle atmosphere and lower ionosphere (with F)
(convener : S. Fukao, Japan)

The tutorial of Commission G, entitled "The Ionosphere from Space", has been given by P. Bauer (France).

Annex 1 - Report on Activities of Working Group 1

The Ionosonde Network Advisory Group (INAG)

The last three years have not been kind ones for Working Group 1. Professor Gledhill, the Chairman-elect, died on 19 June 1988, and with his passing much of the Working Group's momentum was lost. This is reflected in a reduced number of bulletins being produced; only four in the last three years (February and December 1988 and June and November 1989) and, since the last URSI General Assembly, there has only been one INAG meeting, at Exeter, during the IAGA meeting in 1989.

I was asked by Dr. Rishbeth to chair INAG in the interim period leading up to the Prague General Assembly, and during my period as Chairman I have looked at the issues INAG faces. In my first comment as Chairman, I outlined the areas I felt were important with the most important one being : participation. I believe that INAG cannot be effective unless it has a broader, more vocal membership. The INAG mailing list is the first area to seek serious members and the recent mail voting for INAG offices has reinforced the impression that the revised mailing list for INAG is now an effective core body of interested people. This, I believe, is the most significant development in the past three years and I hope to build on it in the next three years.

Another area addressed in some detail both in the Bulletin (No 54) and at the only INAG meeting is the issue of ionosonde data. INAG has a major task ahead of it if it is to offer good advice on how networks are to handle their past records and how they should plan for the future. This was approached in two ways. One was to update the current ionosonde network master list - in order to know where the data is being obtained. Although there have been a number of revisions, there are still stations which only report data occasionally and which are not on the master list. Second, comments were sought on the prospect of establishing baseline stations. No comments were returned on this issue although verbal reactions were positive. I have yet to convert people's words into print.

At the last URSI General Assembly INAG proposed one resolution regarding the operation of the worldwide ionosonde network. It contained three parts, regarding the closure of the New Zealand Ionosonde Network, the De Bilt Ionosonde, and the possibility of opening an ionosonde at Easter Island. It is hard to measure the impact of resolutions, but it is a pleasure to acknowledge that Professor W.J. Baggaley, of the University of Canterbury, Physics Department in New Zealand, in cooperation with IPS Radio and Space Services in Australia, has continued the collection and distribution of data from Christchurch and the collection of ionograms from Scott Base to support research projects. However, the ionosonde at De Bilt did close, and while many agree Easter Island is a good site, nobody has yet placed an ionosonde there.

The next three years will be critical for INAG. This last triennium has seen a further reduction in the number of articles offered for bulletins, but, hopefully, this trend can now be reversed.

P.J. WILKINSON, Chairman-designate

Annex 2 - Report on Activities of Working Group 2

Beacon Satellite Group

In the years 1987-1990 the Beacon Satellite Group (Chairman : R. Leitinger, Austria; Co-Chairmen : J.A. Klobuchar, U.S.A., and T.R. Tyagi, India) fulfilled its tasks by having two international Symposia sponsored by URSI and by giving advice and issuing recommendations on all important matters related to the activities of the members of the Group.

The Group maintains a comparatively large mailing list with open access instead of applying rules for formal membership. In this way we reach all scientists who are interested in exchanging information and getting news about satellite beacon activities. Formal Business Meetings are held during the Symposia. The Group is interdisciplinary and comprises members who are primarily interested in ionospheric physics as well as members who are interested in the application of trans-ionospheric propagation of radio waves in areas which range from communication engineering to space geodesy and radio astronomy.

Beacon satellite activities are not evenly distributed : larger regional groups of scientists involved in beacon satellite observations exist in the U.S.A., in India, in China, in Australia. There are some hopes of increased activities in South America in the near

future. Unfortunately no satellite beacons are observed in Africa where only a few ionospheric stations exist. Contacts to interested scientists have been established for many years but up to now no observation plans could be carried out because of financial problems.

Very good relations exist between the Beacon Satellite Group and the International Association of Geodesy (IAG) organizations dealing with atmospheric effects in Space Geodesy : the Chairman of the Beacon Satellite Group is a member of the joint IAG Comm. VIII/COSPAR "CSTG" (Int. Coord. of Space Techniques for Geodesy and Geodynamics) and the IAG Special Study Group 4.93 "Wave Propagation in Refractive Media".

The exchange of information was done partly by means of Circular Letters issued by the Chairman and partly by various other means of communication when the information was of interest to individual members only or to regional groups of members.

The Beacon Satellite Symposium 1988 was held in Beijing, China, from 18 to 21 April on the invitation of the China Research Institute of Radio Wave Propagation and of the Chinese Institute of Electronics (CIE), in parallel with the International Symposium on Radio Propagation. There were 22 participants from 12 countries and 11 participants from the People's Republic of China. About 15 scientists (5 from abroad, 10 from China) who had registered for the Radio Propagation Symposium attended some of the sessions of the Beacon Satellite Symposium. Thirty seven papers were presented in 5 scientific sessions. Proceedings appeared with International Academic Publishers (distributors : Pergamon Press). A detailed report appeared in the URSI Bulletin.

The Beacon Satellite Symposium 1990 was held in Tucuman, Argentina, from 27 to 30 March on the invitation of the Universidad Nacional de Tucuman. There were 20 participants from 10 countries and 12 from Argentina. Forty-four papers were presented in 8 sessions. Proceedings are in print. A detailed report has appeared in the URSI Bulletin.

The Beacon Satellite Symposium 1992 is in the planning stage : it will be held in or near Boston, Massachusetts, U.S.A., and will be organized by Dr. Min-Chang Lee (MIT), probably at a time following the end of the U.S. academic year.

R. LEITINGER, Chairman

Annex 3 - Report on Activities of Working Group 3

Ionospheric Mapping and Modelling

Working Group G-3 was formed in Tel Aviv, and combined some of the activities of the International Reference Ionosphere and the Working Group on Ionospheric Mapping chaired by Ken Davies. It viewed itself as having a broader charter than just ionospheric mapping. Specific areas of work that were committed, at least initially, were :

- (i) Physically based ionospheric modelling;
- (ii) Data bases required and necessary to verify models;
- (iii) Improved mapping techniques; and
- (iv) Irregularity modelling.

Most of these activities have been addressed, although much more as the result of individual efforts than a coordinated working group activity. Dr. David Anderson (U.S.A.) has produced a series of reports and papers describing electron density parameters that are based upon varying degrees of complex theoretical calculations. Dr. Dieter Bilitza has put together a report describing a worldwide data base of ionospheric measurements. This effort by Dr. Bilitza in fact superseded the group's original plan to develop a more propagation-oriented data base. Efforts were undertaken to develop a high-latitude ionospheric irregularity model, and a report describing the model will be available very soon, authored by Dr. Elkins (U.S.A.). The model is based on HF auroral backscatter data. A paper describing a new set of ionospheric mapping coefficients was published in 1989. These coefficients were slightly improved over those reported by Ken Davies in 1987 at Tel Aviv. No further improvements on ionospheric mapping were undertaken.

Much of the work of Working Group G-3 complements the interests and the activity of Working Group G-4 (Informatics) under the leadership of Dr. Bodo Reinisch (U.S.A.); G-4 has made tremendous progress. In light of the need to assure high coordination of efforts, particularly considering the fact that most scientists around the world have limited time and resources, consideration should be given to merging G-3 and G-4. It should be pointed out that there is considerable interest in ionospheric mapping/modelling on the part of representatives from India, South Africa, and Japan, as well as by the individuals mentioned above.

C.M. RUSH, Chairman

Annex 4 - Report on Activities of Working Group 4

Ionospheric Informatics

The Ionospheric Informatics Working Group was formed during the URSI General Assembly of 1987 in Tel Aviv with the task to promote the application of information technology to the acquisition, processing, archiving and distribution of ionospheric data. During the first Business Meeting in Tel Aviv the members specified three tasks for the 1987-1990 period : (1) ionogram data formats for data archiving, (2) electron density profiles with emphasis on the E-F valley problem, and (3) oblique HF propagation studies. The IIWG held Business Meetings in September 1987 (URSI, Tel Aviv, Israel), July 1998 (COSPAR, Helsinki, Finland), August 1988 (Geophysics Informatics Workshop, Moscow, U.S.S.R.), January 1989 (US URSI, Boulder, CO), July 1989 (IAGA, Exeter, U.K.), August 1989 (IRI Workshop, Abington, U.K.) and January 1990 (US URSI, Boulder, CO). In July 1989, the IIWG conducted a Workshop on "Digital Ionogram Data Formats for World Data Center Archiving" in Lowell, MA, U.S.A.. A half-day symposium on "Electron Density Profiles and the E-F Valley Problem" has been organized for the URSI General Assembly in Prague, Czechoslovakia, September 1990.

The IIWG has produced four papers published in Advances in Space Research, Vol. 10, No 8, Chapter 7, 1990 :

1. "N(h) Profile Data at World Data Centers" by Allen et al.
2. "Discussion of the Valley Problem in N(h) Analysis of Ionograms", by Gulyaeva et al.
3. "Digital Ionogram Data", by Reinisch et al.
4. "Oblique Propagation Studies", by Bradley.

An important breakthrough was achieved at the Lowell Workshop. A new format for tabulated monthly ionogram characteristics was unanimously approved by the Workshop participants for recommendation to URSI as the new URSI standard. This format allows the economical archiving of non-time uniform data. World Data Center A at Boulder plans to use this format for the ionogram characteristics on CD ROM. A report on this new format has been widely circulated.

B.W. REINISCH, Chairman

Annex 5 - Report on Activities of Working Group GH1

Incoherent Scatter

The major effort of the Working Group during the past three years has been scheduling the Incoherent-scatter Coordinated World Day Calendar each year. (These periods appear on the International Geophysical Calendar issued by the World Data Center.) Some of these periods last for 1 day; others last for 2 to 6 days.

The scheduling process has become more complex than in the past. A major reason is that these longer periods have become the observational focus for many experiments performed under the US CEDAR (Coupling, Energetics and Dynamics of Atmospheric Regions) programme and the international WITS (World Ionosphere - Thermosphere Study) and , now, STEP (Solar Terrestrial Programme) programmes. As a consequence, it is necessary to coordinate with numerous scientific groups, in addition to the organizations running the radars, and to satisfy their needs. The process normally starts with letters in the late spring followed by consultations at the spring AGU (American Geophysical Union) meeting in May and CEDAR workshop in June, followed by another round of letters and then consultations at an international meeting in June or July.

In addition to the continued good support of the World Days by the groups running Sondrestrom, EISCAT (European Incoherent Scatter Scientific Association), Millstone Hill, Arecibo, and Jicamarca, there is good news from Professor Fukao that the MU (Middle and Upper Atmosphere) radar is operating on most World Days, and from Professor Taran of the Kharkov Polytechnical Institute that his radar is operating on some of the World Days.

In relation to coordination of scheduling we had meetings at the CEDAR workshops in 1988 and 1989. We also had a meeting at the Helsinki COSPAR meeting immediately after the ISR (Indirect Scatter Radar) symposium. A final meeting is to be held in Prague at the 1990 General Assembly.

Another scheduling matter considered during the last three years is a quick response by the incoherent-scatter radars to a magnetic storm. At Helsinki and in communications thereafter it was established that considerable scientific interest exists for such a response and that the organizations operating the first five radars named above are willing, under appropriate conditions, to do so. On the agenda for the Prague meeting is to work out the mechanisms for alerting the radar organizations about the possibility of a quick turn on, and for making the decision to turn on and to operate in a particular mode.

One of the problems facing the community is quick and convenient communications. This is true for the coordinated World Days, for quick-response operation, and for informing a wide range of scientists about when the individual radars are planning to operate. An approach is to set up an international accessible electronic bulletin board. A possibility being pursued is to take advantage of the bulletin-board system being established for STEP by its Informatics Division. Its problems are similar, its scope is international, and its prototype is about to be tested.

This Working Group is supposed to look into the possibility of establishing a southern-hemisphere incoherent-scatter radar. Because of the considerable activity during the past three years in our community to establish new radars on the equator and in the northern hemisphere, there has been no activity in this direction. However, it should be noted that new northern-hemisphere radars could give rise to an interesting conjugate location for a future radar:

V.B. WICKWAR, Chairman

COMMISSION H - WAVES IN PLASMAS

Chairman : Professor H. Matsumoto (Japan)

REPORT ON BUSINESS MEETINGS

The Commission held three Business Meetings, respectively on 28, 31 August and 3 September. The second meeting was held jointly with Commission G.

First Business Meeting (28 August)

The meeting was attended by 31 persons.

1. Brief Introduction of Commission Activities during the General Assembly

The Chairman gave a brief introduction and summary of the Commission Activities during the General Assembly. This included : Scientific Sessions, Business Sessions, General and Tutorial Lectures. The Chairman also gave the sad news of the death of Vice-Chairman Dr. D. Jones, together with that of Dr. V.I. Aksenov (U.S.S.R.), one of the candidates for Chairman and Vice-Chairman. A copy of the memo from the Chairman to Commission H Official members was distributed to the participants.

2. Election of Chairman and Vice-Chairman

Prior to the election, the Chairman reported that one of the three candidates, Dr. V.I. Aksenov, passed away after his nomination. His death was reported to the Chairman after the mail voting had been completed. In the Business Meeting, eight official members (from China-CIE, Czechoslovakia, France, German D.R., Japan, New Zealand, Poland, U.K.) were present. Three of them (France, Poland, U.K.) re-voted prior to the voting. Given the demise of Dr. Aksenov, the points given in the mail voting were recounted by giving two points to the candidate who received the higher ranking and one to the other. The vote resulted in the following ranking for the two remaining candidates :

1. R.F. Benson (U.S.A.)
2. F. Lefevvre (France)

According to the result, Commission H will report to the Council that it recommends Dr. R.F. Benson as a candidate for Chairman, and Dr. F. Lefevvre as a candidate for Vice-Chairman.

3. Review of Radio Science (RRS)

Professor Dowden, President of the URSI Publications Committee, reported the current issues concerning the Review of Radio Science. He explained the current problem of the page limitation allotted to Commissions G and H, and of the hard job of squeezing or dropping the references submitted to the Editor.

He presented five options attempting to reduce the size of the reference list, and one option to increase the allotted pages (by printing two or three independent volumes of the RRS).

Additional opinions from the floor were as follows :

- As the current text of the RRS carries so little information, it may be better to have only the Reference Section.
- In addition to the conventional listing of references, some number of key words would increase the value of the information.
- Instead of introducing each paper or papers from each research group, the RRS should be devoted to Review Papers on specific selected topics.

4. Terms of Reference

The Chairman reported the discussion on Terms of Reference in the Council and Coordinating Committee. As to the attempt of harmonizing the format, no specific opinion was presented, and the issue was left to the Chairman and Vice-Chairman, who would await concrete suggestions from the Commission Chairmen's Meeting.

5. IGBP/ISY

The Chairman reported the current status of IGBP (International Geosphere and Biosphere Programme) and ISY (International Space Year). This subject will be discussed in the Third Business Meeting, after the detailed information in written form is distributed to the members.

6. Sponsorship of meetings

The Chairman reported the sponsorships given by Commission H in the past triennium, based on recommendations made at the General Assembly in Tel Aviv. The following Workshops and Symposia had been approved there.:

- 89-1 : Workshops on Artificial Ionization Mirror (U.S.S.R. : mode A)
- 89-1 : URSI Symposium on Wave-Particle Interactions and Wave-induced Particle Precipitation (New Zealand : mode B)

- 89-3 : 19th ICPIG (International Conference on Phenomena in Ionized Gases) (Yugoslavia : mode B)
- 91-1 : Symposia on Artificial Modification of the Ionosphere (U.S.S.R. : mode B)
- 91-1 : 20th ICPIG (Italy : mode A)
- 91-3 : 4th ISSS (International School for Space Simulation) (Japan : mode B).

Partial financial support was given to JS-3, one of the joint sessions at the General Assembly in Prague. Sponsorships for the next triennium will be recommended at a later Business Meeting.

7. Working Groups

The current Working Groups in which Commission H is involved are :

- C/H Wave Analysis : the H representative was the late D. Jones.
- G/H Incoherent Scatter : the H representative is V.B. Wickwar.
- H/G Computer Experiments, Simulation and Analysis of Wave Plasma Process : the H representatives are H. Matsumoto and M. Ashour-Abdalla.
- IAGA/H/G Wave Instabilities in Plasmas : the H representative is T. Sato.
- IAGA/H Passive Electromagnetic Probing of the Magnetosphere : the H representative is U.S. Inan.

The first three Working Groups have been active, and have been functioning well in the past triennium. However, the latter two Inter-Union groups have made no report on their activity. They might well be eliminated for the next triennium, unless any suggestion for maintaining them is made at the Third Business Meeting, at which Chairmanships (or co-chairmanships) will be discussed, and appointments made.

8. Resolution/Recommendation Committee

In order to prepare the text of resolutions and recommendations to the Council, Dr. R.F. Benson, Dr. F. Lefeuvre and the current Chairman were appointed as R/R Committee. The Committee members will prepare a draft of the texts of resolution and recommendation by the Third Business Meeting.

9. Preliminary discussion of Scientific Programmes at the Next General Assembly

Proposals were put forward for :

1. Computer Experiments
2. Nonlinear Plasma Response to Tether, Beam and Gas Injection experiments

3. Wave Analysis focussing on a specific topic.

More topics will be proposed in the Third Business Meeting. Agreement was obtained to draw a draft of Scientific Sessions (with conveners names) by the end of the present General Assembly.

Second Business Meeting (31 August)

Together with Commission G.

Professor Rishbeth called the meeting to order at 5.07 p.m.

1. Review of Radio Science (RRS)

Vice-President R. Dowden gave a report concerning future plans being considered for the RRS. He said that the Publications Committee had suggested a change of title to the plural : "Reviews of Radio Science", which would consist of about 40 review articles. These would be reviewed and edited by the Commission Editors, who would also be responsible for requesting lists of references from Member Committees. All of these references would be combined onto a floppy disk. The following suggestions and comments were made from the floor :

- Separate chapters into separate volumes, and make disks containing all references available at no extra cost.
- Make the Reviews part of a special issue of "Radio Science". This suggestion generated both concern over logistics problems and support in that it would be easier to recruit reviewers.
- The present form is of use to graduate students ; many topics may get left out with the new concept.
- Make the review in highlight form.
- The present form serves a unique purpose, e.g. as a starting point in a literature search.
- The present text is difficult to write and is of little reading value; it would be better to simply organize references by subject.
- This subject is discussed all too often at business meetings.

Some participants wondered whether there was any difference between the proposed concept and the presently published Tutorial Lectures. The Chairman answered that Tutorials are aimed mainly at members of other Commissions.

2. Joint G/H Working Groups

Reports were presented on the two G/H Working Groups : Incoherent Scatter and Computer Simulation. V. Wickwar reported on the former, the main activity of which has been to schedule joint operations of all incoherent scatter radars (CEDAR, WITS, STEP). Another goal has been to try and work out a decision-and-alert-mechanism for operations during periods of special geomagnetic activity. Efforts have been directed toward establishing a bulletin board and finding a site for a Southern Hemisphere station. A leadership election in the group will take place on Monday. Agreement was given to continue the Working Group.

Professor Matsumoto discussed the activities of the Computer Simulation and Wave Analysis Working Groups. These include national schooling, coordinating simulation studies jointly with other international bodies (like SCOSTEP), and helping conveners of sessions at General Assemblies. Agreement was given to continue the Working Group. F. Lefeuvre suggested that the Wave and Turbulence Analysis Working Group (former CH.1 Wave Analysis) be expanded to include Commission G.

L. Duncan proposed to reactivate the Active Experiments Working Group. No action was taken - the subject will be considered at the 3 September Business Meetings, held separately by G and H.

A. Smith presented a report on the Inter-Union Working Group (IAGA/URSI G/H) on Passive Probing, which included a proposed name change to : VLF/ELF Remote Sensing of the Ionosphere and Magnetosphere. The continuation of this Working Group under the name change was approved.

3. Scientific Programme at the 1993 General Assembly

Dr. Lefeuvre suggested a joint symposium on "Fine Structures and Solitons in Space Plasmas : Observation and Analysis Techniques". Other proposals for joint sessions were made by Dr. Wernik, viz.

1. Nonlinear waves in the ionosphere and atmosphere (G, H, F)
2. Recent results of coordinated campaigns (G, H)
3. Active experiments in ionospheric and space plasmas (G, H)
4. Prediction-oriented data acquisition and modelling efforts treating solar-terrestrial relationships (G, H, J)
5. Resonance effects produced in the F region by high-power radio waves (G, H)

6. Plasma perturbations and waves generated by active experiments (G, H).

4. IUWDS

Dr. Reddy reported on the International Ursigram and World Days Service, and asked members to consider the need for including :

- (1) Interplanetary scintillation indices
- (2) G Map indices (from Cambridge University)
- (3) Electronic mail rather than telex.

The report of Dr. Reddy can be found on p. 159.

Third Business Meeting (3 September, 17.00-19.10)

1. Working Groups

After some discussion, a resolution was passed enumerating the working groups for the triennium 1990-3. The text can be found under Resolution H.3 on p. 192.

2. Terms of Reference

After considering the request of the URSI President and Secretary General to make the style of the terms of reference more uniform among the Commissions, the members recommended the terms of reference given in Resolution U.1, p. 164.

3. Review of Radio Science (RRS)

R. Benson asked for a vote among the members concerning the future form of the Review of Radio Science. The following three options were presented :

- (1) Up to four reviews in hardcopy form, and all references (with key words) on a disk.
- (2) Topic sub-headings (similar to present), followed by citations, and a list of references on hardcopy and all references on a disk.
- (3) Leave it in the present form.

The votes for these options were 12, 8 and 2, respectively.

4. Sponsorship of meetings

The recommendations for sponsorship are found under Resolution H.2, p. 192.

5. Scientific programme for the 1993 General Assembly

R. Benson presented the following list of joint symposia being considered for the 1993 General Assembly :

1. Nonlinear wave theories and observations in space (H, G) with F. Lefeuvre (France) as the Commission H representative. Three half-day sessions were recommended.
2. Computer experiments of nonlinear kinetic processes in space plasma (H, G) with H. Matsumoto (Japan) as the Commission H representative. S. Ossakow was suggested as a representative from G. Two half-day sessions were recommended.
3. Active experiments in space (G, H) with R. Pfaff as the Commission H representative. M. Kelley was suggested as a representative from G. Two half-day sessions were recommended.

The following were additional suggestions made from the floor :

4. Humans' impact on the space environment (H, E), with P. Bernhardt as the Commission H representative. Two half-day sessions were recommended (this suggestion requires negotiations with E).
5. Resonance effects produced in the F region by high -power radio waves (G, H), with A. Gurevich (U.S.S.R.) as the Commission H representative. (F. Djuth is the proposed Commission G representative). One half-day session was recommended.
6. Computer simulation of MHD processes in space plasmas, with S.T. Wu and G. Chanteur recommended as conveners. Two half-day sessions were recommended.
7. Parallel electric field in laboratory and space plasmas, with J. Lemaire (Belgium) and, to be confirmed, E. Whipple (U.S.A.) as conveners. Two half-day sessions were recommended.
8. Electromagnetic and electrostatic cyclotron waves in magnetospheric and laboratory plasmas : theory, simulations and experiments, with D. Nunn (U.K.), and Y. Omura (Japan) as conveners. Two half-day sessions were recommended.
9. Whistlers and particle precipitation, with H. Strangeways (U.K.) and U. Inan (U.S.A.) as conveners. Two half-day sessions were recommended.
10. Waves in plasmas (an open session) with R. Benson (U.S.A.) as convener. Two half-day sessions.

It was agreed that the following two proposed joint G/H sessions be sponsored by G alone :

1. Recent results of coordinated campaigns.
2. Prediction-oriented data acquisition and modelling efforts treating solar-terrestrial relationships.

Note : after the meeting a joint E, H Symposium entitled : "Radio Noise Associated with Earthquakes" was also suggested ; this suggestion was being investigated.

6. Computational techniques

A recommendation was passed to draw the attention of National Administrations to the importance of new computational techniques in Radio Science, and to the desirability of establishing supercomputer centres dedicated to Radio Science in different parts of the world. The text of the Recommendation can be found under H.1 on p. 192.

At the end of the meeting, Dr. R. Benson asked the members to thank Hiroshi Matsumoto for his great efforts over the last three years, expressed his desire to work closely with Vice-Chairman F. Lefeuvre, and asked for the assistance of the Commission members over the next three years.

SCIENTIFIC PROGRAMME

Commission H organized one Scientific Session, namely

H1. Waves in plasma (convener : H. Matsumoto, Japan)

The Commission also participated in ten Joint Sessions

- JS1. Wave and turbulence analysis techniques (with C, G, J) (conveners : F. Lefeuvre, W. Kofman, France, P. Thomasson, U.K. and S. Basu, U.S.A.)
- JS2. Radio Propagation in the ionosphere and magnetosphere : theory and application (with G) (conveners : K.C. Yeh, U.S.A. and I. Kimura, Japan)
- JS3. Theory and Computer experiments of plasma processes (with G) (conveners : B. Lembège, France, and S.L. Ossakow, U.S.A.)
- JS4. VLF Triggered emissions (with G) (conveners : Y. Omura, Japan, and D. Nunn, U.K.)
- JS5. Predictability of Solar-terrestrial weather and its ionospheric impact (with G) (convener : E.P. Szuszcwicz, U.S.A.)

- JS6. Effects of high power radio waves on the ionosphere and magnetosphere (with G) (conveners : M.T. Rietveld, Norway, and P. Bernhard, U.S.A.)
- JS7. The radio planets (with G, J) (conveners : M. Kaiser and D.O. Muhleman, U.S.A., and I. Hanasz, Poland)
- JS8. Ionospheric and magnetospheric effects of lightning (with G) (conveners : U.S. Inan, U.S.A., and H.J. Strangeways, U.K.)
- JS16. Radio Noise associated with earthquakes (with E) (conveners : T. Yoshino, Japan, and M. Gokhberg, U.S.S.R.)
- JS17. Characterization of terrestrial and power line sources (with E) (conveners : M. Hayakawa, Japan, and K. Bullough, U.K.)

The tutorial of Commission H, entitled "Simulation Technology for Plasma Wave Research", has been given by J.W. Eastwood (U.K.).

COMMISSION J - RADIO ASTRONOMY

Chairman : Professor R.H. Frater (Australia)

Vice-Chairman : Professor R.D. Ekers (Australia)

REPORT ON BUSINESS MEETINGS

The Commission held three Business Meetings, respectively on 28 and 31 August, and 3 September.

First Business Meeting (28 August)

1. Election of a Vice-Chairman

A survey of the voting procedure showed that :

- a) Informal votes were re-submitted;
- b) No representatives wished to change their vote;
- c) No additional representatives were present.

Three candidates had been nominated. The ballot resulted in the following names being submitted to the Council, in order of preference :

1. R.T. Schilizzi (Netherlands)
2. ex aequo : Y.N. Parijskij (U.S.S.R.) and M. Morimoto (Japan)

2. Terms of Reference

A working party comprising Drs. Schilizzi, Wielebinski and Ekers was asked to finalise the Commission J recommendations.

3. Inter Union Commission on the Allocation of Frequencies (IUCAF)

Dr. Robinson reported on the first meeting of IUCAF. It was resolved that the next business session would deal with matters of substance concerning the World Administrative Radio Conference in 1992. In relation to membership of IUCAF, Commission J recommended that :

- a) the existing representatives be retained for the next triennium;
- b) that representation be made to IAU to recommend the appointment of Dr. Ishiguro as the IAU representative, replacing Dr. Kaifu.

4. Intercommission Working Groups

Commission J recommended the appointment of Dr. Alan Young as the Commission J representative on the Intercommission Working Group on Time Domain Waveform Measurements.

5. Review of Radio Science

The review was discussed at length at the meeting. The present format was considered to be of dubious value, even to the Commission's members in the Third World. Commission J therefore recommended that the format of the Review be changed to "Highlights in Radio Science", with up to six highlights (with references) covered for each commission.

Commission J also recommended that full bibliographies for each Commission should be prepared in computer readable form.

Second and Third Business Meetings (respectively on 31 August and 3 September)

1. Terms of Reference of Commission J on Radio Astronomy

The approved terms of reference can be found under Resolution U.1 (p. 164).

2. Working Groups

The resolution concerning the Working Group on Global VLBI can be found under J.1, p. 194. The agreed representation for the 1990-3 triennium is :

EVN (Europe)	2
NRAO (USA)	2
Academy of Science (U.S.S.R.)	2
CSIRO (Australia)	1
NAO (Japan)	1
At Large	<u>2</u>
	10

3. Reports from Symposia held in the past triennium

3.1. The IAU Colloquium 112 on "Environmental Impacts on Astronomy : Light Pollution, Radio Interference and Space Debris" was held in Washington, D.C., U.S.A., on August 12-16, 1988, following the IAU General Assembly in Baltimore. The meeting was well attended : over one hundred participants from twenty countries took part in it. Nearly one half of the meeting was dedicated to

radio interference issues. Since the last World Administrative Radio Conference (WARC), held in 1979, the use of the radio spectrum increased enormously, and instances of interference at radio observatories have proliferated. New services and technologies (e.g. satellite borne spread spectrum transmitters) have been introduced, and made radioastronomical observations difficult, and in some cases impossible to conduct in some portions of the spectrum.

An objective of the meeting was to call this situation to the attention of the regulatory agencies and commercial providers of radio services, in addition to scientists. The papers presented ranged from the description and analysis (and in a few cases the successful resolution) of some cases of interference at local, as well as global levels, the national and international regulatory framework, and expectations for the near future. A press conference was held, which was well attended, and several resolutions were adopted, expressing the need to conserve certain portions of the spectrum for astronomical research. The need for certain locations (the far side of the Moon, the South Pole, and the L2 Lagrangian Point) to remain radio-pollution-free was also emphasised. The Proceedings of the Colloquium, edited by D. Crawford, are expected to appear in 1990.

T. GERGELY, National Science Foundation, U.S.A.

3.2. VLBI Summer School

More than one hundred students and lecturers from around the world took part in the First Summer School on VLBI, organized near Bologna, Italy, by the European VLBI Network in September, 1988.

Lectures were given on all aspects of VLBI, from data collection and calibration to image formation and the derivation of astrometric and geodetic parameters. The organization of worldwide VLBI, and prospects for new instrumentation, were also covered.

The Proceedings of the Summer School have been published in the NATO series.

R.T. SCHILIZZI

3.3 Report on the Symposium on Submillimetre and Millimetre-wave Astronomy

A symposium was held in Kailua-Kona, on the Big Island of Hawaii, in October 1988. Approximately one hundred and fifty attended, and the meeting covered both technical developments in this rapidly evolving area - including such things as superconducting detectors and high-precision antennae - and the recent

astronomical results, particularly the first data from the new submillimetre telescope on Mauna Kea, which has been recently completed.

In addition to URSI, support was provided by the California Institute of Technology, the U.K. Science and Engineering Research Council, and the National Research Council of Canada. The Proceedings (Eds. Watt and Webster) have been published by Kluwer.

R. HILLS

3.4 Report on the Symposium on Radio Astronomical Seeing

The Symposium was held in Beijing (China) 15-19 May 1989. The topic was unusual and involved a multi-disciplinary approach. It encompassed the troposphere, ionosphere, interplanetary and interstellar media. It involved instrumental problems at very low and very high frequencies, and theoretical work on the atmosphere and ionosphere. Initial organization went slowly, but in the last few months before the meeting when key people started to decide to attend there was a rapid snowballing effect, resulting in a well attended and high-level meeting. The Symposium was effective despite the wide range of topics. The volume of Proceedings (Ed J. Baldwin) has been completed.

Despite the logistical problems in Beijing, resulting from the student actions in Tienamen Square during the meeting, the local organizers coped very well.

R.D. EKERS

4. Sponsorship of meetings in 1991-3

URSI Commission J recommends URSI Sponsorship for the following symposia during 1991-1993, subject to receipt of proper requests from the organizers (See Recommendation J.3, p. 194):

- 4.1. High Resolution Imaging, July 1992, NSW, Australia (probably Sydney of Narrabri). Sponsoring Organizations ; IAU Commissions 9 & 40, Co-sponsoring Organizations : URSI Commission J. Chairmen SOC : J. Davis (Australia - IAU), R. Ekers (Australia - URSI). Contact address : Professor John Davis, Department of Physics, University of Sydney, Sydney 2006, Australia.
- 4.2. Space VLBI, August-September (adjacent to the URSI General Assembly), Japan. Co-sponsoring Organizations : IAU Commission 40, Chairman SOC : M. Morimoto, National Astronomy Observatory, Japan.

- 4.3. Astronomy with Millimetre and Sub-Millimetre Wave Interferometry, 1992, 5 days, probably in October, Japan (probably in Hakone). Sponsoring Organization : IAU Commission 40, Co-sponsoring Organizations : URSI Commission J. Chairman SOC (Scientific Organizing Committee) : J. Welch (U.S.A.). Contact address : Professor M. Ishiguro, Nobeyama Radio Observatory.
- 4.4. Waves propagation in random media, during the first two weeks of August 1992, Seattle, Washington, USA. Sponsoring Organizations : URSI Commissions B, F, G, J. Co-sponsoring Organizations : ASA (Acoustical Society of America), ICO (International Commission for Optics), SPIE (Society of Photo-optical Instrumentation Engineers). Chairman SOC : V. Tatarskii (U.S.S.R.). Contact address : Professor K.C. Yeh, Department of Electrical Engineering, University of Illinois.

5. Joint Symposia for the 1993 General Assembly

Two joint Symposia were recommended. (see Recommendation J.2, p. 194)

- 1) Imaging through Adaptive Spatial Signal Processing
Convenors : Commission B, B. Steinberg (U.S.A.),
Commission J, T. Cornwell (U.S.A.).
- 2) Radio Interference to Passive Services
Convenors : Commission J, T. Gergely (U.S.A.),
Commission F, A. Gasiewski (U.S.A.).

6. Time Domain Metrology

Dr. A. Young reported on the Business meetings held by the relevant Intercommission Working Group. In his capacity as Commission J representative, he explained that JS22 topics are time domain reflectometry, pulse generation, measurement of narrow pulses, on-wafer testing in the time domain and waveform deconvolution.

Most of the first meeting was taken up with a discussion of the future of this Joint Session. All present wanted it to continue, but all were unhappy with the long string of ten minute papers. Dr. Young suggested that some ten minute papers were acceptable as long as at least half were longer. However, the majority view was to suppress ten minute papers in the future, by either extending session time or reducing the number of papers.

This was followed by a vote on the Chairman and Vice-Chairman, a discussion on a mechanism for the distribution of information and lists of papers, and a discussion of the various meetings in this and peripheral areas.

7. The Sunspot Index Data Centre

Having regard to the importance of maintaining longterm records, now highlighted by the growing interest in Global Change, Commission J recommended that URSI should sponsor the Sunspot Index Data Centre. The URSI Council subsequently passed Resolution U.20 (see p. 173) to support this recommendation.

8. Inter Union Commission on Frequency Allocation

The Commission informed the Council about serious problems concerning the importance of a proper scientific use of the radio spectrum. This action gave rise to Resolutions U.25 and U.26 (see p. 176) both directed at the CCIR.

9. Declaration of Principles Following the Detection of Extraterrestrial Intelligence

The supporting document (see p. 196) was presented by Dr. Jill Tarter at the first meeting of the Commission. A number of Official Members expressed the view that they were not in a position to endorse the document on behalf of their Member Committees. The proposal for endorsement could thus only be dealt with at a future business meeting, i.e. at the next General Assembly. Under these circumstances, Dr. Tarter withdrew her request for formal support from URSI. It was then determined that the participants should vote, on a personal basis. The statement appearing under J.4, p. 195, was supported by a majority vote.

10. Postmortem

There was some discussion on the crowded nature of some parts of the programme at this General Assembly. It was resolved that overlap within the Commission should be avoided at future General Assemblies. It was further resolved that Commission J should avoid Joint Symposia where there was not a serious J interest. Other requests should be covered by the participation of appropriate Commission J speakers.

It was resolved that more effort should be spent organizing poster sessions, ensuring that there is adequate opportunity for poster viewing, and that opportunities are provided for authors to make brief presentations in oral sessions.

It was agreed that progress reports should be separated out from new results in the Observatory reports.

SCIENTIFIC PROGRAMME

Commission J organized eleven Scientific Sessions, namely

- J1 Signals and images in radio astronomy
(convener : J. O'Sullivan, Australia)
- J2 Radio Astronomical interferometers
(convener : R.D. Ekers, Australia)
- J3 VLBI tape recorder technology
(convener : K. Johnston, U.S.A.)
- J4 Solar Radio Astronomy
(convener : J.T. Schmelz, U.S.A.)
- J5. Reports from observatories I
(conveners : W. Miller Goss, U.S.A. and M. Morimoto, Japan)
- J6. Reports from observatories II
(conveners : W. Miller Goss, U.S.A. and M. Morimoto, Japan)
- J7. Progress in submillimetre receivers
(convener : R. Hills, U.K.)
- J8. Feed arrays and active optics for radio telescopes
(convener : P.J. Napier, U.S.A.)
- J9. Reports from observatories III
(conveners : W. Miller Goss, U.S.A. and M. Morimoto, Japan)
- J10. Space VLBI
(conveners : R.T. Schilizzi, Netherlands, and N.S. Kardashev, USSR))
- J11. Polarization
(convener : R. Wielebinski, Germany)

The Commission also participated in five Joint Sessions

- JS1. Wave and turbulence analysis techniques (with C, G, H)
(conveners : F. Lefeuvre, W. Kofman, France, P. Thomasson, U.K. and S. Basu, U.S.A.)
- JS7. The radio planets (with G, H)
(conveners : M. Kaiser and D.O. Muhleman, U.S.A. and I. Hanasz, Poland)
- JS13. Spectrum management and advanced radio communication technology
(with C, E) (conveners : R.D. Parlow, and G.H. Hagn, U.S.A.)
- JS21. Antennas : measurements of properties (with A)
(conveners : O.C. Jones, U.K., and D.H. Russell, U.S.A.)
- JS24. Pulsar-timing properties and problems (with A)
(convener : A. Lyne, U.K.)

The tutorial of Commission J, entitled "Polarization", has been given by V. Radhakrishnan (India).

COMMISSION K - ELECTROMAGNETICS IN BIOLOGY AND MEDICINE

Temporary Chairperson : Professor J.B. Andersen (Denmark)

Temporary Vice-Chairperson : Dr. M.A. Stuchly (Canada)

The decision to create the Commission was made at the Council meeting of 3 September. Professor J. Bach Andersen had first presented to the Council the following report of the ad hoc group. The group held an open business meeting on Wednesday 29 August from 16.20 to 17.20, which was attended by about 50 delegates.

URSI's future involvement in the biological/medical area

1. Background

URSI's role in establishing international fora for discussion and cooperation in the bioelectromagnetics field is well recognized in the bioelectromagnetics community. Commission A's role in hosting these activities over the last many years should be commended and recognized. The interdisciplinary character of the science has shown a need for creation of special societies, such as BEMS (Bioelectromagnetics Society) and EBEA (European Bioelectromagnetics Association) where biologists, physicians, physicists and engineers would interact. The activities and interests concerning bio-effects (both harmful and beneficial) have increased considerably over the last three years, so that the present scope is much wider than the metrological aspects that were most prevalent in the beginning, and which were the reasons for the Commission A connection. Thus there seems to be a general consensus in the URSI Community that now the time is right for assessing URSI's role in this area and enlarging the involvement.

2. Considerations and views put forward

2.1. Possible alternatives

As alternative possibilities for the future organization three solutions seemed to exist :

- a) Continuation of the Working Group
- b) Establishment of a Scientific Committee
- c) Establishment of a new Commission

There was a general consensus that (a) should be ruled out. The choice between (b) and (c) was less clear in the beginning, but the final discussions favoured strongly option (c). The reasons are illustrated below.

2.2. Reasons for expansion from Working Group to Commission

An overview of the present activities in the Commissions will help illuminate URSI's involvement.

Commission A will still have an interest in the metrological aspects of bioelectromagnetics. Commission B has an increasing interest exemplified by a special session at the recent Commission B Symposium in Stockholm. The interests lie mainly in the numerical and analytical solution of field problems concerning the complex, inhomogeneous (and often non-linear) biological media, such as encountered in e.g. hyperthermia applications. Microwave Diffraction Imaging and Applied Potential Tomography both show promise as new imaging devices in biological/medical applications, and similar modelling problems are encountered in Magnetic Resonance devices. Commission C is involved in general with Radio Communication Systems, of which many in the future will involve personal, portable transmitters. The possible hazards are an important social issue there, especially taking into account the various standards in different parts of the world. Commission D includes biophotonics and bioelectronics as part of its activities, as shown by the present scientific programme in Prague. Commission E has had a sustained interest over the years in including the human factor in considering electromagnetic compatibility problems. These are probably the main interests at present, although one should not rule out the influence on the biosphere from induced magnetic fields from geophysical activities in the atmosphere.

The above list of the present activities does not in itself necessitate the formation of a new Commission, but it is felt that the present field of activities should be enlarged by including more general medical applications arising from the use of electromagnetic waves, and that the cohesion and visibility of the field would be strengthened by the formation of a new Commission.

Needless to say, a new Commission would co-operate in the usual manner with the present Commissions, e.g. by having joint sessions at General Assemblies.

URSI's strength lies in its truly international character and organization, so that information will be disseminated globally and contacts established on the same scale. No other organization seems to have a similar network in this field.

URSI is organizationally different from other more specialized societies, such as BEMS and EBEA, and would thus supplement instead of compete. URSI will be an instrument in coordinating meetings, research cooperation etc., in harmony with the present traditions of Commissions to cooperate with other societies. The URSI

Commission should keep its distinct profile as being a physics - mathematics - engineering community relating to electromagnetics, and not expand into strictly biological areas.

It is not the intention to define, with this document, the details of a possible, future Commission. This should be left to the people working in the field. The goal is to stress the need for a free standing body with stability ; a Commission would serve that purpose. The rotation of chairpersons would also ensure that new people get involved every three years. Some concern has been expressed that a Commission might be too bureaucratic, but experience from the present Commissions indicates that this need not be so.

3. Recommendations

It is recommended, that :

- URSI establish a new Commission K;
- the terms of reference, although yet to be defined, should include the study of interactions between electromagnetic radiation and living systems from essentially DC to optical frequencies. This would include not only possible hazards and ensuing standards, but also beneficial medical applications.
- the new Commission should cooperate with the other Commissions and Societies in the traditional URSI fashion, with the aim of bringing true internationalism and a comprehensive and diverse expertise to the physical-mathematical-engineering aspects of electromagnetics.
- the work of starting a new Commission should be launched immediately.

As a possible name for the new Commission, the ad hoc group suggests
"Electromagnetics in Biology and Medicine"

J.B. ANDERSEN

SCIENTIFIC PROGRAMME

The Commission did not, for obvious reasons, have a programme of its own in Prague, but its general field of activity was represented by the programme put together by BEMS and URSI, and which included the following Scientific Sessions :

BEMS 1 : *Mechanisms of interactions and biological effects*

Oral presentation - Chairpersons : C.F. Blackman (U.S.A.), M.G. Shandala (U.S.S.R.), H. Pafkova (Czechoslovakia)

Posters - Chairpersons : H. Trzaska (Poland), N. Kuster (Switzerland), B. Coufalova (Czechoslovakia)

BEMS 2 : *Quantitation of Exposures*

Posters - Chairpersons : H. Trzaska (Poland), N. Kuster (Switzerland), B. Coufalova (Czechoslovakia)

BEMS 3 : *Medical Applications*

Oral presentation I - Chairpersons : A.M. Demetskyi (U.S.S.R.), A. Guseo (Hungary), J. Jerabek (Czechoslovakia)

Oral presentation II - Chairpersons : F. Bardati (Italy), M. Meskens (Belgium), M. Lapes (Czechoslovakia)

BEMS 4 : *Hygienics Standards*

Oral presentation - Chairpersons : Li Ji-xi (China), B.M. Savin (U.S.S.R.), J. Musil (Czechoslovakia)

REPORTS OF THE INTER-COMMISSION WORKING GROUPS (I.W.G.)

TIME DOMAIN WAVEFORM MEASUREMENTS

by Professor T.K. Sarkar

The IWG organized and convened one scientific session : JS22. There were ten papers : two invited papers of thirty minutes duration and eight contributed papers of ten minutes each. The average attendance was about 80. Two one hour Business Meetings were held on August 30 and September 3 from 17.00 to 18.00. In these meetings, the following business agenda was followed and completed :

1. Introduction of members and visitors to one another and nomination of new members.
2. Dr. Sarkar, who replaced Dr. Nahman as Chairman, reported on the overall activities of the IWG for the past three years. Several sessions were organized at the URSI meeting in Boulder on Time Domain Measurements and also at the Conference on Precision Electromagnetic Measurements (1990) held in Ottawa.
3. It was decided to abandon 10 minute presentations in the future. The suggestions made were :
 - a. To have fewer, but longer papers, probably of 20 minute duration;
 - b. To make a strong recommendation to the Council that the number of technical sessions be expanded to 9,5 days to make proper use of two weeks;
 - c. Alternatively, to request Council to emphasize poster sessions in order to make up for the lack of slots for papers.
4. The possible activities for the IWG during the next years (if it is decided by the Council that this group should continue), including the XXIV General Assembly, were discussed. The following was suggested for possible adoption as a resolution by the Council :
 - a. It is recommended that the IWG continue for the next triennium with Dr. Tapan K. Sarkar as the Chairman and with the existing terms of reference. See Resolution U.18, p. 173.
 - b. It was recommended that for those countries in which National Radio Science meetings are held, the IWG members residing therein should organize time domain scientific sessions in concert with interested commissions. Specifically :

- Professor Paul Smith (U.K.) should organize a session(s) at the London, Ontario (June 1991) meeting with all the other 9 commissions on Time Domain Measurements.
 - Coordinators should be assigned from IWG to organize sessions at the CPEM (1991, France) and NEM meeting at Albuquerque.
- c. It was recommended that IWG prepare a review of Time Domain Metrology for the next triennium. Several possibilities suggested were that a summary be presented in the Review of Radio Science (1990 - 1992) under the heading Electromagnetic Metrology of Commission A. Then interested authors can obtain an annotated unedited version of the entire bibliography from the Chairman on an electronic medium. A request is made to the Council for such representation in the Review of Radio Science.
- d. For the XXIV General Assembly, the IWG should propose two scientific sessions in Time Domain measurements to provide a forum for both summary and research papers.

T.K. SARKAR

REPORTS ON ACTIVITIES OF INTER-UNION ORGANIZATIONS

INTER-UNION COMMISSION ON THE ALLOCATION OF FREQUENCIES TO RADIO ASTRONOMY AND SPACE SCIENCE (IUCAF)

1. *Dr. Robinson prepared a report on the activities of IUCAF from 1 August 1988 to 1 March 1990. (Dr. J.W. Findlay retired from IUCAF in August 1988, and Dr. B.J. Robinson was elected Chairman in his place.) The essential points of this report are summarized below :*

"The major task of IUCAF is to coordinate international preparations for the meetings of the CCIR and the ITU World Administrative Radio Conferences, in order to keep the passive bands throughout the radiofrequency spectrum free from harmful interference. These passive bands are used for space research, radio astronomy and Earth exploration satellites.

Members of IUCAF participated in the Interim Meetings of CCIR Study Group 2 in November 1987 and the Final Meeting in September 1989. The documents prepared at these meetings set the technical framework for the ITU World Administrative Radio Conference (WARC). A WARC is to be convened in 1992 to re-allocate the 0.5 GHz to 3 GHz region of the radio spectrum. This region is of particular importance for space research, radio astronomy and earth exploration.

A majority of the members of IUCAF attended IAU Colloquium No 112 in Washington on "Light Pollution, Space Junk and Radio Interference" in August 1988. Three meetings of IUCAF were held in Washington on 13, 14, and 15 August 1988. At these meetings the major threats to radio astronomy and space research were identified.

Under the aegis of the European Science Foundation, a Committee on Radio Astronomy Frequencies (CRAF) has been formed to coordinate frequency protection matters in Europe. The Chairman of the Committee is Dr. H.C. Kahlman. Since he is an IAU representative on IUCAF, close collaboration with CRAF is assured.

In May 1989 discussions took place in China on the setting up of an Asian equivalent of the European CRAF. The proposed Asian Committee would support IUCAF and provide it with relevant information on interference problems in the region.

Preparations of IUCAF for WARC'92 are in full swing. To increase its geographical effectiveness, IUCAF is moving to set up a network of Correspondents in countries which adhere to URSI Commission J. At WARC'92 the votes of Third World Countries will be particularly important and the role of Argentina, Brazil, China, Egypt, India, Iraq, Nigeria, Peru and Thailand will be fostered by IUCAF members or correspondents."

2. Statement of Income and Expenditure for the year ended 31 December 1989

INCOME

Contributions from :	URSI	3.000,00	
	IAU	4.000,00	
	ICSU	1.000,00	
	COSPAR	<u>1.000,00</u>	
	TOTAL INCOME		9.000,00

EXPENDITURE

- Expenses Dubinsky	1.248,22	
- Audit fees	<u>100,00</u>	
	TOTAL EXPENDITURE	1.348,22

Excess of Income over Expenditure for the year	7.651,78
Accumulated Balance at 1 January 1989	<u>2.874,27</u>
Accumulated Balance at 31 December 1989	10.526,05
	=====

Rates of exchange

1 January 1989 : \$1 = BEF 36,10
 31 December 1989 : \$1 = BEF 37,50

3. *The IUCAF Group met in Prague on August 28 and 30, 1990, and reported to Commissions E, F and J at their Business Meetings. The following points were discussed :*

1. Agenda for WARC 1992

In June the ITU Administrative Council decided on the agenda for the 1992 World Administrative Radio Conference in Seville. IUCAF identified the following nine agenda items as important for the passive services :

2.1. : Definitions for new space applications

- 2.2.1. : Allocations at frequency bands above 20 GHz to new space service applications
- 2.2.3.(a) : Allocation for a Sound Broadcasting Satellite Service in the range 500 - 3,000 MHz.
- 2.2.3.(b) : Allocation for wide RF-band high-definition television
- 2.2.4. : Allocation of frequency bands to the Mobile and Mobile-satellite services, including public correspondence with aircraft and "Future Public Land Mobile Telecommunication Systems".
- 2.2.6. : Examination at the frequency bands 2,025 - 2,110 MHz and 2,200 - 2,290 MHz for Space Operations and Space Research.
- 2.2.7. : Sharing criteria for the Radiodetermination - Satellite Service in the Frequency range 1.6 - 2.5 GHz.
- 2.9.1. : To safeguard the interests of services that may be affected by changes to the frequency allocation table.

2. Major dangers for Passive Services at WARC 1992

- (a) Explosive growth of mobile services (1.7 - 2.3 GHz)
- (b) Development of land mobile satellite service (1.645 - 1.6605 GHz)
- (c) Radio Determination Satellite Service (1.610 - 1.625 GHz)
- (d) Digital sound broadcasting from satellite (? GHz)
- (e) Wide RF band High Definition TV (21.4 - 22 GHz)
- (f) New Space Services above 20 GHz
- (g) GLONASS navigation system (1.610 - 1.625, 1.660 - 1.670 GHz)
- (h) GPS navigation system (1.660 - 1.670 GHz)

3. Reports for ITU on the Needs of Radio Astronomy

Three reports were discussed :

- (a) Ir. H.C. Kahlman presented the report prepared by the Committee on Radio Astronomy Frequencies (CRAF) of the European Science Foundation
- (b) Professor R.M. Price presented the report prepared by the Committee on Radio Frequencies (CORF) of the U.S. National Academy of Sciences.
- (c) Dr. B.J. Robinson distributed a more concise IUCAF report for delegates to WARC 1992, edited from a report initiated by Dr. A.R. Thompson (U.S. Correspondent of IUCAF)

4. Meeting of Space Frequency Coordination Group (SFCG)

The SFCG will meet near Washington on 1-5 October, 1990. IUCAF will be represented by Dubinsky (IAU), Horner (COSPAR), Pankonin (IAU) and Robinson (URSI). The SFCG meeting will consider the needs of space research and space

operations, especially in the band 2200 - 2300 MHz. This band is also used by radio astronomy for VLBI measurements, both across the earth and linked to future space telescopes (Radioastron and VSOP projects).

5. CCIR Interim Working Party 2/2 (IWP 2/2)

This IWP of the CCIR will meet near Washington from 8-12 October 1990. It is a key meeting of CCIR to set up the technical standards for the WARC in 1992 for space operations, space research, radioastronomy and earth exploration.

IUCAF will be represented by Dubinsky (IAU), Horner (COSPAR), Pankonin (IAU) and Robinson (URSI) plus IUCAF correspondents from Canada (R.S. Roger), Sweden (J. Ellder) and U.S.A. (T. Gergeley).

6. Spread Spectrum Modulation

IUCAF is concerned at the spread of interference from Spread Spectrum Modulation Techniques, particularly as used by GPS, GLONASS and RDSS. Dr. Robinson discussed interference measurements made in Australia, Canada, Sweden, U.K., and U.S.A.. Dr. J. Ponsonby presented an important report on spread spectrum commissioned by IUCAF in 1988. This will be an important topic for CCIR IWP 2/2 in Washington.

7. Meetings in 1991 and 1992

IUCAF will need to have representatives at the following meetings in 1991 :

- CCIR Joint Interim Working Party, March 1991, in Geneva;
- SFCG-II meeting in October 1991, in Madrid.

The CCIR and SFCG meetings in 1990 and 1991 all focus on the WARC in February 1992. IUCAF will need a strong delegation of members and IUCAF correspondents at the WARC, which lasts four weeks and two days. To cover the high costs involved with the meetings in 1991 and 1992, IUCAF has applied to ICSU for US\$ 6,000 to supplement the funds provided by URSI, IAU and COSPAR.

8. Terms of Reference of IUCAF

IUCAF was founded at the 1960 General Assembly in London, to cover the allocation of frequencies for space research and radio astronomy.

ICSU has asked whether the terms of reference of IUCAF can be extended to include passive remote sensing. I hope the URSI Council will agree to this change to the terms of reference. There are many frequency bands common to space research, radioastronomy and passive remote sensing.

9. Adverse environment Impacts on Astronomy

The September 1988 URSI Symposium in Washington dealt with Light Pollution, Radio Interference and Space Junk. This was a meeting of experts.

The secretary General at the IAU has obtained UNESCO funds for a conference in the Summer of 1992 to publicize "Adverse Environmental Effects on Astronomy". He has asked IUCAF to play a major role in this conference, and will presumably approach URSI soon about participation.

B.J. ROBINSON, Chairman

FAGS AND THE PERMANENT SERVICES

FAGS COUNCIL

by Dr. R. Wielebinski, Secretary

The Federation of Astronomical and Geophysical Services was established in 1956 with the intent to support the establishment of Services which collect long series of scientific observations. The observations are to be of value in astronomy, geophysics and related sciences. FAGS has thus to play a major role in the Global Change studies; some of the data collected through FAGS Services go back to 1800!

The finances of FAGS come from ICSU and the three supporting Unions. In 1990 the funding was as follows :

ICSU : \$50,500
IUGG : \$10,000
IAU : \$2,500
URSI : \$2,000

These funds are then distributed to the ten active Services during the annual meeting of the Council where each Union has two representatives. This means that each Union would be in a position to obtain substantial money to support their Service.

URSI is at present represented by one Service only (International Ursigram and World Days Service (IUWDS)). It would be desirable to see if some additional URSI activity could be placed inside FAGS, which is a good channel for getting small funds from ICSU (or UNESCO) to collect important observational data.

The ten services (with corresponding distribution of funds in 1990) are :

	\$
- International Earth Rotation Service (IERS)	16,000
- Quarterly Bulletin on Solar Activity (QBSA)	5,500
- International Service for Geomagnetic Indices (ISGI)	4,900
- Permanent Service for Mean Sea Level (PSMSL)	11,000
- Bureau Gravimétrique International (BGI)	8,000
- International Centre for Earth Tides (ICET)	10,000
- International Ursigram and World Days Service (IUWDS)	1,000
- World Glacier Monitoring Service (WGMS)	4,000
- Sunspot Index Data Centre (SIDC)	2,000
- Centre de Données Stellaires (CDS)	<u>3,000</u>
	\$65,400

BUREAU INTERNATIONAL DE L'HEURE (BIH)

by Mr. B. Guinot, Director of the BIH

"On the 1st of January 1988, as a consequence of a reorganization of international services dealing with the Rotation of the Earth and Time, responsibility for the establishment of International Atomic Time (TAI) was officially transferred from the Bureau International de l'Heure (BIH) to the Bureau International des Poids et Mesures (BIPM). In fact, the BIPM had already housed the BIH Time Section since 1985 : the transfer did not involve any scientific and technical discontinuity.

TAI and its sister time scale Coordinated Universal Time (UTC) are still made available by issuing corrections to add to the readings of the master clocks of national laboratories. These corrections are given for dates at 10-day intervals."

In the rest of his Report, which is available from the Secretariat, Mr. Guinot discussed :

(a) The establishment of TAI and UTC

- Clock data received at BIH/BIPM
- Time comparisons
- Algorithms for TAI
- Stability of TAI
- Dissemination of TAI and UTC

(b) Other research.

THE INTERNATIONAL URSIGRAM AND WORLD DAYS SERVICE (IUWDS)

Excerpts of the report by Dr. P. Thompson, Chairman

1. Introduction

The International Ursigram and World Days Service (IUWDS), a joint service of URSI, IAU and IUGG and a permanent service of the Federation of Astronomical and Geophysical Data Analysis Services (FAGS), aims to provide information rapidly to the world scientific community to assist in the planning, coordination and conduct of scientific work in disciplines affected by the sun-earth environment.

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 designed to be very flexible and can be easily adjusted to fit the needs of the scientific community.

In addition, on behalf of COSPAR, each month IUWDS summarizes the status of satellite orbits 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. This bulletin is produced by the World Data Centre A for Rockets and Satellites.

The present solar cycle has proved to be a very active one, both in terms of the rise in sunspot number and in the number of severe disturbances to the sun-earth environment. The active solar cycle combined with the increasing sensitivity of modern technology to events in the sun-earth environment has emphasized the relevance and importance of the services coordinated by IUWDS.

2. The International Ursigram Service

The International Ursigram Service operates through a number of Regional Warning Centres (RWC) and Associate Regional Warning Centres (ARWC) scattered all around the world. Warning Centres are located in : Boulder (U.S.A.), Darmstadt (FRG), Moscow (U.S.S.R.), Paris (France), New Delhi (India), Ottawa (Canada), Prague (Czechoslovakia), Tokyo (Japan), Sydney (Australia) and Warsaw (Poland).

In its own geographic areas, each RWC collects all the data and reports available concerning the state of the sun-earth environment. In some cases, these come from observatories operated directly by the Regional Warning Centre. In many cases, they are gathered from regional scientific institutes and universities.

3. Publications

The *International Geophysical Calendar* is distributed free of charge throughout the world. The present distribution is approximately 2,000 copies, produced at a nominal cost.

The *Spacewarn Bulletin* is also distributed free of charge throughout the world. Approximately 600 copies are produced.

The *Geolerts* and the abbreviated Calendar records are published monthly in "Solar and Geophysical Data" which is distributed to 2,000 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 the "IUWDS Alert Periods" in the Solar-Geophysical Data Books published by World Data Centre A. 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 Book* has been updated and reprinted in a loose leaf format.

4. Summary of activities during 1989

- 4.1 The Third Solar-Terrestrial Predictions Workshop (16-20 October 1989, Leura, Australia);
- 4.2 Reprinting of IUWDS Code Book in a loose leaf format;
- 4.3 Meeting of Warning Centre representatives in Leura.

A formal meeting of the IUWDS Steering Committee will take place during the 1990 COSPAR Assembly in the Netherlands.

At the Prague General Assembly, Dr. B.M. Reddy of ARWC New Delhi, (also URSI Representative to IUWDS,) presented the following report to the Council.

"The International Ursigram and World Days Service is a joint service of URSI, IAU and IUGG and a permanent service of the Federation of Astronomical and Geophysical Data Services (FAGS). The major aim of this service is to provide solar geophysical forecasts and data to the world scientific community for planning and coordination of scientific activities.

The third solar terrestrial predictions workshop was held during October 16-20, 1989 at Leura, near Sydney, Australia. During the above workshop, a meeting of the warning centre representatives was organized to survey the present status of data exchange. In response to a request from the Chinese Academy of Sciences, China was formally admitted to the IUWDS network at a meeting of the IUWDS Steering Committee in July 1990. A number of institutes including the Beijing Astronomical Observatory, Yunnan Observatory, Purple Mountain Observatory and Chinese Institute of Radiowave Propagation will participate in data exchange. It is recommended that the present data exchange by telex should be replaced by electronic mail to improve efficacy of near-real-time data exchange.

The possibility of including Interplanetary Scintillation Indices and G-Map information (Cambridge University, U.K.) on a routine basis should be considered with a view toward improving prediction potential.

Special efforts should be made to predict and disseminate sets of very quiet days in advance for coordinated observations of ionospheric and magnetospheric characteristics."

REPORT ON THE WORK OF THE DRAFTING COMMITTEE

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

Designated by URSI Council :

URSI Secretariat :

Prof. A.D. Olver (U.K.)

Mrs. Y. Stevanovitch

Dr. G. Pillet (France)

Prof. S.S. Swords (Ireland)

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

The Drafting Committee met in London on 20 November 1990 and agreed on the French and English texts of the resolutions and recommendations adopted during the XXIII General Assembly. These texts will be published in the December 1990 issue of the URSI Information Bulletin and in Volume XXII of the Proceedings of URSI General Assemblies.

In view of the difficulties caused by the timing of the Business sessions, it is recommended that the Board of Officers give consideration to the method of recording resolutions.

The Committee noted that there are considerable variations in the style of the Terms of Reference for Commissions and recommends that the Board of Officers prepare guidelines for Commissions.

RESOLUTIONS AND RECOMMENDATIONS OF THE COUNCIL

U.1 URSI Scientific Commissions

The URSI Council,

noting

- (a) that, according to Resolution C.1 (Lima, 1975), the topics covered by the Commissions should be reviewed at each General Assembly;
- (b) that, in addition, the Commissions have been invited by the present General Assembly to bring some uniformity in the wording of their terms of reference;
- (c) that Commissions A, E, and F do not feel it necessary to modify their terms of reference as stated in the Annex to Resolution U.1 (Tel Aviv, 1987);

confirms or approves, as appropriate, the titles and terms of reference of the Commissions as given in the Annex.

Annex

1. Commission A - ELECTROMAGNETIC METROLOGY, Electromagnetic measurements and standards.

The Commission promotes research and developments in :

- (a) Measurements and standards in time and frequency, including infrared and optical frequencies;
 - (b) Measurements in the time domain;
 - (c) Measurements in the frequency domain;
 - (d) Measurements in telecommunications;
 - (e) Measurements using lasers;
 - (f) Quantum metrology and electrical methods in fundamental constants;
 - (g) Measurements and standards from microwaves to submillimetre waves.
2. Commission B - FIELDS AND WAVES, Electromagnetic theory and practice, including antennas and waveguides.

The interest of Commission B is fields and waves, encompassing theory, analysis, computation, experiments, and validation. Areas of emphasis are :

- (a) Time-domain phenomena;
- (b) Scattering and diffraction;
- (c) Propagation and wave guiding;
- (d) Radiation and antennas;
- (e) Inverse scattering.

The Commission fosters the creation, development and refinement of associated analytical and numerical tools to better understand these phenomena. It encourages innovation and seeks to apply interdisciplinary concepts and methods.

3. Commission C - SIGNALS AND SYSTEMS.

The Commission promotes research and development in :

- (a) Telecommunication systems;
- (b) Spectrum and medium utilization;
- (c) Modulation and coding;
- (d) Signal and image processing;
- (e) Circuit theory and design;
- (f) Information theory.

The design of effective telecommunication systems requires the balance of scientific, engineering and economic factors. The Commission emphasizes research into the scientific factors, and provides expertise in other areas of radio science required for system design.

4. Commission D - ELECTRONICS AND PHOTONICS.

The Commission promotes research and reviews new development in :

- (a) Electronic devices and applications;
- (b) Photonic devices and applications;
- (c) Physics, materials, CAD, technology and reliability of electronic and photonic devices,

with particular reference to radio science and telecommunications.

The Commission deals with devices for generation, detection, storage and processing of electromagnetic signals together with their applications, covering all frequencies, including microwave and optical domains.

5. Commission E - ELECTROMAGNETIC NOISE AND INTERFERENCE.

The Commission promotes research and development in :

- (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 title : Electromagnetic Compatibility.

6. Commission F - WAVE PROPAGATION AND REMOTE SENSING

(including radio-meteorology, radio-oceanography and remote sensing of non-ionized media).

The Commission encourages :

- (a) The study of 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 subsurface medium,
- (v) characterization of the environment as it affects wave phenomena;
- (b) The application of the results of these studies, particularly in the areas of remote sensing and communications;
- (c) The appropriate 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).

The Commission deals with the study of the ionosphere in order to provide the broad understanding necessary for radio communications. Specifically, it includes the following areas :

- (a) Global morphology and modelling of the ionosphere;
- (b) Ionospheric space-time variations;
- (c) Development of tools and networks needed to measure ionospheric properties;
- (d) Theory and practice of radio propagation via the ionosphere;
- (e) Application of ionospheric information to radio communications.

To achieve these objectives, the Commission cooperates with other URSI Commissions, corresponding bodies of the ICSU family (IUGG, IAU, COSPAR, SCOSTEP, etc) and other organizations (CCIR, etc.).

8. Commission H - WAVES IN PLASMAS (including space and laboratory plasmas).

The goals of the Commission are :

- (a) To study waves in plasmas in the broadest sense and, in particular :
 - (i) the generation (i.e. plasma instabilities) and propagation of waves in plasmas,
 - (ii) the interaction between these waves and wave-particle interactions,
 - (iii) plasma turbulence processes and chaos,
 - (iv) spacecraft-plasma interactions ;
- (b) To encourage the application of the results of these studies, particularly in the areas of solar/planetary plasma interactions, and the increased exploitation of space as a research laboratory.

9. Commission J - RADIO ASTRONOMY (including remote sensing of celestial objects).

- (a) The activities of the Commission are concerned with observation and interpretation of all radio emissions and reflections from celestial objects.
- (b) Emphasis is placed on :
 - (i) the promotion of technical means for making radio-astronomical observations and data analysis,
 - (ii) support of activities to protect radio-astronomical observations from harmful interference.

U.2 New Commission on Electromagnetics in Biology and Medicine

The URSI Council,

considering

- (a) that, in view of the ever increasing interest and activities in the field of bio-electromagnetics and its interdisciplinary character, there is a need for a truly

international forum where biologists, physicians, physicists and engineers would be able to interact;

- (b) that the role of URSI in establishing such an international forum had already been recognized by the community involved, and that it is now time for enlarging the involvement of URSI in this area;
- (c) that Commission A Working Group on Interactions of Electromagnetic Fields with Biological Systems had been originally created to cover the metrological aspects of bio-electromagnetics, but that the scope of the Working Group had become much wider over the years;
- (d) that several URSI Commissions could contribute usefully to the development of bio-electromagnetics by bringing diverse expertise in the physical, mathematical and engineering aspects;

resolves

- 1. to create a new Commission K, under the provisional title "Electromagnetics in Biology and Medicine", the precise terms of reference of which will be defined, but should include the study of interactions between electromagnetic radiation and living systems in the whole frequency spectrum and applications in medicine;
- 2. to designate Professor J. Bach Andersen (Denmark) as interim Chairman of the new Commission, and Dr. M. Stuchly (Canada) as interim Vice-Chairman.

U.3 Scientific Committee on Telecommunications

The URSI Council,

considering

- (a) that the URSI/CCIR/CCITT Liaison Committee had expressed the opinion that its role and status should be re-examined;
- (b) that the main activities of the Committee had concentrated in the past on the cooperation with the International Radio Consultative Committee (CCIR), one of the technical Committees of the International Telecommunication Union (ITU);
- (c) that URSI should play a role in the advancement of telecommunications science in general, and not restrict its activities to the study of topics of direct interest to the technical Committees of ITU;
- (d) that the structure of the URSI/CCIR/CCITT Liaison Committee was based excessively on voluntary action by individual scientists on the URSI side, and that the mandate of the Committee was not well defined;
- (e) that more efficiency would be achieved by establishing a Scientific Committee with precise but not too restrictive terms of reference;

resolves

- 1. to create a Scientific Committee on Telecommunications, with the following terms of reference :

"The objectives of the Scientific Committee on Telecommunications are to facilitate the cooperation between the Commissions of URSI, and also the cooperation of these with CCIR and CCITT Study Groups for the study of scientific aspects of the telecommunications problems.

The Committee includes, among others, the Chairmen of the appropriate URSI Commissions, or their delegates, and representatives designated by CCIR and CCITT.

The Committee shall :

- (a) identify those areas which may influence the evolution of telecommunications in the long term;
- (b) keep the URSI community informed on specific problems raised by the evolution of telecommunications;
- (c) keep the CCIR and CCITT informed on basic scientific results of importance to telecommunications;
- (d) assist the CCIR and CCITT in the precise formulation of questions addressed to the scientific community, and more specifically to URSI;
- (e) by stimulating studies and symposia, prepare the URSI responses to such questions in an appropriate form".

2. to appoint L. Barclay (U.K.) and P. Delogne (Belgium) as Chairman and Vice-Chairman respectively of the new Committee.

U.4 URSI Statutes

The URSI Council,

having examined the proposed modifications to the URSI Statutes;

resolves to approve the revised version of the Statutes with slight changes in the wording of Articles 1 and 13.

U.5 Honorary Presidents

The URSI Council,

considering that the title of Honorary President can be conferred on former members of the Board of Officers who have made notable contributions to the achievement of the objectives of the Union;

resolves to confer the title of Honorary President of URSI on

Professor W.E. Gordon, and

Professor F.L.H.M. Stumpers

in recognition of the outstanding services they have given and that they continue to give

U.6 Admission of New Members and Associate Members

The URSI Council,

having considered the application submitted by the following scientific institutions :

- (a) King Abdulaziz City for Science and Technology in Saudi Arabia for full membership of the Union;
- (b) the Scientific Research Council of Jamaica, the National Science and Technology Council in Grenada and the Scientific and Technical Research Council of Turkey for associate membership of the Union;

resolves to accept these applications subject to these institutions satisfying the criteria of the URSI Statutes.

U.7 Network of Correspondents

The URSI Council,

noting the recommendations made by the URSI Standing Committee on Membership;

resolves that a Network of Correspondents be created within URSI according to the following scheme :

- (i) any scientist attending a General Assembly will have an opportunity to register as a correspondent for a three-year period by paying a special fee when registering for the Assembly;
- (ii) individual scientists not able to attend a General Assembly will be given the possibility of being included in the Network of Correspondents by applying direct to the URSI Secretariat and by paying the special fee;
- (iii) scientists from developing countries will be included in the Network without any charge according to a mechanism still to be devised;
- (iv) correspondents participating in the Network will be kept informed about the activities of the Union;
- (v) they will have no voting rights, but will be allowed to express their views in the Commissions on matters of a scientific nature.

U.8 URSI Finances and Membership of the Standing Finance Committee

The URSI Council,

having considered the recommendations contained in the Report of the Standing Finance Committee, dated 4 September 1990;

resolves

1. to accept the recommendations referred to above;
2. to approve the audited accounts of the Union for the years ending 31 December 1987, 1988 and 1989;
3. to publish the Report of the Treasurer and the Report of the Standing Finance Committee in Volume XXII of the *Proceedings of URSI General Assemblies*;
4. To place on record its appreciation of the outstanding services rendered to the Union by Dr. H.J. Albrecht in his capacity as Treasurer;
5. to appoint the following as members of the Standing Finance Committee for the next triennium :

Chairman : K. Géher (Hungary)

Members : C. Butler (U.S.A.)
F. Gardiol (Switzerland)
J.G. Lucas (Australia)
S. Radicella (Argentina)
F.W. Sluijter (Netherlands)
S.S. Swords (Ireland).

U.9 URSI Publications and Membership of the Standing Publications Committee

The URSI Council,

recognizing that the implementation of the recommendations contained in the Report of the Standing Publications Committee, dated 4 September 1990, would serve a useful purpose in increasing the visibility of the Union and in disseminating widely information about its activities;

resolves

1. to approve the recommendations referred to above;
2. to publish the Report of the Standing Publications Committee in Volume XXII of the *Proceedings of URSI General Assemblies*;
3. to appoint the following as members of the Standing Publications Committee for the next triennium :

Chairman : P.J.B. Clarricoats (U.K.)

Members : S.A. Bowhill (U.S.A.)
P. Delogne (Belgium)
R.L. Dowden (New Zealand)
K. Géher (Hungary)
G. Hyde (U.S.A.)
R. Stone (U.S.A.)

U.10 Standing Committee on URSI Membership

The URSI Council,

noting the importance of the role played by the Standing Committee on Membership over the last three years in conducting consultations on the membership structure of the Union;

resolves

1. to extend the terms of reference of the Committee (C.7, Lima 1975) as follows :
 - (i) to propose ways of bringing URSI to the attention of radio scientists in territories which have not yet decided to adhere to the Union;
 - (ii) to consider all questions related to the membership structure of URSI, and to report on them to the Council;
 - (iii) to examine at each General Assembly the status of the Associate Member Committees, and to submit recommendations for consideration by the Council;
2. to record its thanks to Dr. Petit, Chairman of the Committee, for the work performed during the past triennium, in particular for the detailed reports on the consultations referred to above;
3. to appoint the following as members of the Standing Committee on URSI Membership for the next triennium :

Chairman : T.B.A. Senior (U.S.A.)

Members : S. Okamura (Japan)
M. Petit (France)
J. Shapira (Israel)
V. Shevchenko (U.S.S.R.)
Yu-Kai Chen (China, SRS).

U.11 Standing Committee on Developing Countries

The URSI Council,

having considered

- (a) the report of the Standing Committee on Developing Countries for the period 1988-1990;
- (b) the proposals for future activities of the Committee;

recognizing that URSI should pursue its efforts toward the development of telecommunications science and the training of radio scientists in developing countries;

resolves

1. to approve the plan of action submitted by the Committee for the triennium 1991-1993, including the publication of an *URSI Handbook on Earth-Space Propagation*

in the Tropics, and the organization of two Colleges on Radio Propagation, in cooperation with the International Centre for Theoretical Physics (ICTP);

2. to appoint the following as members of the Committee for the next triennium :

Chairman : S. Radicella (Argentina)

Members : G.O. Ajayi (Nigeria)
M.S. Assis (Brazil)
Feng Shizhang (China, CIE)
J.O. Oyinloye (Nigeria)
B. Reddy (India)
J. Voge (France).

U.12 Standing Committee on Future General Assemblies

The URSI Council,

considering

- (a) that the number of participants in URSI General Assemblies is increasing over the years;
- (b) that the organization of a General Assembly involves a very considerable amount of work on the part of the Local Organizing Committee, as well as the availability of suitable facilities;
- (c) that it is essential to keep the Members Committees informed of the general requirements for the organization of such a major event;

resolves

1. to ask the Committee to keep the points referred to above in mind when seeking invitations for a General Assembly;
2. to appoint the following as members of the Standing Committee on Future General Assemblies for the following triennium :

Chairman : T. Okoshi (Japan)

Members : J.W. Klein (Germany)
I.A. Salem (Egypt)
A.M. Scheggi (Italy)
E.M. Zhabotinskij (U.S.S.R.)
V. Zima (Czechoslovakia).

U.13 International Geosphere-Biosphere Programme and World Climate Research Programme

The URSI Council,

considering

- (a) that URSI has a role to play in the major interdisciplinary cooperative programme launched by the International Council of Scientific Unions (ICSU) under the title : "International Geosphere-Biosphere Programme : A Study of Global Change" (IGBP);

- (b) that it would be desirable for URSI to associate itself with the World Climate Research Programme (WCRP), a joint undertaking of ICSU and the World Meteorological Organization (WMO), launched in early 1980;
- (c) that URSI can make useful contributions to these programmes, particularly in view of its expertise in radio remote sensing methods and in data handling;

resolves

1. to extend the terms of reference of the Committee in IGBP so as to include also the WCRP;
2. to appoint the following as members of the Committee for the next triennium :

Chairman : G. Brussaard (Netherlands)

Members : W.E. Gordon (U.S.A.)
A. Guissard (Belgium)
J. Gower (Canada)
H. Hallikainen (Finland)
N. Matuura (Japan)
M. Petit (France)
S. Radicella (Argentina)
H. Rishbeth (U.K.)
K. Serafimov (Bulgaria)
P.A. Watson (U.K.)
A. Wernik (Poland).

U.14 International Space Year (ISY)

The URSI Council,

having considered the report in which Professor W.E. Gordon, Chairman of the ad hoc Group on ISY, gives an overview of the preparations for the International Space Year in 1992;

noting the conclusion that there seems to be no scientific role for the Unions in the ISY;

resolves to dissolve the ad hoc Group for the International Space Year.

U.15 ad hoc Group on Environmental Consequences of Nuclear War

The URSI Council,

noting that the scientific findings of the SCOPE-ENUWAR Project, to which the URSI ad hoc Group has contributed with a "Factual Statement on Nuclear Electromagnetic Pulse and Associated Effects", have influenced the discussions among nuclear weapon nations, and that the scientific findings were also brought to the attention of the United Nations;

considering that the ad hoc Group might still have a role to play in the future;

resolves to maintain the ad hoc Group on Environmental Consequences of Nuclear War for the next triennium, with the following membership :

Chairman : M. Wik (Sweden)

Members : W. Graf (U.S.A.)
D. Hansen (Switzerland)
J. Shiloh (Israel).

U.16 Standing Committee on Young Scientists

The URSI Council,

considering

- (a) that participation of young scientists in URSI General Assemblies and Symposia, and interaction between the young and older scientists are essential to the life of the Union;
- (b) that a way of contributing to the advancement of radio science in developing countries consists in bringing young scientists from these countries to URSI meetings;
- (c) that, since 1969, the Young Scientist Programme has developed into one of the most successful ventures of the Union;

resolves

- 1. to create a Standing Committee on Young Scientists;
- 2. to appoint the following as members of the Committee for the next triennium :

Chairman : E.V. Jull (Canada)

Members : Feng Shizhang (China, CIE)
D. Gjessing (Norway)
A.P. Mitra (India)
T. Okoshi (Japan)
G. Pillet (France)
R. Sagalyn (U.S.A.)
T. Simtrakarn (Thailand)
L. Zombory (Hungary).

U.17 Committee on the Future of URSI

The URSI Council,

recognizing

- (a) that it is desirable to follow up the conclusions and suggestions formulated by the Corsendonk Conference in March 1987;
- (b) that there is a need for some long-range planning and for an examination in depth of the structure and organization of URSI, so as to adapt them to changing conditions for the benefit of the radio science community;

resolves

1. to create a Committee on the Future of URSI;
2. to appoint the following as members of the Committee for the next triennium :

Chairman : E. V. Jull (Canada)

Members : P. Bauer (France)
A.L. Cullen (U.K.)
W.E. Gordon (U.S.A.)
J.G. Lucas (Australia)
K. Serafimov (Bulgaria)
J. Shapira (Israel)

Secretary : P. Lagasse (Belgium)

U.18 Inter-Commission Working Group on Time Domain Waveform Measurements

The URSI Council,

having considered the recommendations contained in the Report submitted by the Inter-Commission Working Group on Time Domain Waveform Measurements;

noting that Dr. N.S. Nahman has expressed the wish to retire as Chairman of the Working Group;

resolves

1. to maintain the Inter-Commission Working Group on Time Domain Waveform Measurements for the period 1990-1993;
2. to place on record its appreciation of the way Dr. Nahman had conducted the activities of the Working Group since 1981;
3. to appoint T.K. Sarkar (U.S.A.) as Chairman of the Working Group.

U.19 Research Station for the Upper Atmosphere

The URSI Council,

noting the extreme importance of an ionosonde station near the eastern edge of the South Atlantic anomaly for the URSI and CCIR programmes;

recommends that a research station for the upper atmosphere be established in this region.

U.20 Sunspot Index Data Centre (SIDC)

The URSI Council,

considering

- (a) the importance of maintaining long-term records, now highlighted by the growing interest in the International Geosphere-Biosphere Programme (IGBP);
- (b) the regular operation and very valuable activities of the Sunspot Index Data Centre (SIDC), located at the Royal Observatory of Belgium in Brussels;

resolves that URSI should sponsor the Sunspot Index Data Centre, which adheres to the Federation of Astronomical and Geophysical Data Analysis Services (FAGS).

U.21 High Latitude Observatories

The URSI Council,

considering the complexity of the high latitude ionosphere, its tight coupling to the magnetosphere, the controlling influence of the interplanetary magnetic fields and of the solar wind;

noting that continuous monitoring, which can be provided by ground-based observatories, is required to understand the dynamic coupling processes;

urges the national authorities to support the installation and cooperative operation of high latitude observatories that include advanced digital ionosondes, optical instrumentation, incoherent and coherent scatter radars, and beacon satellite facilities.

U.22 Incoherent Scatter and MST Radars

The URSI Council,

considering

- (a) that IS (incoherent scatter) and MST (mesosphere-stratosphere-troposphere) radars are valuable tools for studying the atmosphere;
- (b) that due to the weak scattering processes used, the radars must transmit high powers on high gain antennas and detect small returns in a high noise environment;

noting that increasing spectrum congestion, resulting from the expansion and use of radio services, may cause harmful interference to the radars;

resolves

1. to bring this problem to the attention of the International Telecommunication Union (ITU) and its technical bodies, the International Frequency Registration Board (IFRB) and the International Radio Consultative Committee (CCIR) and, in particular, to the attention of the national telecommunications authorities, through URSI Member Committees;
2. to urge them to take reasonable measures to minimize interference problems at IS and MST radar sites;

expresses the hope that frequency allocations will continue and will be issued to these radars on an interference-free basis and that, if possible, interference protection zones will be established around these radar facilities.

U.23 Natural Noise from Lightning

The URSI Council,

recognizing that it is possible to have, in forthcoming meteorological satellites, payloads to characterize lightning activity;

resolves to reiterate and update recommendation E.19 (Tel Aviv, 1987) as follows

considering

- (a) that Commission E promotes scientific research in the field of electromagnetic environment, including natural noise from lightning;
- (b) that, as part of forthcoming meteorological satellites being planned by NASA, ESA and EUMETSAT, 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 in 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 study of whistlers and might even contribute to the geophysical aspects relating to the magnetosphere and to the Earth-ionosphere waveguide and its boundaries, and to the Earth's environmental research;
- (e) that several relationships have recently been discovered between lightning and atmospheric electricity, meteorological phenomena, Earth's environmental phenomena;
- (f) 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;
- (g) 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 to the organizations involved that the potentialities of the proposed lightning flash detector should be evaluated and given serious consideration for inclusion in a meteorological satellite.

U.24 Remote Sensing Laboratories

The URSI Council,

noting the financial problems encountered by remote sensing laboratories in small countries, and especially those in Eastern Europe;

resolves

1. that URSI should support, and promote actively, participation of these laboratories in international remote sensing experiments;
2. in particular, that URSI should ensure the distribution, through its regular publications, of information to workers in small countries concerning projects planned and ongoing in this area.

U.25 Protection of Frequency Bands Allocated to Space Research, Radio Astronomy and Earth Exploration

The URSI Council,

noting

- (a) the ever growing use and resulting congestion of the radio spectrum;
- (b) the increasing numbers of airborne and satellite services;
- (c) the increasing use of spread spectrum and broadband modulation techniques;
- (d) the increasing numbers of cases of harmful interference from services operating in adjacent bands and even from services assigned to bands far removed in frequency;
- (e) the improved state of filter and receiver technologies;

resolves to urge the Director of the International Radio Consultative Committee (CCIR)

1. to bring to the attention of member Administrations the urgent need to avoid harmful interference in the frequency bands allocated for space research, radio astronomy and Earth exploration, bearing in mind that passive observations in these services require noise detection at the highest sensitivity possible, and that any intended or spurious emission in the allocated bands is harmful, particularly from satellites or aircraft;
2. to initiate the steps necessary to establish appropriate technical standards towards that end.

U.26 Use of the Radio Spectrum

The URSI Council,

urges the International Radio Consultative Committee (CCIR) and the administrations adhering to it to recognize the importance of the scientific use of the radio spectrum, in particular by earth exploration and

monitoring the natural resources of the Earth and the fragile balance of the Earth's ecosystem, and also for exploring the Universe;

commends the International Radio Consultative Committee (CCIR) for its continuing work

- (i) to set in place the technical framework for efficient and economical use of the radio spectrum, and
- (ii) to ensure adequate protection for the passive services from harmful interference, particularly from airborne and space transmitters;

expresses the conviction that the CCIR framework will ensure the rational use, conservation and protection of the scarce radio-frequency spectrum.

U.27 Inter-Union Commission on Frequency Allocation to Radio Astronomy and Space Science

The URSI Council,

considering

- (a) the request by the International Council of Scientific Unions (ICSU) that the Inter-Union Commission on Frequency Allocation to Radio Astronomy and Space Science (IUCAF), of which URSI is the parent Union, extend its terms of reference so as to cover passive remote sensing, in addition to space research and radio astronomy;
- (b) the great importance of the work performed by IUCAF in seeking allocation of appropriate frequencies of interest to the scientific community and in striving to protect such frequencies against harmful interference;

resolves

- 1. to approve the modification referred to above to the terms of reference of IUCAF;
- 2. to continue its financial support of the activities of the Inter-Union Commission.

U.28 XXIV General Assembly

The URSI Council,

having considered the invitations for the XXIV General Assembly which had been submitted by the URSI Member Committees in China (Beijing), in India and in Japan;

resolves

- 1. to accept the invitation of the Japanese URSI Committee to hold the XXIV General Assembly in Kyoto from 25 August to 2 September 1993;
- 2. to record its thanks to the Member Committees in China (Beijing) and in India for their invitations.

U.29 UNESCO and ICSU Subventions

The URSI Council,
considering

- (a) that an important part of the activities of URSI consists in the organization of international scientific symposia and other meetings, in the issuing of publications, and in its Young Scientist Programme;
- (b) that the subventions from UNESCO and from ICSU are used to cover part of the cost of these activities;

resolves to convey to these organizations its warm thanks and appreciation for the valuable support thus provided.

U.30 Vote of Thanks to the Czechoslovak URSI Committee

The URSI Council,

resolves unanimously to record its warm appreciation of the invitation extended to it by the Czechoslovak URSI Committee to hold the XXIII General Assembly in Prague. The generous hospitality and the excellence of the facilities provided by the Local Organizing Committee for the scientific and administrative sessions, in particular the collection and publication in Prague of a large amount of abstracts, merit the highest praise. A special word of appreciation is offered to the Czechoslovak hosts for a most enjoyable and successful programme of social events and for their welcome to the persons accompanying the participants in the Assembly.

RESOLUTIONS AND RECOMMENDATIONS OF COMMISSIONS

COMMISSION A - ELECTROMAGNETIC METROLOGY

A.1. Accurate Time Comparison

Commission A,

considering,

- (a) that the best practical method of comparing the frequency of primary frequency standards maintained in various national laboratories is by means of satellites;
- (b) that the same is valid for the comparison of time scales;
- (c) that the International Atomic Time Scale (TAI) established by the Bureau International des Poids et Mesures (BIPM) is based mainly on these time comparisons made via satellites;
- (d) that the existing satellite navigation systems such as GPS and GLONASS can provide time comparisons at the level of accuracy needed in those applications;
- (e) that the same satellite systems find scientific uses in other fields such as geodesy and geoscience;

recommends that the authorities responsible for the maintenance of such navigation systems should avoid, as far as it is possible, any intentional degradation of the performance of such systems that would be detrimental to their general scientific use.

A.2. Laser Diodes and Laser Diode Pumped Solid State Lasers

Commission A,

considering,

- (a) the need of simple tunable lasers with narrow emission linewidth for metrological applications;
- (b) the low cost, long lifetime and small size of laser diodes or laser diode pumped solid state lasers;
- (c) the availability of single frequency lasers at only a few wavelengths;

expresses the opinion

1. that the development of such lasers should be continued with the aim of obtaining laser radiation in the widest possible range of the visible and near infrared spectrum;
2. that the research into improving the spectral purity of their emission should be continued.

3. that methods of reproducible continuous frequency tuning of such lasers should be investigated.

A.3. Traceability of ANA Measurements

Commission A,

considering,

- (a) that the use of automatic network analysers (ANA) for RF and microwave measurements is widespread, both in science and industry;
- (b) that there is a need to establish a widely recognized procedure for verifying the performance of these complex instruments, especially in connection with laboratory accreditation schemes;
- (c) that there is also a need for the development of transfer standards for use in calibrating ANAs;

expresses the opinion that research should be undertaken to develop suitable common techniques and transfer standards to enable the traceability of ANA measurements to national or international standards to be demonstrated.

A.4. SI Units

Commission A,

considering,

- (a) that the SI has progressed from a system of units represented largely by standards based on artifacts to a system, the units of which are now based mainly on physical constants;
- (b) that this evolution is very beneficial to the radio science community by providing world-wide uniformity in the realization of the electrical units;
- (c) that this progress has been made possible due to research activities on basic concepts underlying the practical realizations of often well accepted standards;

expresses the opinion that basic research work oriented to improving the present practical realization of the SI units be encouraged in metrological laboratories and that collaboration be encouraged between these laboratories in order to avoid unnecessary duplications and to improve, when possible, the efficiency of the work performed.

COMMISSION B - FIELDS AND WAVES

B.1. Symposium on Electromagnetic Theory

Commission B,

considering

- (a) that the URSI Symposia on Electromagnetic Theory have been held at intervals of three years for almost 40 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 Sydney, Australia, from 17 to 20 August 1992.

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 :

- 20th, 21st and 22nd European Microwave Conferences in 1990, 1991 and 1992;
- International Symposia on Antennas (JINA) in 1990 and 1992;
- 7th and 8th International Conferences on Antennas and Propagation (ICAP) in 1991 and 1993;
- 3rd and 4th Asia-Pacific Microwave Conferences (APMC) in 1990 and 1992;
- North American Radio Science Meeting and International IEEE/AP-S Symposium in 1991;
- International Symposium on Antennas and Propagation (ISAP) in 1992.

B.3. 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 great interest encountered by the joint session held at the present General Assembly;

recommends

1. that the Inter-Commission Working Group on Time-Domain Waveform Measurements (IWG-TDWM) be continued;
2. that T.K. Sarkar (USA) be appointed Chairman of the Working Group.

B.4. Timing of General Assemblies

Commission B,

recognizing that recent General Assemblies have commenced ever later in the month of August;

considering the fact that a General Assembly that stretches within the month of September is inconvenient for academics from Northern America and elsewhere, who must teach classes or administer examinations;

requests that every effort be made to bring forward the dates of the next General Assembly in Kyoto in 1993;

recommends that an ad hoc Committee be established by the Board of Officers to consider preferred times for future General Assemblies.

COMMISSION C - SIGNALS AND SYSTEMS

C.1. Future Conferences and Symposia

Commission C,

recommends

1. support for the following symposia for which information was supplied by the organizers :
 - 2nd URSI Symposium on Signals, Systems and Electronics (ISSSE'92), organized jointly by Commissions C and D;
 - 3rd International Symposium on Recent Advances in Microwave Technology (ISRAMT'91), under Mode A;
2. support for the following conferences, subject to the necessary information being supplied to the URSI Secretariat:
 - International Zurich Seminar on Digital Communication;
 - European Signal Processing Conference (EUSIPCO);
 - European Conference on Circuit Theory and Design (ECCTD);
 - Conference on Intelligence Networks;
 - Conference on Digital Signal Processing;
 - Colloquium on Microwaves (MICROCOLL).

C.2. Joint Symposia at the XXIV General Assembly

Commission C,

recommends that the following topics be selected for Joint Symposia at the next General Assembly:

- (i) Signal Processing Antennas, with Commission B;
- (ii) Broad-band Communication and Multipoint Propagation, with Commissions F and G.

COMMISSION D - ELECTRONIC AND OPTICAL DEVICES AND APPLICATIONS

D.1. Change of Title of the Commission

Commission D,

considering that the concern within URSI toward telecommunications is increasing, and that the area covered by Commission D is strongly related to telecommunications;

resolves

1. that its activities be enhanced beyond its traditional "Service Commission" character;
2. that the terms of reference be changed accordingly;
3. that the subject title of the Commission be changed from "Electronic and Optical Devices and Applications" to "Electronics and Photonics".

Note : the new terms of reference of Commission D are given in Council Resolution U.1.

D.2. Symposia at the 1993 General Assembly

Commission D,

considering the terms of its Resolution D.1;

resolves to change its basic policy in organizing the scientific sessions at the General Assembly from its traditional invited paper format to the one including contributed papers, the decision on whether to open all sessions, or only some of them, to be made in the course of the organizational process.

D.3. "Review of Radio Science"

Commission D,

considering

- (a) that the intended readership of the "Review of Radio Science" is not clearly defined;
- (b) that Commission D covers extremely wide areas of technical and scientific interest;
- (c) that, due to page limitations, it is not possible to write a comprehensive statement in the present form;
- (d) that there is no uniformity in the selection of the references to be cited;

resolves

1. that the text be written by invited experts, who should review selected topics of importance within the range of activities of Commission D;
2. that an expanded list of references based on the lists submitted by Official Members of the Commission and collected from the papers published in international refereed journals be compiled on a diskette dedicated to Commission D, with a format compatible with the standard PC and Macintosh computers.

D.4. Sponsorship of International Conferences

Commission D,

recommends sponsorship or co-sponsorship, as appropriate, of the following meetings :

- URSI International Symposium on Signals, Systems and Electronics (ISSSE'92), Paris, 1-4 September 1992, organized jointly by Commissions C and D;
- European Conferences on Optical Communication (ECOC), in 1991, 1992 and 1993;
- European Microwave Conferences in 1991, 1992 and 1993;
- International Conference on Solid State and Integrated Circuits (ICSSIC) in Beijing, China, October 1992;
- 4th Asia Pacific Microwave Conference (APMC) in 1992.

COMMISSION E - ELECTROMAGNETIC NOISE AND INTERFERENCE

E.1. Radio Noise

Commission E,

considering

- (a) that CCIR Report 322-3 represents a global model of atmospheric radio noise from lightning;
- (b) that interference from other-user signals on assigned HF frequencies can impose a greater limitation on communication system performance;
- (c) that there is currently no global model of this interference;

recommends that an international cooperative effort be encouraged to work toward the development of a global model of the probability of occurrence of HF other-user signal interference as a function of frequency (by allocated bands), bandwidth, time of day, season and sunspot number for omni-directional antennas and, to the extent possible, directional antennas.

E.2. Working Groups

Commission E,

resolves to establish the following Working Groups :

- E.1. Spectrum Management and Utilization
Chairman : R.D. Parlow (USA);
- E.2. Non-Gaussian Noise in Communication
Chairman : A.D. Spaulding (USA);
- E.3. High Power Electromagnetics
Chairman : R.L. Gardner (USA);
- E.4. Terrestrial and Planetary Electromagnetic Noise
Co-Chairmen : M. Hayakawa (Japan), and E.K. Smith (USA);
- E.5. Interaction with and Protection of Complex Electrical Systems
Co-Chairmen : C. Baum (USA), P. Degauque (France) and M. Ianoz (Switzerland);
- E.6. Effects of Transients on Equipment
Co-Chairman : V. Scuka (Sweden), and B. Demoulin (France);
- E.7. Extra-terrestrial and Terrestrial Meteoroelectric Environment with Noise and Chaos
Chairman : H. Kikuchi (Japan).

E.3. Co-sponsorship for Future Meetings

Commission E,

recommends co-sponsorship of the following symposia :

- Zurich Electromagnetic Compatibility Symposium in 1991;
- International COMMSPHERE Symposium, 23-25 April 1991, Israel;
- Beijing Electromagnetic Compatibility Symposium, May 1992 (subject to the necessary information being supplied by the organizers);
- Wroclaw Electromagnetic Compatibility Symposium, June 1992;
- Zurich Electromagnetic Compatibility Symposium in 1993.

COMMISSION F - RADIO PROPAGATION AND REMOTE SENSING

F.1. Sponsorship of International Conferences

Commission F,

recommends sponsorship or co-sponsorship, as appropriate, of the following conferences :

under Mode A

- International Meeting on Wave Propagation in Random Media, Seattle, USA, 1992 (URSI member : A. Ishimaru)
- Open Colloquium on Regional Factors in Predicting Radio Wave Attenuation due to Rain, Rio de Janeiro, December 1990 (URSI member : M.P.M. Hall);
- International Conferences on Antennas and Propagation (ICAP) in 1991 (York, U.K.) and 1993 (URSI member : M.P.M. Hall) ;
- Symposium on Electromagnetic Scattering from the Ocean Surface (URSI member : J. Apel);

under Mode B

- International COMMSPIRE Symposium, Herzlia, Israel, 1991 (URSI member : J. Shapira);
- URSI Open Symposium on Wave Propagation and Remote Sensing, Malaysia, 1992 (URSI member : P.A. Watson);
- Symposium on Microwave Signatures, Munich, Germany, June 1992 (URSI member : M. Chandra);
- International Geoscience and Remote Sensing Symposium (IGARSS) in 1991 (URSI member : I.V. Lindell), 1992 and 1993.

F.2. Coordination with IGARSS'93

Commission F,

considering the need for efficient and economic travel planning;

recommends that URSI coordinates planning of the 1993 General Assembly with the International Geoscience and Remote Sensing Symposium (IGARSS) in 1993, both to be held in Japan.

COMMISSION G - IONOSPHERIC RADIO AND PROPAGATION

G.1. Working Groups

Commission G,

resolves

1. to maintain the following Working Groups :

- G.1. Ionosonde Network Advisory Group (INAG)

- Chairman : P.J. Wilkinson (Australia)

- Secretary : R. Conkright (USA)

- G.2. Studies of the Ionosphere Using Beacon Satellites

- Chairman : R. Leitingner (Austria)

- Vice-Chairmen : J.A. Klobuchar (USA), T.R. Tyagi (India);

2. to maintain the former joint Working Group GH.1 on Incoherent Scatter, from which Commission H has withdrawn, as Working Group G.3 with J.M. Holt (USA) as Chairman and P.J.S. Williams (U.K.) as Vice-Chairman;
3. to merge Working Groups G.3 and G.4 into a new Working Group G.4 on Ionospheric Informatics, with B.W. Reinisch (USA) as Chairman, and D. Anderson (USA) as Vice-Chairman, and with the following terms of reference :

"To promote the application of information technology to the acquisition, processing, archiving and distribution of ionospheric data, and to assist in developing empirical and physical models of the ionosphere."

G.2. Joint Working Groups

Commission G,

resolves

1. to maintain the joint Working Group GH.2 on Computer Experiments, Simulation and Analysis of Wave Plasma Processes, with S. Ossakow (USA) as Commission G representative;
2. to form a new Joint Working Group GH.1 on Active Experiments in Plasmas, with Sa. Basu (USA) as Commission G representative;
3. to join the former Joint Working Group CH.1 on Wave Analysis under the new title CGH.1 on Wave and Turbulence Analysis.

G.3. URSI Contribution to FAGS

Commission G,

recommends to the Council that the annual contribution of URSI to the Federation of Astronomical and Geophysical Data Analysis Services (FAGS) of US\$2,000 be confirmed, and divided between the International Ursigram and World Days Service (IUWDS) and the Solar Index Data Centre (SIDC).

G.4. Commission G Representatives

Commission G,

resolves to appoint the following representatives :

- URSI Committee on the International Geosphere-Biosphere Programme (IGBP) : A.W. Wernik (Poland);
- Inter-Union Working Group on VLF/ELF Remote Sensing of the Ionosphere and Magnetosphere : A.J. Smith (U.K.);
- International Reference Ionosphere (joint URSI-COSPAR) : L. Bossy (Belgium).

G.5. Sponsorship of Symposia 1991-1993

Commission G,

recommends URSI sponsorship for the following Symposia during 1991-1993 in Mode B, subject to receipt of proper requests from the organizers :

- Artificial Modification of the Ionosphere, Suzdal, U.S.S.R., 1991;
- Symposium of the Beacon Satellite Working Group, Boston, U.S.A., 1992;
- International Meeting on the Middle Atmosphere Sciences, Kyoto, Japan, 23-26 March 1992;
- International Meeting on Wave Propagation in Random Media, Seattle, U.S.A., August 1992;
- Symposium on High Latitude Ionosphere, Fairbanks, U.S.A., 1992.

G.6. INAG Bulletin

Commission G,

recognizing the important role of the "INAG Bulletin" (Ionosonde Network Advisory Group) in maintaining the world network of ionospheric stations and the quality of the data acquired by the network;

recommends that URSI continue to support financially the publication of the Bulletin for the next three years;

expresses its thanks to WDC-A in Boulder for the generous support it provides for the production of this Bulletin.

G.7. Formatting of Ionospheric Characteristics Data

Commission G,

considering

- (a) the need for ionospheric characteristics;
- (b) the increasing availability of digital (computer readable) ionospheric data obtained from analog and automatically scaled digital ionograms;

recognizing that the Working Group G.4 on Ionospheric Informatics, in cooperation with the World Data Centres, developed a data format at the Lowell Workshop in July 1989, which was widely distributed and discussed;

resolves that ionospheric characteristics archived in the World Data Centres can be formatted in the IIWG flexible database structure, and that data which have not passed a quality control be marked as such.

G.8. OMEGA VLF Navigation System

Commission G,

considering that the ionosphere below 100 km can be effectively studied using VLF CW propagation;

noting that this may be done using the OMEGA VLF navigation system in cooperation with the International OMEGA Association and the Japanese Maritime Safety Agency;

recommends the continuation of the operation of the OMEGA VLF navigation system for the continuous monitoring of the lower ionosphere.

COMMISSION H - WAVES IN PLASMAS

H.1. Importance of Computer Experiments and Establishment of Supercomputer Centres for Plasma Radio Science

Commission H,

considering

- (a) that computer experiments are yielding new and exciting results on non-linear processes in waves in space plasmas;
- (b) that these experiments demand large amount of computing time and memory on supercomputers;
- (c) that the demands of supercomputing are rapidly increasing in radio science;

recommends that the attention of national administrations be drawn to the importance of new computational techniques in space plasma radio science and to the desirability of establishing supercomputer centres dedicated to space plasma radio science in different parts of the world.

H.2. Sponsorship of Symposia and Meetings

Commission H,

recommends the co-sponsorship by URSI of the following meetings :

- Artificial Modification of the Ionosphere, Suzdal, U.S.S.R., 1991;
- 4th International School for Space Simulation, Nara, Japan, 1991 (Mode B);
- XXth International Conference on Phenomena in Ionized Gases (ICPIG), Barga, Italy, 1991 (Mode B);
- Workshop on Turbulence in Space Plasmas, Aussois, France, 1993 (Mode B);
- XXIst International Conference on Phenomena in Ionized Gases (ICPIG), Dresden, Germany, 1993 (Mode B).

H.3. Working Groups

Commission H,

having considered the reports submitted by its various Working Groups;

resolves

1. to continue the Inter-Union (URSI/IAGA) Working Group 1 on Passive Electromagnetic Probing of the Magnetosphere, under the new name "VLF/ELF Remote Sensing of the Ionosphere and Magnetosphere (VERSIM)", with U. Inan (U.S.A.) as Co-Chairman for Commission H;
2. to dissolve the Inter-Union (URSI/IAGA) Working Group 2 on Wave Instabilities in Plasmas;
3. to continue the Joint Working Group CH.1 on Wave Analysis as a joint C, G and H Working Group under the new name "Wave and Turbulence Analysis", with F. Lefeuvre (France) as Co-Chairperson for Commission H;
4. to withdraw participation in the Joint Working Group on Incoherent Scatter (former GH.1);
5. to continue the Joint Working Group GH.2 on Computer Experiments, Simulation and Analysis of Wave Plasma Processes, with only one Commission H Co-Chairman : H. Matsumoto (Japan);
6. to establish a new Joint Working Group GH.1 on Active Experiments in Plasmas, with P. Bernhardt (USA) as Co-Chairman for Commission H;
7. to withdraw from the Inter-Commission Working Group on Time-Domain Waveform Measurements.

COMMISSION J - RADIO ASTRONOMY

J.1. Working Group on Global VLBI

Commission J,

considering

- (a) the importance of high resolution astronomical imaging by the use of VLBI;
- (b) the consequent need for simultaneous observations in different parts of the world, using telescopes belonging to different VLBI networks;

recognizing the imminence of orbiting (space) VLBI;

resolves

1. that a Working Group for Global VLBI be established, with the following objectives:
 - (i) to set up mechanisms to coordinate global VLBI (i.e. multi-network VLBI);
 - (ii) to promote compatibility of technology;
 - (iii) to serve as an interface to other organizations for policy issues (peer review, core programme, etc.);
2. that the Chairman of the Working Group be designated by Commission J;
3. that the membership should consist of representatives of the various VLBI networks, to be agreed between the Chairman and the Directors of the ground-based networks and to be reviewed at the XXIV General Assembly in Kyoto, Japan, in 1993.

Note : Commission J appointed Roy Booth (Sweden) as inaugural Chairman of the Working Group.

J.2. Proposals for Joint Symposia at the 1993 General Assembly

Commission J,

recommends the following subjects for Joint Symposia at the General Assembly in Kyoto, Japan, 1993 :

- Imaging through Adaptive Spatial Signal Processing, with Commission B, conveners : B. Steinberg (U.S.A.) for Commission B and T. Cornwell (U.S.A.) for Commission J;
- Radio Interference to Passive Services, with Commission F, conveners : T. Gergely (U.S.A.) for Commission J and A. Gasiewski (U.S.A.) for Commission F.

J.3. Sponsorship of Symposia during 1991-1993

Commission J,

recommends URSI sponsorship or co-sponsorship, as appropriate, for the following symposia :

- Astronomy with Millimetre and Submillimetre Wave Interferometry, Japan, 1992;
- Wave Propagation in Random Media, Seattle, U.S.A., August 1992;
- High Resolution Imaging, Australia, July 1992;
- Space VLBI, Japan, adjacent to URSI General Assembly, August/September 1993.

J.4. "Declaration of Principles concerning Activities following the Detection of Extraterrestrial Intelligence"

Commission J,

considering the great importance for humankind of the possible detection of signals from extraterrestrial civilizations;

recognizing

- (a) the general interest in the science and technology inherent in searches for signals from extraterrestrial civilizations;
- (b) the major role to be played by some radiotelescopes around the world in these searches during the coming decades;

is sympathetic to the intent of the document entitled "Declaration of Principles concerning Activities following the Detection of Extraterrestrial Intelligence", which is reproduced in Annex.

ANNEX

"We, the institutions and individuals participating in the search for extraterrestrial intelligence,

Recognizing that the search for extraterrestrial intelligence is an integral part of space exploration and is being undertaken for peaceful purposes and for the common interest of all mankind,

Inspired by the profound significance for mankind of detecting evidence of extraterrestrial intelligence, even though the probability of detection may be low,

Recalling the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, which commits States Parties to that Treaty "to inform the Secretary General of the United Nations as well as the public and the international scientific community, to the greatest feasible and practicable, of the nature, conduct, locations and results" of their space exploration activities (Article XI),

Recognizing that any initial detection may be incomplete or ambiguous and thus require careful examination as well as confirmation, and that it is essential to maintain the highest standards of scientific responsibility and credibility,

Agree to observe the following principles for disseminating information about the detection of extraterrestrial intelligence :

1. Any individual, public or private research institution, or governmental agency that believes it has detected a signal from or other evidence of extraterrestrial intelligence (the discoverer) should seek to verify that the most plausible explanation for the evidence is the existence of extraterrestrial intelligence rather than some other natural phenomenon or anthropogenic phenomenon before making any public announcement. If the evidence cannot be confirmed as indicating the existence of extraterrestrial intelligence, the discoverer may disseminate the information as appropriate to the discovery of any unknown phenomenon.
2. Prior to making a public announcement that evidence of extraterrestrial intelligence has been detected, the discoverer should promptly inform all other observers or research organizations that are parties to this declaration, so that those other parties may seek to confirm the discovery by independent observations at other sites and so that a network can be established to enable continuous monitoring of the signal or phenomenon. Parties to this declaration should not make any public announcement of this information until it is determined whether this information is or is not credible evidence of the existence of extraterrestrial intelligence. The discoverer should inform his/her or its relevant national authorities.
3. After concluding that the discovery appears to be credible evidence of extraterrestrial intelligence, and after informing other parties to this declaration, the discoverer should inform observers throughout the world through the Central Bureau for Astronomical Telegrams of the International Astronomical Union, and should inform the Secretary General of the United Nations in accordance with Article XI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies. Because of their demonstrated interest in and expertise concerning the question of the existence of extraterrestrial intelligence, the discoverer should simultaneously inform the following international institutions of the discovery and should provide them with all pertinent data and recorded information concerning the evidence : the International Telecommunication Union, the Committee on Space Research of the International Council of Scientific Unions, the International Astronautical Federation, the International Academy of Astronautics, the International Institute of Space Law, Commission 51 of the International Astronomical Union and Commission J of the International Radio Science Union.
4. A confirmed detection of extraterrestrial intelligence should be disseminated promptly, openly, and widely through scientific channels and public media, observing the procedures in this declaration. The discoverer should have the privilege of making the first public announcement.
5. All data necessary for confirmation of detection should be made available to the international scientific community through publications, meetings, conferences, and other appropriate means.
6. The discovery should be confirmed and monitored and any data bearing on the evidence of extraterrestrial intelligence should be recorded and stored permanently to the greatest extent feasible and practicable, in a form that will make it available for further analysis and interpretation. These recordings should be made available to the international institutions listed above and to members of the scientific community for further objective analysis and interpretation.
7. If the evidence of detection is in the form of electromagnetic signals, the parties to this declaration should seek international agreement to protect the appropriate frequencies by exercising the extraordinary procedures established within the World Administrative Radio Council of the International Telecommunication Union.

8. No response to a signal or other evidence of extraterrestrial intelligence should be sent until appropriate international consultations have taken place. The procedures for such consultations will be the subject of a separate agreement, declaration or arrangement.
9. The SETI Committee of the International Academy of Astronautics, in coordination with Commission 51 of the International Astronomical Union, will conduct a continuing review of procedures for the detection of extraterrestrial intelligence and the subsequent handling of the data. Should credible evidence of extraterrestrial intelligence be discovered, an international committee of scientists and other experts should be established to serve as a focal point for continuing analysis of all observational evidence collected in the aftermath of the discovery, and also to provide advice on the release of information to the public. This committee should be constituted from representatives of each of the international institutions listed above and such other members as the committee may deem necessary. To facilitate the convocation of such as committee at some unknown time in the future, the SETI Committee of the International Academy of Astronautics should initiate and maintain a current list of willing representatives from each of the international institutions listed above, as well as other individuals with relevant skills, and should make that list continuously available through the Secretariat of the International Academy of Astronautics. The International Academy of Astronautics will act as the Depository for this declaration and will annually provide a current list of parties to all the parties to this declaration."

RESOLUTIONS ET RECOMMANDATIONS DU CONSEIL

U.1 Les Commissions scientifiques de l'URSI

Le Conseil de l'URSI,

notant

- (a) qu'aux termes de la Résolution C.1 (Lima, 1975), les Commissions sont tenues de réexaminer leurs sujets d'étude à l'occasion de chaque Assemblée générale;
- (b) qu'en outre, elles ont été invitées au cours de la présente Assemblée générale à apporter plus d'uniformité dans la rédaction de leurs mandats;
- (c) que les Commissions A, E et F n'estiment pas nécessaire de modifier leurs mandats tels qu'ils figurent à l'annexe à la Résolution U.1 (Tel Aviv, 1987);

confirme ou approuve, selon le cas, les titres et mandats des Commissions reproduits en annexe.

Annexe

1. Commission A - METROLOGIE ELECTROMAGNETIQUE, Mesures et étalons électromagnétiques.

La Commission tend à promouvoir les recherches et les développements dans les domaines suivants:

- (a) mesures et étalons de temps et de fréquence, y compris les infrarouges et le domaine optique;
- (b) mesures dans le domaine temporel;
- (c) mesures dans le domaine des fréquences;
- (d) mesures dans les télécommunications;
- (e) mesures au moyen du 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.

2. Commission B - ONDES ET CHAMPS. Théorie électromagnétique et applications, y compris les antennes et les guides d'ondes.

L'intérêt de la Commission B porte sur *les champs et les ondes*, et englobe la théorie, l'analyse, le calcul, les expériences, et leur confirmation, l'accent étant mis sur les sujets suivants:

- (a) phénomènes dans le domaine temporel;
- (b) diffusion et diffraction;
- (c) propagation et guidage des ondes;
- (d) rayonnement et antennes;
- (e) inversion de la diffusion.

La Commission encourage les études ayant pour but de créer, de développer et d'affiner les méthodes numériques et analytiques en vue d'une meilleure

compréhension de ces phénomènes. Elle préconise l'esprit d'innovation et s'efforce d'appliquer des concepts et méthodes pluridisciplinaires.

3. Commission C - SIGNAUX ET SYSTEMES.

La Commission tend à promouvoir les recherches et les développements dans les domaines suivants:

- (a) systèmes de télécommunications;
- (b) utilisation du spectre et des milieux de transmission;
- (c) modulation et codage;
- (d) traitement du signal et de l'image;
- (e) théorie et conception des circuits;
- (f) théorie de l'information.

La conception de systèmes de télécommunications efficaces requiert un équilibre entre les considérations liées à l'ingénierie scientifique et les facteurs économiques. La Commission met l'accent sur la recherche scientifique et fournit l'expérience nécessaire à la conception des systèmes dans d'autres domaines de la radioélectricité scientifique.

4. Commission D - ELECTRONIQUE ET PHOTONIQUE.

La Commission tend à promouvoir les recherches et à faire le point des nouveaux développements dans les domaines suivants:

- (a) dispositifs électroniques et applications;
- (b) dispositifs photoniques et applications;
- (c) physique, matériaux, CAO, technologie et fiabilité des dispositifs électroniques et photoniques

présentant un intérêt particulier pour la radioelectricité scientifique et les télécommunications.

La Commission étudie les dispositifs pour la production, la détection, le stockage et le traitement des signaux électromagnétiques, ainsi que leurs applications à toutes les fréquences, y compris les hyperfréquences et le domaine optique.

5. Commission E - BRUITS ET BROUILLAGES ELECTROMAGNETIQUES.

La Commission tend à promouvoir les recherches et les développements dans les domaines suivants:

- (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 titre commun de compatibilité électromagnétique.

6. Commission F - PROPAGATION DES ONDES ET TELEDETECTION

(y compris la radiométéorologie, la radio-océanographie et la télédétection des milieux non ionisés).

La Commission tend à encourager :

- (a) l'étude de tous les aspects de la propagation des ondes à toutes les fréquences dans un milieu non-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;
- (b) l'application des résultats de ces études, en particulier dans les domaines de la télédétection et des communications;
- (c) le développement d'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).

La Commission s'occupe de l'étude de l'ionosphère ayant pour but la compréhension générale de ce milieu nécessaire aux radiocommunications. Elle s'intéresse plus spécifiquement aux sujets suivants :

- (a) morphologie globale et modélisation de l'ionosphère;
- (b) variations spatio-temporelles de l'ionosphère;
- (c) développement des outils et réseaux nécessaires à la mesure des caractéristiques de l'ionosphère;
- (d) théorie de la propagation radioélectrique par l'intermédiaire de l'ionosphère, et applications;
- (e) application aux radiocommunications de la connaissance de l'ionosphère.

Pour atteindre ces objectifs, la Commission collabore avec d'autres Commissions de l'URSI, les organismes concernés du CIUS (UGGI, UAI, COSPAR, SCOSTEP, etc.) ainsi qu'avec d'autres organisations internationales (CCIR, etc.)*

8. Commission H - ONDES DANS LES PLASMAS (y compris les plasmas spatiaux et de laboratoire).

La Commission a pour buts:

- (a) d'étudier les ondes dans les plasmas au sens le plus large et, en particulier, les sujets suivants:
 - (i) la génération (instabilités dans les plasmas) et la propagation des ondes dans les plasmas,
 - (ii) les interactions onde-onde et les interactions onde-particule,

* CIUS : Conseil International des Unions Scientifiques

UGGI : Union Géodésique et Géophysique Internationale

UAI : Union Astronomique Internationale

COSPAR : Comité de Recherche Spatiale

SCOSTEP : Comité Scientifique de Physique Solaire-Terrestre

- (iii) les processus de turbulence dans les plasmas et le chaos,
- (iv) les interactions entre les plasmas et les engins spatiaux;
- (b) d'encourager l'application des résultats de ces études, en particulier dans les domaines suivants : interactions entre plasmas solaires et planétaires et utilisation accrue de l'espace comme un laboratoire de recherche.

9. Commission J - RADIOASTRONOMIE (y compris la télédétection des objets célestes).

- (a) Les activités de la Commission concernent l'observation et l'interprétation de toutes les émissions et réflexions radioélectriques en provenance d'objets célestes.
- (b) L'accent est mis sur :
 - (i) la promotion de moyens techniques pour les observations et l'analyse des données radioastronomiques,
 - (ii) l'appui des démarches ayant pour but d'obtenir la protection des observations radioastronomiques contre les brouillages nuisibles.

U.2 Nouvelle Commission sur l'électromagnétisme en biologie et en médecine

Le Conseil de l'URSI,

considérant

- (a) que, vu l'intérêt croissant et la multiplication des activités dans le domaine du bio-électromagnétisme et son caractère pluridisciplinaire, un forum réellement international s'avère nécessaire pour les échanges entre biologistes, médecins, physiciens et ingénieurs;
- (b) que la communauté des spécialistes intéressés a d'ores et déjà reconnu le rôle que l'URSI jouait pour établir ce forum international, et que le temps est venu pour l'Union d'étendre son action dans ce domaine;
- (c) que le Groupe de travail de la Commission A "Interactions entre champs électromagnétiques et systèmes biologiques, et mesures correspondantes " avait été créé à l'origine pour étudier les aspects métrologiques du bio-électromagnétisme, mais que le champ d'activité du Groupe s'est élargi au fil des années;
- (d) que plusieurs Commissions de l'URSI sont susceptibles de contribuer au développement du bio-électromagnétisme par leur expérience des différents aspects des problèmes physiques, mathématiques et d'ingénierie;

décide

1. de créer une nouvelle Commission K, ayant pour titre provisoire "Electromagnétisme en biologie et en médecine", dont le mandat précis reste à définir, mais comportera l'étude des interactions entre le rayonnement électromagnétique et les systèmes vivants dans tout le spectre des fréquences, ainsi que les applications en médecine;
2. de désigner J. Bach Andersen (Danemark) et M. Stuchly (Canada) respectivement comme président intérimaire et comme vice-président intérimaire.

U.3 Comité scientifique des télécommunications

Le Conseil de l'URSI,

considérant

- (a) que le Comité de liaison URSI/CCIR/CCITT a exprimé l'opinion que son rôle et son statut devraient être réexaminés;
- (b) que, dans le passé, l'essentiel des activités du Comité a porté sur la collaboration avec le Comité Consultatif International des Radiocommunications (CCIR), l'un des Comités techniques de l'Union Internationale des Télécommunications (UIT);
- (c) que, de manière générale, l'URSI devrait contribuer au développement de la science des télécommunications, sans se limiter à la seule étude de sujets intéressant directement les Comités techniques de l'UIT;
- (d) que, de par sa structure, le Comité de liaison URSI/CCIR/CCITT dépendait de manière excessive de la bonne volonté de scientifiques individuels associés à l'URSI, et que son mandat n'était pas suffisamment bien défini;
- (e) qu'un Comité scientifique, nanti d'un mandat précis mais pas trop restrictif, serait plus efficace;

décide

1. de créer un Comité scientifique des télécommunications ayant pour mandat le texte suivant :

"Le Comité scientifique des télécommunications a pour objectif de faciliter la collaboration entre les Commissions de l'URSI, mais aussi la collaboration entre ces dernières et les Commissions d'études du CCIR et du Comité Consultatif International de Télégraphie et de Téléphonie (CCITT), pour l'étude des aspects scientifiques des problèmes de télécommunication.

Le Comité comprend, entre autres, les Présidents des Commissions de l'URSI concernées, ou bien leurs délégués, et des représentants désignés par le CCIR et le CCITT.

Il aura pour mission :

- (a) d'identifier les facteurs susceptibles d'influencer l'évolution à long terme des télécommunications;
- (b) de tenir les scientifiques associés à l'URSI au courant des problèmes spécifiques posés par l'évolution des télécommunications,
- (c) de porter à la connaissance du CCIR et du CCITT les résultats de la recherche fondamentale ayant de l'importance pour les télécommunications;
- (d) d'aider le CCIR et le CCITT à formuler avec précision les questions adressées à la communauté scientifique, et plus spécialement à l'URSI;
- (e) en stimulant les études et l'organisation de colloques, de préparer les réponses de l'URSI à ces questions sous forme appropriée".

2. de désigner L. Barclay (Royaume-Uni) et P. Delogne (Belgique) respectivement comme Président et Vice-Président du nouveau Comité.

U.4 Statuts de l'URSI

Le Conseil de l'URSI,

ayant examiné le projet de revision des Statuts de l'Union;

décide d'approuver ce projet, sous réserve de légères modifications à la rédaction des Articles 1 et 13.

U.5 Présidents d'honneur

Le Conseil de l'URSI,

considérant qu'il a pouvoir de conférer le titre de Président d'honneur à d'anciens membres du Bureau qui ont apporté une contribution particulièrement remarquable à la réalisation des buts de l'Union;

décide de conférer le titre de Président d'honneur

au Professeur W.E. Gordon, et

au Professeur F.L.H.M. Stumpers

en reconnaissance des éminents services qu'ils ont rendus et ne cessent de rendre à l'Union.

U.6 Admission de nouveaux Comités Membres

Le Conseil de l'URSI,

ayant examiné des demandes d'admission présentées par les institutions scientifiques suivantes :

- (a) King Abdulaziz City for Science and Technology, Arabie Saoudite, comme Membre de l'Union;
- (b) le Conseil de la Recherche scientifique de la Jamaïque, le Conseil national de Science et de Technologie de Grenada, et le Conseil de la Recherche scientifique et technique de Turquie, comme Membres associés;

décide d'accepter ces demandes sous réserve que ces institutions satisfassent aux conditions prévues par les Statuts de l'URSI.

U.7 Réseau de Correspondants

Le Conseil de l'URSI,

ayant pris connaissance des recommandations formulées par le Comité permanent pour l'adhésion à l'URSI;

décide de créer comme suit un Réseau de Correspondants de l'URSI :

- (i) tout scientifique participant à une Assemblée générale de l'Union pourra s'inscrire comme correspondant pour une période de trois ans moyennant paiement d'une somme spéciale lors de son inscription à l'Assemblée;
- (ii) les scientifiques qui n'ont pas la possibilité d'assister à une Assemblée générale pourront adhérer au réseau de correspondants en s'adressant directement au Secrétariat de l'URSI pour verser la somme spéciale mentionnée en (i);
- (iii) les scientifiques de pays en développement pourront être inclus gratuitement au réseau de correspondants selon un mécanisme à définir;
- (iv) les correspondants faisant partie du réseau seront tenus au courant des activités de l'Union;
- (v) ils n'auront pas droit de vote, mais seront autorisés à émettre leur avis sur les questions de caractère scientifique au sein des Commissions.

U.8 Finances de l'Union et composition du Comité permanent des finances

Le Conseil de l'URSI,

ayant pris connaissance des recommandations formulées dans le rapport du Comité permanent des finances, en date du 4 septembre 1990;

décide

- 1. d'accepter les recommandations précitées;
- 2. d'approuver les comptes certifiés de l'Union pour les exercices prenant fin au 31 décembre 1987, 1988 et 1989;
- 3. de publier les rapports du Trésorier et du Comité des finances dans le Volume XXII des *Comptes Rendus des Assemblées générales de l'URSI* ;
- 4. d'exprimer au Dr. H.J. Albrecht sa gratitude pour les éminents services qu'il a rendus à l'Union en sa qualité de Trésorier;
- 5. de désigner les personnalités suivantes comme membres du Comité permanent des finances pour les trois années à venir :

Président : K. Géher (Hongrie)

Membres : C. Butler (EUA)
F. Gardiol (Suisse)
J.G. Lucas (Australie)
S. Radicella (Argentine)
F.W. Sluijter (Pays-Bas)
S.S. Swords (Irlande).

U.9 Publications de l'URSI et composition du Comité permanent des publications

Le Conseil de l'URSI,

estimant que la mise en oeuvre des recommandations formulées dans le rapport du Comité permanent des publications, en date du 4 septembre 1990, contribuera à augmenter le rayonnement de l'URSI en diffusant largement des informations sur ses activités;

décide

1. d'approuver les recommandations susmentionnées;
2. de publier le rapport du Comité permanent des publications dans le Volume XXII des *Comptes Rendus des Assemblées générales de l'URSI* ;
3. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir :

Président : P.J.B. Clarricoats (Royaume-Uni)

Membres : S.A. Bowhill (EUA)
P. Delogne (Belgique)
R.L. Dowden (Nouvelle Zélande)
K. Géher (Hongrie)
G. Hyde (EUA)
R. Stone (EUA)

U.10 Comité permanent pour l'adhésion à l'URSI

Le Conseil de l'URSI,

considérant que le Comité permanent pour l'adhésion à l'URSI a joué un rôle important au cours des trois années écoulées dans la conduite des consultations sur la possibilité d'introduire de nouvelles catégories de membres ;

décide

1. d'étendre le mandat de ce Comité (Rés.C.8, Lima 1975) comme suit :
 - (i) proposer des moyens propres à porter les activités de l'URSI à l'attention des scientifiques radioélectriciens dans les territoires où il n'y a pas de Comité Membre de l'URSI;
 - (ii) étudier toutes les questions relatives aux catégories de membres de l'URSI et faire rapport au Conseil;
 - (iii) examiner, à l'occasion de chaque Assemblée générale, le statut des Comités Membres associés et présenter à ce sujet ses recommandations au Conseil;
2. d'exprimer sa gratitude au Dr. M. Petit, Président du Comité, pour le travail qu'il a effectué au cours des trois années écoulées et, en particulier, pour ses comptes rendus détaillés des consultations citées;

3. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir :

Président : T.B.A. Senior (EUA)

Membres : S. Okamura (Japon)
M. Petit (France)
J. Shapira (Israël)
V. Shevchenko (URSS)
Yu-Kai Chen (Chine, SRS).

U.11 Comité permanent pour les pays en développement

Le Conseil de l'URSI,

ayant pris connaissance

- (a) du rapport d'activités 1988-1990 du Comité permanent pour les pays en développement;
- (b) des propositions faites par ce Comité concernant ses futures activités;

considérant que l'URSI doit poursuivre ses efforts en faveur du développement de la science des télécommunications et de la formation des scientifiques radioélectriciens dans les pays en développement;

décide

1. d'approuver le plan d'action présenté par le Comité pour la période 1991-1993, lequel prévoit la publication d'un *Manuel de l'URSI sur la propagation terre-espace dans les régions tropicales*, ainsi que l'organisation de deux cycles d'études sur la propagation radioélectrique, en collaboration avec le Centre International de Physique Théorique (CIPT);
2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir :

Président : S. Radicella (Argentine)

Membres : G.O. Ajayi (Nigeria)
M.S. Assis (Brésil)
Feng Shizhang (Chine, CIE)
J.O. Oyinloye (Nigeria)
B. Reddy (Inde)
J. Voge (France).

U.12 Comité permanent pour les Assemblées générales de l'URSI

Le Conseil de l'URSI,

considérant

- (a) que le nombre de participants aux Assemblées générales de l'Union n'a cessé de s'accroître au fil des années;

- (b) que, pour organiser une Assemblée générale, le Comité d'organisation doit engager des efforts très considérables et assurer tous les moyens logistiques appropriés;
- (c) qu'il est essentiel d'informer les Comités Membres de toutes les conditions requises pour l'organisation d'une réunion de cette envergure;

décide

1. de demander aux membres du Comité, lorsqu'ils sollicitent des invitations pour l'organisation d'une Assemblée générale, de garder les points susmentionnés à l'esprit;
2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir :

Président : T. Okoshi (Japon)

Membres : J.W. Klein (Allemagne)
I.A. Salem (Egypte)
A.M. Scheggi (Italie)
E.M. Zhabotinskij (URSS)
V. Zima (Tchécoslovaquie).

U.13 Programme International Géosphère-Biosphère et Programme Mondial de Recherche sur le Climat

Le Conseil de l'URSI,

considérant

- (a) que l'Union a un rôle à jouer dans le programme de coopération inter-disciplines lancé par le Conseil International des Unions Scientifiques (CIUS) sous le titre "Programme International Géosphère-Biosphère : Etude globale de leur Evolution" (IGBP);
- (b) qu'il serait souhaitable que l'URSI s'associe au Programme Mondial de Recherche sur le Climat (WRPC), organisé conjointement par le CIUS et l'Organisation Météorologique Mondiale (OMM) et lancé dès 1980;
- (c) que l'URSI est susceptible d'apporter d'importantes contributions à ces deux programmes étant donné, plus spécialement, son expérience des méthodes radioélectriques de télédétection et du traitement des données;

décide

1. d'élargir le mandat du Comité de l'URSI pour le Programme International Géosphère-Biosphère de manière à inclure aussi le Programme Mondial de Recherche sur le Climat;
2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir :

Président : G. Brussaard (Pays-Bas)

Membres : W.E. Gordon (EUA)
A. Guissard (Belgique)
I. Gower (Canada)

H. Hallikainen (Finlande)
N. Matuura (Japon)
M. Petit (France)
S. Radicella (Argentine)
H. Rishbeth (Royaume-Uni)
K. Serafimov (Bulgarie)
P.A. Watson (Royaume-Uni)
A. Wernik (Pologne).

U.14 Année Internationale de l'Espace

Le Conseil de l'URSI,

ayant pris connaissance du rapport dans lequel le Prof. W.E. Gordon, Président du Groupe ad hoc pour l'Année Internationale de l'Espace, donne un aperçu général des préparatifs en vue de l'AIE en 1992;

notant que, dans la conclusion de ce rapport, il est dit qu'il ne semble pas y avoir de rôle scientifique à jouer par les Unions dans ce programme;

décide de dissoudre le Groupe ad hoc pour l'Année Internationale de l'Espace.

U.15 Groupe ad hoc sur les conséquences d'une guerre nucléaire pour l'environnement

Le Conseil de l'URSI,

notant que les conclusions scientifiques du projet SCOPE-ENUWAR, pour lequel le Groupe ad hoc de l'URSI a préparé une "Déclaration de fait sur l'impulsion électromagnétique nucléaire et ses retombées", ont influencé les discussions des nations possédant des armes nucléaires, et ont été portées à l'attention de l'Organisation des Nations Unies;

considérant que ce Groupe pourrait encore être appelé à jouer un certain rôle dans l'avenir;

décide de maintenir le Groupe ad hoc sur les conséquences d'une guerre nucléaire pour l'environnement, composé des membres suivants :

Président : M. Wik (Suède)

Membres : W. Graf (EUA)
D. Hansen (Suisse)
J. Shiloh (Israël).

U.16 Comité permanent pour les jeunes scientifiques

Le Conseil de l'URSI,

considérant

- (a) que la participation de jeunes scientifiques aux Assemblées générales et aux colloques de l'Union et que les échanges entre jeunes scientifiques et scientifiques plus âgés revêtent une importance essentielle pour la vie de l'Union;
- (b) qu'un des moyens de contribuer au progrès de la radio-électricité scientifique dans les pays en développement consiste à faire participer les jeunes scientifiques de ces pays aux réunions de l'URSI;
- (c) que, depuis 1969, le Programme des jeunes scientifiques s'est avéré être l'une des entreprises les plus fructueuses de l'Union;

décide

- 1. de créer un Comité permanent pour les jeunes scientifiques;
- 2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir:

Président : E.V. Jull (Canada)

Membres : Feng Shizhang (Chine, CIE)

D. Gjessing (Norvège)

A.P. Mitra (Inde)

T. Okoshi (Japon)

G. Pillet (France)

R. Sagalyn (EUA)

T. Simtrakarn (Thaïlande)

L. Zombory (Hongrie).

U.17 Comité de réflexion sur l'avenir de l'URSI

Le Conseil de l'URSI,

reconnaisant

- (a) qu'il est souhaitable de donner suite aux conclusions et suggestions formulées par la Conférence de Corsendonk de mars 1987;
- (b) qu'il est nécessaire d'établir des plans à long terme et de procéder à un examen approfondi de la structure et de l'organisation de l'URSI, afin de les adapter à des conditions en évolution, pour mieux servir les intérêts de la communauté radio-scientifique;

décide

- 1. de créer un Comité de réflexion sur l'avenir de l'URSI;
- 2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir :

Président : E.V. Jull (Canada)

Secrétaire : P. Lagasse (Belgique)

Membres : P. Bauer (France)

A.L. Cullen (Royaume-Uni)

W.E. Gordon (EUA)

M.C. Jones (Australie)

K. Serafimov (Bulgarie)
J. Shapira (Israël)

U.18 Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel,

Le Conseil de l'URSI,

ayant pris connaissance des recommandations formulées dans le rapport du Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel;

notant que le Dr. N.S. Nahman a exprimé le désir de cesser ses activités en tant que Président du Groupe de travail;

décide

1. de maintenir le Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel pendant la période 1990-1993;
2. d'exprimer au Dr. Nahman sa gratitude pour la façon dont il a dirigé les activités du Groupe depuis 1981;
3. de désigner T.K. Sarkar (EUA) comme Président du Groupe de travail.

U.19 Station de recherche sur la haute atmosphère

Le Conseil de l'URSI,

notant l'extrême importance qu'une station ionosphérique située à proximité du bord oriental de l'anomalie de l'Atlantique Sud revêtirait pour les programmes de l'URSI et du CCIR;

recommande qu'une station de recherche sur la haute atmosphère soit établie dans cette région.

U.20 Centre de données pour les indices de l'activité solaire

Le Conseil de l'URSI,

considérant

- (a) qu'il importe de poursuivre l'acquisition des séries de données à long terme, en particulier du fait de l'intérêt accru qui est actuellement porté au Programme International Géosphère-Biosphère;
- (b) que le Centre de données pour les indices de l'activité solaire (SIDC), situé à l'Observatoire Royal de Belgique à Bruxelles, maintient une activité continue et très efficace;

décide d'accorder le patronage de l'URSI au Centre de données pour les indices de l'activité solaire, lequel est affilié à la Fédération des Services permanents d'analyse de données astronomiques et géophysiques (FAGS).

U.21 Observatoires de haute latitude

Le Conseil de l'URSI,

considérant le caractère complexe de l'ionosphère de haute latitude, son couplage étroit avec la magnétosphère, l'influence prépondérante qu'ont sur elle les champs magnétiques interplanétaires et le vent solaire;

notant que la surveillance continue que peuvent assurer les observatoires au sol est nécessaire à la compréhension des processus dynamiques de couplage;

invite instamment les autorités nationales à fournir leur soutien à l'installation et à coopérer au fonctionnement d'observatoires de haute latitude comprenant des ionosondes numériques modernes, des instruments optiques, des radars à diffusion cohérente et à diffusion incohérente et des équipements permettant la réception des signaux de satellites à balise.

U.22 Radars à diffusion incohérente et radars MST

Le Conseil de l'URSI,

considérant

- (a) que les radars à diffusion incohérente et les radars MST (mésosphère-stratosphère-troposphère) constituent de précieux outils pour l'étude de l'atmosphère;
- (b) qu'étant donné les faibles processus de diffusion mis en jeu, ces radars doivent émettre de fortes puissances sur des antennes à gain élevé et détecter de faibles signaux de retour dans un environnement à niveau de bruit élevé;

notant que des brouillages nuisibles à ces radars peuvent être provoqués par la congestion croissante du spectre, laquelle résulte de l'expansion et de l'utilisation des services radio;

décide

1. de porter ce problème à l'attention de l'Union Internationale des Télécommunications (UIT) et de ses organes techniques, le Bureau International d'Enregistrement des Fréquences (IFBR) et le Comité Consultatif des Radiocommunications (CCIR) et, en particulier, des autorités nationales des télécommunications par l'intermédiaire des Comités Membres de l'URSI;

2. de les inviter instamment à prendre des mesures appropriées pour minimiser les problèmes de brouillage aux emplacements des radars à diffusion incohérente et des radars MST;

exprime l'espoir que les attributions de fréquences se poursuivront, que des fréquences seront attribuées à ces radars sur base primaire et que, si possible, des zones de protection contre les brouillages seront établies autour des installations.

U.23 Bruits radioélectriques d'origine naturelle dus aux décharges orageuses

Le Conseil de l'URSI,

reconnaissant la possibilité d'intégrer aux futurs satellites météorologiques des instruments capables de fournir des données sur les décharges orageuses;

décide de réitérer et de mettre à jour sa Recommandation U.19, adoptée à Tel Aviv en 1987, comme suit :

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 les projets de la NASA, de l'ESA et d'EUMETSAT d'adjoindre à de 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, le guide d'ondes Terre-ionosphère et ses limites, ainsi qu'à la recherche sur l'environnement terrestre;
- (e) que plusieurs relations ont été découvertes récemment entre l'électricité atmosphérique, les phénomènes météorologiques et l'environnement terrestre d'une part, et les décharges orageuses de l'autre;
- (f) 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;
- (g) 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 aux organisations concernées 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.24 Laboratoires de télédétection

Le Conseil de l'URSI,

notant les problèmes financiers auxquels se heurtent les laboratoires de télédétection dans les petits pays, plus spécialement en Europe de l'Est;

décide

1. que l'URSI appuie et encourage activement la participation de ces laboratoires aux expériences de télédétection internationales;
2. en particulier, qu'elle assure la diffusion, par la voie de ses publications régulières, de renseignements sur les programmes futurs ou en cours dans ce domaine, à l'intention des scientifiques des petits pays.

U.25 Protection des bandes de fréquences attribuées à la recherche spatiale, à la radioastronomie et à l'exploration de la Terre

Le Conseil de l'URSI,

notant

- (a) l'utilisation toujours croissante et la congestion du spectre radioélectrique qui en résulte;
- (b) le nombre croissant des services utilisant des engins aéroportés et des satellites;
- (c) l'utilisation accrue de la technique d'étalement du spectre et d'autres techniques de modulation à large bande;
- (d) le nombre de plus en plus élevé de cas de brouillages nuisibles provenant de services fonctionnant dans des bandes adjacentes et, même, fonctionnant à des fréquences éloignées;
- (e) le perfectionnement des techniques de filtrage et de réception;

décide d'inviter instamment le Directeur de Comité Consultatif des Radiocommunications (CCIR)

1. à attirer l'attention des Administrations Membres sur la nécessité urgente d'éviter les brouillages nuisibles dans les bandes de fréquences attribuées à la recherche spatiale,

à la radioastronomie et à l'exploration de la Terre, et de tenir compte du fait que les observations passives de ces services exigent de détecter des signaux avec la plus grande sensibilité possible et que toute émission, intentionnelle ou fortuite, dans ces bandes est nuisible, particulièrement si elle provient de satellites ou d'engins aéroportés;

2. à entamer dans ce but les démarches nécessaires en vue de l'établissement de normes techniques appropriées.

U.26 Utilisation du spectre radioélectrique

Le Conseil de l'URSI,

demande instamment au Comité Consultatif International des Radiocommunications (CCIR) et à ses Administrations Membres de reconnaître l'importance de l'utilisation scientifique du spectre radioélectrique, plus particulièrement pour l'exploration de la Terre, la radioastronomie et la recherche spatiale, lesquelles jouent un rôle primordial dans la surveillance des ressources naturelles et du fragile écosystème de la Terre, ainsi que dans l'exploration de l'Univers;

adresse ses félicitations au Comité Consultatif International des Radiocommunications pour les efforts incessants qu'il engage enfin

- (i) d'établir le cadre technique permettant l'utilisation efficace et économique du spectre radioélectrique,
- (ii) d'assurer aux services passifs une protection adéquate contre les brouillages nuisibles, en particulier ceux provenant d'émetteurs aéroportés et spatiaux;

exprime sa conviction que les directives techniques du CCIR permettront d'assurer l'utilisation rationnelle du spectre des fréquences radioélectriques, ainsi que sa conservation et sa protection.

U.27 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 la demande adressée par le Conseil International des Unions Scientifiques (CIUS) à la Commission inter-Unions pour l'attribution de fréquences à la radioastronomie et à la science spatiale (IUCAF), dont l'URSI est l'Union mère, d'élargir son mandat de manière à ajouter la télédétection passive à la radioastronomie et à la science spatiale;
- (b) l'extrême importance des travaux de l'IUCAF dans l'obtention d'attributions de fréquences appropriées pour les besoins de la communauté scientifique et la protection de ces fréquences contre les brouillages nuisibles;

décide

1. d'approuver l'extension du mandat de l'IUCAF dont question ci-dessus;
2. de maintenir son assistance financière en faveur des activités de la Commission.

U.28 XXIV Assemblée générale

Le Conseil de l'URSI,

ayant examiné les invitations présentées par les Comités Membres de l'URSI en Chine (CIE, Pékin), en Inde et au Japon pour la tenue de la XXIV^e Assemblée générale;

décide

1. d'accepter l'invitation du Comité japonais d'organiser la XXIV^e Assemblée générale à Kyoto du 25 août au 2 septembre 1993;
2. d'exprimer ses remerciements aux Comités chinois (CIE, Pékin) et indien pour leurs aimables invitations.

U.29 Subventions de l'UNESCO et du CIUS

Le Conseil de l'URSI,

considérant

- (a) que l'Union consacre une part considérable de ses activités à l'organisation de réunions et de colloques scientifiques internationaux, à la production de publications et à son Programme de jeunes scientifiques;
- (b) que les subventions accordées à l'URSI par l'UNESCO et le CIUS permettent de couvrir en partie les frais de ces activités;

décide d'exprimer à ces deux organisations sa vive gratitude pour le précieux appui qui lui est ainsi fourni.

U.30 Remerciements au Comité tchécoslovaque de l'URSI

Le Conseil de l'URSI,

décide à l'unanimité d'adresser sa très sincère gratitude au Comité tchécoslovaque de l'URSI pour l'invitation de tenir la XXIII^e Assemblée générale à Prague. L'accueil cordial et généreux qui a été réservé aux participants, ainsi que l'excellence des dispositions prises par le Comité local pour l'organisation des séances scientifiques et administratives et, en particulier, pour le rassemblement et la publication sur place d'un grand nombre de résumés, sont dignes des plus vifs éloges. Il exprime aux hôtes tchécoslovaques sa profonde appréciation pour la mise en oeuvre d'un programme social particulièrement agréable et réussi, ainsi que pour la chaleureuse bienvenue adressée aux personnes accompagnant les participants à l'Assemblée.

RESOLUTIONS ET RECOMMANDATIONS DES COMMISSIONS

COMMISSION A - METROLOGIE ELECTROMAGNETIQUE

A.1. Comparaisons de temps

La Commission A,

considérant,

- (a) que les satellites offrent la meilleure méthode pratique pour la comparaison de la fréquence des étalons primaires de fréquence qui sont maintenus dans les différents laboratoires nationaux;
- (b) qu'il en est de même pour ce qui concerne la comparaison des échelles de temps;
- (c) que l'échelle de Temps Atomique International (TAI), qui est établie par le Bureau International des Poids et Mesures (BIPM), est basée pour l'essentiel sur les comparaisons de temps effectuées au moyen de satellites;
- (d) que les systèmes de navigation par satellite existants, tels que GPS et GLONASS, sont susceptibles de fournir des comparaisons de temps ayant le niveau de précision requis pour ces applications;
- (e) que ces mêmes systèmes par satellite sont utilisés dans d'autres disciplines scientifiques, telles que la géodésie et les sciences de la Terre;

recommande que les autorités responsables de la maintenance de ces systèmes de navigation fassent en sorte, dans la mesure du possible, que les performances de ces systèmes ne subissent aucune dégradation intentionnelle qui pourrait nuire à leur utilisation scientifique générale.

A.2. Diodes laser et lasers à état solide pompés par diode laser

La Commission A,

considérant,

- (a) qu'il est nécessaire de disposer de lasers accordables simples à faible largeur de raie d'émission pour les applications métrologiques;
- (b) que les diodes laser et les lasers à état solide pompés par diode laser sont peu onéreux, ont une longue durée de vie et des dimensions réduites;
- (c) que les lasers à fréquence unique ne sont disponibles que pour quelques longueurs d'ondes seulement;

émet l'avis

1. qu'il convient de poursuivre le développement de tels lasers afin d'obtenir un rayonnement laser dans la gamme la plus large possible du spectre visible et proche infrarouge;
2. qu'il convient également de poursuivre la recherche visant à améliorer la pureté spectrale de leur émission;
3. que les méthodes d'accord continu reproductible des fréquences devraient être étudiées.

A.3. Raccordement des mesures effectuées au moyen d'analyseurs automatiques de réseau

La Commission A,

considérant,

- (a) que l'utilisation d'analyseurs automatiques de réseau pour les mesures aux fréquences radioélectriques et aux hyperfréquences est largement répandue, tant dans le domaine scientifique que dans le domaine industriel;
- (b) qu'il est nécessaire de définir une méthode largement acceptée pour vérifier les performances de ces instruments complexes, plus particulièrement en relation avec les procédures d'homologation des laboratoires;
- (c) qu'il est également nécessaire de développer des normes de transfert pour l'étalonnage des analyseurs automatiques de réseau,

émet l'avis que des études devraient être entreprises pour développer des techniques communes et des normes de transfert appropriées.

A.4. Unités du Système International

La Commission A,

considérant,

- (a) que le Système International d'unités a enregistré des progrès qui ont permis de passer d'un système d'unités représentées pour la plupart par des étalons basés sur des artefacts à un système dont les unités sont fondées principalement sur des constantes physiques;
- (b) que cette évolution est particulièrement avantageuse pour la communauté radio-scientifique en ce qu'elle assure une uniformité à l'échelle mondiale de réalisation des unités électriques;
- (c) que ce progrès a été rendu possible par l'étude des concepts fondamentaux à la base de la réalisation pratique d'étalons le plus souvent bien acceptés;

émet l'avis que les laboratoires de métrologie devraient être encouragés à poursuivre la recherche fondamentale tendant à améliorer la réalisation pratique actuelle des unités du Système International, mais aussi qu'ils devraient être invités à collaborer afin d'éviter les doubles emplois et d'augmenter, si possible, l'efficacité de leurs travaux.

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 près de 40 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 Sydney, Australie, du 17 au 20 août 1992.

B.2. Copatronage de conférences internationales

La Commission B,

considérant que certaines conférences internationales à venir présentent un intérêt direct pour la Commission;

recommande que l'URSI accorde son patronage aux conférences suivantes :

- les 20^e, 21^e et 22^e Conférences européennes sur les Hyperfréquences, en 1990, 1991 et 1992;
- Les Journées Internationales de Nice sur les Antennes (JINA) en 1990 et 1992;
- les 7^e et 8^e Conférences internationales sur les Antennes et la Propagation (ICAP) en 1991 et 1993;
- les 3^e et 4^e Conférences Asie-Pacifique sur les Hyperfréquences (APMC) en 1990 et 1992;
- la Conférence radio-scientifique nord-américaine et le Colloque international de la Société Antennes et Propagation de l'IEEE en 1991;
- le Symposium international sur les Antennes et la Propagation (ISAP) en 1992.

B.3. 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 inter-Commissions sur la mesure des formes d'onde dans le domaine temporel et, en particulier, le grand intérêt suscité par la séance commune organisée au cours de la présente Assemblée générale;

recommande

1. le maintien du Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel;
2. la désignation de T.K. Sarkar (EUA) comme Président de ce Groupe.

B.4. Dates des Assemblées générales de l'URSI

La Commission B,

notant que le début des dernières Assemblées générales de l'Union s'est situé de plus en plus tard au mois d'août;

considérant qu'une Assemblée générale empiétant sur le mois de septembre présente quelques inconvénients pour les membres du personnel académique d'Amérique du Nord et d'ailleurs, lesquels sont appelés à donner et à faire passer des examens pendant cette période;

demande qu'il soit fait en sorte que cette date soit avancée pour l'Assemblée générale à Kyoto en 1993;

recommande que le Bureau de l'URSI forme un Comité ad hoc ayant pour mission d'examiner la question des dates les plus appropriées pour la tenue des futures Assemblées générales de l'Union.

COMMISSION C - SIGNAUX ET SYSTEMES

C.1. Colloques et conférences

La Commission C,

recommande

1. que l'URSI accorde son soutien aux colloques suivants, pour lesquels les organisateurs ont déjà fourni tous les renseignements requis :
 - 2^e Symposium de l'URSI sur les Signaux, les Systèmes et l'Electronique (ISSSE'92), organisé conjointement par les Commissions C et D;
 - 3^e Colloque international sur les Progrès récents en technologie hyperfréquences (ISRAMT'91), Mode A;
2. que l'URSI accorde son soutien aux conférences suivantes, sous réserve que les renseignements requis soient fournis au Secrétariat de l'URSI:
 - Séminaire international de Zurich sur la Communication numérique;
 - Conférence européenne sur le Traitement du signal (EUSIPCO);
 - Conférence européenne sur la Théorie et la conception des circuits (ECCTD);
 - Conférence sur les Réseaux intelligents;
 - Conférence sur le Traitement numérique du signal;
 - Colloque sur les Hyperfréquences (MICROCOLL).

C.2. XXIVe Assemblée générale : Symposia communs à plusieurs Commissions

La Commission C,

recommande le choix des sujets suivants pour les symposia communs à plusieurs Commissions à organiser pendant l'Assemblée générale de 1993 :

- (i) Antennes à traitement de signal, en commun avec la Commission B;
- (ii) Communications à large bande et propagation multipoint, en commun avec les Commissions F et G.

COMMISSION D - DISPOSITIFS ELECTRONIQUES ET OPTIQUES ET APPLICATIONS

D.1. Changement du titre de la Commission

La Commission D,

considérant que les télécommunications font l'objet d'un intérêt accru au sein de l'URSI et que celles-ci sont étroitement liées au domaine qu'elle couvre;

décide

1. d'étendre son champ d'activité de manière à dépasser le rôle traditionnel de "Commission de service" qui était le sien;
2. de modifier son mandat en conséquence;
3. de remplacer son titre actuel : "Dispositifs électroniques et optiques et applications" par le titre suivant : "Electronique et photonique".

Note : Pour le nouveau mandat de la Commission D, voir la Résolution U.1 du Conseil.

D.2. XXIVe Assemblée générale : séances scientifiques

La Commission D,

considérant les termes de sa Résolution D.1,

décide de modifier sa politique traditionnelle qui consistait à organiser ses séances scientifiques à l'Assemblée générale sur base de communications invitées, et d'admettre dorénavant des communications proposées; la question de savoir si toutes ses séances ou seulement quelques-unes d'entre elles feront l'objet d'appels à communications sera tranchée en cours d'organisation.

D.3. "Review of Radio Science"

La Commission D,

considérant

- (a) que l'on ne sait pas exactement à quel public s'adresse la "Review of Radio Science";
- (b) que la Commission D couvre des domaines d'intérêt scientifique et technique extrêmement vastes;
- (c) qu'étant donné les restrictions existantes quant au nombre de pages, il n'est pas possible de produire un exposé cohérent dans la forme actuelle;
- (d) qu'il y a manque d'uniformité pour ce qui concerne la sélection des références à citer;

décide

1. que le texte sera rédigé par des experts invités à préparer des exposés de synthèse sur des sujets déterminés ressortissant au domaine de la Commission D et présentant une importance particulière;
2. qu'une liste de références, constituée à partir des listes soumises par les Membres officiels de la Commission des articles publiés dans les revues internationales à comité de lecture, sera enregistrée sur une diskette consacrée à la Commission D et ayant un format compatible avec les microordinateurs classiques PC et Macintosh.

D.4. Patronage de conférences internationales

La Commission D,

recommande le patronage ou le copatronage, selon le cas, des conférences suivantes :

- Symposium International sur les Signaux, les Systèmes et l'Electronique (ISSSE'92), Paris, France, 1-4 septembre 1992, organisé conjointement par les Commissions C et D;
- Conférences européennes sur les Communications optiques (ECOC) en 1991, 1992 et 1993;
- Conférences européennes sur les Hyperfréquences en 1991, 1992 et 1993;
- Conférence internationale sur les Circuits intégrés et les circuits à état solide (ICSIC), Pékin, Chine, octobre 1992;
- 4e Conférence Asie-Pacifique sur les Hyperfréquences (APMC) en 1992.

COMMISSION E - BRUITS ET BROUILLAGES ELECTROMAGNETIQUES

E.1. Bruit radioélectrique

La Commission E,

considérant

- (a) que le Rapport 322-3 du CCIR présente un modèle mondial du bruit radioélectrique atmosphérique dû aux décharges orageuses;
- (b) que les brouillages causés par des signaux d'autres utilisateurs sur des fréquences allouées dans la bande HF sont susceptibles de réduire davantage encore les performances des systèmes de communication;
- (c) qu'il n'existe pas à l'heure actuelle de modèle mondial de ces brouillages;

recommande qu'un programme de collaboration internationale soit encouragé pour développer un modèle mondial de probabilité d'apparition de brouillages causés par des signaux HF d'autres utilisateurs, en fonction de la fréquence (par bandes allouées), de la largeur de bande, de l'heure, de la saison et du nombre de taches solaires, ceci pour des antennes omnidirectionnelles et, dans la mesure du possible, des antennes directionnelles.

E.2. Groupes de travail

La Commission E,

décide d'établir les Groupes de travail suivants :

- E.1. Gestion et utilisation du spectre
Président : R.D. Parlow (EUA);
- E.2. Bruit non gaussien dans les communications
Président : A.D. Spaulding (EUA);
- E.3. Electromagnétique de forte puissance
Président : R.L. Gardner (EUA);
- E.4. Bruit électromagnétique terrestre et planétaire
Co-présidents : M. Hayakawa (Japon) et E.K. Smith (EUA);
- E.5. Interactions avec les systèmes électriques complexes et leurs protections
Co-présidents : C. Baum (EUA), P. Degauque (France) et M. Ianoz (Suisse);
- E.6. Effets des phénomènes transitoires sur les équipements
Co-présidents : V. Scuka (Suède) et B. Demoulin (France);
- E.7. Bruit et chaos dans l'environnement météoroélectrique extraterrestre et terrestre
Président : H. Kikuchi (Japon).

E.3. Copatronage de conférences

La Commission E,

recommande le copatronage par l'URSI des symposia suivants :

- Symposium de Zurich sur la Compatibilité électromagnétique, 1991;
- Symposium international COMMSPHERE, 23-25 avril 1991, Israël;
- Symposium de Beijing sur la Compatibilité électromagnétique, mai 1992 (sous réserve que les renseignements requis soient fournis par les organisateurs);
- Symposium de Wroclaw sur la Compatibilité électromagnétique, juin 1992;
- Symposium de Zurich sur la Compatibilité électromagnétique, 1993.

COMMISSION F - PROPAGATION DES ONDES ET TELEDETECTION

F.1. Patronage de conférences internationales

La Commission F,

recommande le patronage ou le copatronage, selon le cas, des conférences suivantes :

Mode A

- Conférence internationale sur la Propagation des ondes dans les milieux aléatoires, Seattle, EUA, 1992 (membre URSI : A. Ishimaru)
- Colloque sur les Facteurs régionaux dans la prévision de l'affaiblissement des ondes radioélectriques par les précipitations, Rio de Janeiro, décembre 1990 (membre URSI : M.P.M. Hall);
- Conférences internationales sur les Antennes et la propagation (ICAP) en 1991 (York, Royaume-Uni) et 1993 (membre URSI : M.P.M. Hall) ;
- Symposium sur la Diffusion électromagnétique par la surface de l'océan (membre URSI : J. Apel);

Mode B

- Symposium international COMMSPIRE, Herzlia, Israël, 1991 (membre URSI : J. Shapira);
- Symposium sur la Propagation des ondes et la télédétection, Malaisie, 1992 (membre URSI : P.A. Watson);
- Symposium sur les Signatures en hyperfréquences, Munich, Allemagne, juin 1992 (membre URSI : M. Chandra);
- Symposium international de Géoscience et de télédétection (IGARSS) en 1991 (membre URSI : I.V. Lindell), en 1992 et 1993.

F.2. Coordination avec IGARSS'93

La Commission F,

considérant la nécessité de planifier les déplacements des scientifiques de façon efficace et économique;

recommande que l'URSI prenne les mesures appropriées pour coordonner les dates de l'Assemblée générale de l'URSI avec celles du Symposium international de Géoscience et de télédétection (IGARSS), réunions qui doivent se tenir toutes deux au Japon en 1993.

COMMISSION G - RADIOELECTRICITE IONOSPHERIQUE ET PROPAGATION

G.1. 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 : P.J. Wilkinson (Australie)

Secrétaire : R. Konkright (EUA)

G.2. Etude de l'ionosphère au moyen de satellites à balise

Président : R. Leitinger (Autriche)

Vice-Présidents : J.A. Klobuchar (EUA), T.R. Tyagi (Inde);

2. de maintenir le Groupe de travail GH.1 "Diffusion incohérente", dont la Commission H s'est retirée, en tant que Groupe de travail G.3, Président : J.M. Holt (EUA) et Vice-Président : P.J.S. Williams (Royaume-Uni);

3. de fusionner les Groupes de travail G.3 et G.4 en un seul Groupe de travail G.4 "Informatique ionosphérique", Président : B.W. Reinisch (EUA) et Vice-Président : D. Anderson (EUA), avec pour mandat:

"de promouvoir l'application des méthodes de la théorie de l'information à l'acquisition, le traitement, le stockage et la distribution des données ionosphériques, et aider au développement de modèles physiques et empiriques de l'ionosphère".

G.2. Groupes de travail communs à plusieurs Commissions

La Commission G,

décide

1. de maintenir le Groupe de travail commun aux Commissions G et H : "GH.2 Expériences, simulation et analyse par ordinateur des processus d'ondes dans les plasmas". Représentant de la Commission G : S. Ossakow (EUA);
2. de former un nouveau Groupe de travail avec la Commission H : "GH.1 Expériences actives dans les plasmas". Représentant de la Commission G : Sa Basu (EUA);
3. de s'associer au Groupe de travail commun aux Commissions C et H "Analyse des ondes", sous le nouveau titre : "CGH.1 Analyse des ondes et de la turbulence".

G.3. Contribution de l'URSI à la FAGS

La Commission G,

recommande que l'URSI continue de verser à la Fédération des Services permanents d'analyse de données astronomiques et géophysiques (FAGS) une contribution annuelle de 2.000 dollars US à attribuer à parts égales au Service International des Ursigrammes et des journées mondiales (IUWDS) et au Centre de données pour les indices de l'activité solaire (SIDC).

G.4. Représentation de la Commission G

La Commission G,

décide de désigner les représentants suivants :

- Comité de l'URSI pour le Programme international Géosphère-Biosphère (IGBP) : A.W. Wernik (Pologne);
- Groupe de travail inter-Unions de télédétection TBF/EBF de l'ionosphère et de la magnétosphère : A.J. Smith (Royaume-Uni);
- Ionosphère internationale de référence (URSI/COSPAR) : L. Bossy (Belgique).

G.5. Patronage de colloques 1991-1993

La Commission G,

recommande que l'URSI patronne, en Mode B, les colloques suivants pendant la période 1991-1993, sous réserve que les organisateurs soumettent les demandes réglementaires :

- Modification artificielle de l'ionosphère, Suzdal, URSS, 1991;
- Symposium du Groupe de travail "Etude de l'ionosphère au moyen de satellite à balise", Boston, EUA, 1992;
- Conférence internationale sur les Sciences de l'atmosphère moyenne, Kyoto, Japon, 23-26 mars 1992;
- Conférence internationale sur la Propagation des ondes dans les milieux aléatoires, Seattle, EUA, août 1992;
- Symposium sur l'Ionosphère de haute latitude, Fairbanks, EUA, 1992.

G.6. Bulletin de l'INAG

La Commission G,

reconnaissant le rôle important que joue le Bulletin du Groupe Conseil du réseau ionosphérique (*INAG Bulletin*) dans le maintien du réseau mondial des stations ionosphériques et de la qualité des données acquises par celui-ci;

recommande que l'URSI maintienne ses contributions financières pour la publication de ce Bulletin pendant les trois années à venir;

exprime ses remerciements au Centre Mondial de données (WDC-A) de Boulder pour le précieux appui qu'il fournit en vue de la production de ce Bulletin.

G.7. Formatage des paramètres ionosphériques

La Commission G,

considérant

- (a) la nécessité de disposer de paramètres ionosphériques;
- (b) le nombre toujours croissant des données ionosphériques numérisées qui sont obtenues à partir d'ionogrammes analogiques et d'ionogrammes numériques dépouillés automatiquement;

reconnaissant que, en collaboration avec les Centres mondiaux de données, le Groupe de travail G.4 "Informatique Ionosphérique" a développé, lors de sa réunion de Lowell en juillet 1989, un format de données qui a été largement distribué et discuté;

décide que les paramètres ionosphériques qui sont archivés dans les Centres mondiaux de données seront formatés dans le cadre de la base de données du Groupe de travail, et que les données qui ne répondent pas à un certain critère de qualité seront signalées comme telles.

G.8. Système de navigation TBF OMEGA

La Commission G,

considérant que la propagation d'ondes TBF entretenues constitue un moyen efficace pour étudier l'ionosphère en-dessous de 100 km;

notant que le système de navigation TBF OMEGA peut être utilisé à cet effet, en collaboration avec l'Association internationale OMEGA et l'Agence de sécurité en mer japonaise;

recommande le maintien du système de navigation TBF OMEGA pour la surveillance permanente de la base ionosphère.

COMMISSION H - ONDES DANS LES PLASMAS

H.1. Importance des expériences de simulation numérique et établissement de centres de superordinateurs pour l'étude des plasmas au moyen de méthodes radioélectriques

La Commission H,

considérant

- (a) que les expériences de simulation numérique produisent des résultats nouveaux et très intéressants sur les processus non linéaires liés aux ondes dans les plasmas spatiaux;
- (b) que ces expériences exigent des temps de calcul et des mémoires considérables des superordinateurs;
- (c) que les demandes de calculs sur superordinateurs s'accroissent rapidement dans le domaine de la radioélectricité scientifique;

recommande d'attirer l'attention des administrations nationales sur l'importance des nouvelles techniques de calcul dans l'étude des plasmas spatiaux au moyen de méthodes radioélectriques, ainsi que sur l'avantage qu'il y aurait à établir à cette fin des centres de superordinateurs dans les différentes parties du monde.

H.2. Patronage de colloques et de conférences

La Commission H,

recommande le copatronage par l'URSI des conférences suivantes :

- Modification artificielle de l'ionosphère, Suzdal, URSS, 1991;
- 4e Ecole internationale de Simulation de plasmas spatiaux, Nara, Japon, 1991 (Mode B);
- XXe Conférence internationale sur les Phénomènes dans les gaz ionisés (ICPIG), Barga, Italie, 1991 (Mode B);
- Atelier sur la Turbulence dans les plasmas spatiaux, Eussois, France, 1993 (Mode B);
- XXIe Conférence internationale sur les Phénomènes dans les gaz ionisés (ICPIG), Dresden, Allemagne, 1993 (Mode B).

H.3. Groupes de travail

La Commission H,

ayant pris connaissance des rapports présentés par ses différents Groupes de travail;

décide

1. de maintenir le Groupe de travail inter-Unions URSI/IAGA.1 "Sondage électromagnétique passif de la magnétosphère", sous le nouveau titre "Télédétection TBF/EBF de l'ionosphère et de la magnétosphère (VERSIM)". Co-président pour la Commission H : U. Inan (EUA);
2. de dissoudre le Groupe de travail inter-Unions URSI/IAGA.2 "Instabilités des ondes dans les plasmas";
3. de maintenir le Groupe de travail commun aux Commissions C et H "CH.1 Analyse des ondes", sous le nouveau titre "Analyse des ondes et de la turbulence", en tant que Groupe de travail commun aux Commissions C, G et H. Co-président pour la Commission H : F. Lefeuvre (France);
4. de mettre fin à sa participation au Groupe de travail GH.1 "Diffusion incohérente";
5. de maintenir le Groupe de travail commun aux Commissions G et H "GH.2 Expérience, simulation et analyse par ordinateur des processus d'ondes dans les plasmas". Co-président pour la Commission H : H. Matsumoto (Japon);
6. d'établir un nouveau Groupe de travail commun aux Commissions G et H "GH.1 Expériences actives dans les plasmas". Co-président pour la Commission H : P. Bernhardt (EUA);
7. de mettre fin à sa participation au Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel.

COMMISSION J - RADIOASTRONOMIE

J.1. Groupe de travail pour l'interférométrie à très grande base à l'échelle mondiale

La Commission J,

considérant

- (a) que l'utilisation de l'interférométrie à très grande base revêt une grande importance dans l'imagerie astronomique à haute résolution;
- (b) qu'en conséquence, il est nécessaire de procéder à des observations simultanées dans différentes parties du monde en utilisant des télescopes appartenant à divers réseaux;

reconnaissant que la mise sur orbite d'interféromètres à très grande base est imminente;

décide

- 1. qu'un Groupe de travail pour l'interférométrie à très grande base à l'échelle mondiale soit établi, avec les objectifs suivants:
 - (i) mettre en place des mécanismes pour la coordination à l'échelle mondiale de l'interférométrie à très grande base (multi-réseaux);
 - (ii) promouvoir la compatibilité des techniques;
 - (iii) servir de liaison avec d'autres organisations concernant les questions de politique scientifique;
- 2. que le Président du Groupe de travail soit désigné par la Commission J;
- 3. que le Groupe de travail comprenne des représentants des différents réseaux d'interférométrie à très grande base, à désigner de commun accord par le Président du Groupe de travail et les Directeurs des réseaux au sol, et que la composition du Groupe de travail soit réexaminée au cours de la XXIV^e Assemblée générale à Kyoto, Japon, en 1993.

Note : La Commission J a désigné R. Booth (Suède) comme premier Président du Groupe de travail.

J.2. XXIV^e Assemblée générale : Symposia communs à plusieurs Commissions

La Commission J,

recommande que les sujets suivants soient choisis pour l'organisation de symposia communs à plusieurs Commissions au cours de l'Assemblée générale de Kyoto en 1993 :

- Imagerie par filtrage spatial adapté, avec la Commission B. Organisateurs : B. Steinberg (EUA) pour la Commission B et T. Cornwell (EUA) pour la Commission J;
- Brouillages radioélectriques subis par les services passifs, avec la Commission F. Organisateurs : T. Gergely (EUA) pour la Commission J et A. Gasiewski (EUA) pour la Commission F.

J.3. Patronage de colloques 1991-1993

La Commission J,

recommande que l'URSI accorde son patronage ou son copatronage, selon le cas, aux colloques suivants :

- Astronomie au moyen de l'interférométrie en ondes millimétriques et submillimétriques, Japon, 1992;
- Propagation des ondes dans les milieux aléatoires, Seattle, EUA, août 1992;
- Imagerie à haute résolution, Australie, juillet 1992;
- Interférométrie à très grande base dans l'espace, en conjonction avec l'Assemblée générale de l'URSI, Japon, août/septembre 1993.

J.4. Déclaration de principe concernant les activités suivant la détection d'intelligence extraterrestre

La Commission J,

considérant l'extrême importance pour l'humanité de la détection éventuelle de signaux provenant de civilisations extraterrestres;

reconnaissant

- (a) l'intérêt général qui est porté aux disciplines scientifiques et technologiques inhérentes à la recherche de signaux provenant de civilisations extraterrestres;
- (b) le rôle primordial que certains radiotélescope de par le monde auront à jouer dans cette recherche au cours des quelques décennies à venir;

sa déclare favorable aux intentions qui ont présidé à la rédaction du document intitulé "Déclaration de principe concernant les activités suivant la détection d'intelligence extraterrestre".

Note : Le texte anglais original de ce document est reproduit en annexe au texte anglais de l'Avis J.4, page 195.

LIST OF THE MOST IMPORTANT ABBREVIATIONS

AGU	American Geophysical Union
ANA	Automatic Network Analyzer
ARWC	Associate Regional Warning Centre
ASA	Acoustical Society of America
BEMS	Bioelectromagnetics Society
BGI	Bureau Gravimétrique International
BIH	Bureau International de l'Heure
BIPM	Bureau International des Poids et Mesures
CAD	Computer-aided Design
CCDS	Comité Consultatif pour la Définition de la Seconde
CCE	Comité Consultatif d'Electricité
CCIR	Comité Consultatif International des Radiocommunications
CCITT	Comité Consultatif International de Télégraphie et de Téléphonie
CDS	Centre de Données Stellaires
CEDAR	Coupling, Energetics and Dynamics of Atmospheric Regions
COSPAR	Committee on Space Research
COSTED	Committee on Science and Technology in Developing Countries
CPEM	Conference on Precision Electromagnetic Measurements
CRAF	Committee on Radio Astronomy Frequencies
CSIRO	Commonwealth Scientific and Industrial Research Organization
EBEA	European Bioelectromagnetics Association
EISCAT	European Incoherent Scatter Scientific Association
ELF	Extremely Low Frequency
EMC	Electromagnetic Compatibility
ENUWAR	Working Group on Environmental Consequences of Nuclear War
ESA	European Space Agency
EVN	European VLBI Network
FAGS	Federation of Astronomical and Geophysical Services
GLONASS	Global Navigation Satellite System
GMRT	Giant Meter-wavelength Radio Telescope
GPS	Global Positioning System
IAG	International Association of Geodesy
IAGA	International Association of Geomagnetism and Aeronomy
IAMAP	International Association of Meteorology and Atmospheric Physics
IAU	International Astronomical Union
ICAP	International Conference on Antennas and Propagation
ICET	International Centre for Earth Tides
ICO	International Commission for Optics
ICPIG	International Conference on Phenomena in Ionized Gases
ICSU	International Council of Scientific Unions
ICTP	International Centre for Theoretical Physics
IEC	International Electrotechnical Commission
IEE	Institution of Electrical Engineers
IEEE	Institute of Electrical and Electronics Engineers
IERS	International Earth Rotation Service
IFRB	International Frequency Registration Board
IGARSS	International Geoscience and Remote Sensing Symposium
IGBP	International Geosphere-Biosphere Programme
IIWG	Ionosphere Informatics Working Group

IMECO	International Measurement Confederation
INAG	Ionosonde Network Advisory Group
ISAP	International Symposium on Antennas and Propagation
ISGI	International Service for Geomagnetic Indices
ISO	International Organization for Standardization
ISR	Incoherent Scatter Radar
ISSS	International School for Space Simulation
ISSSE	International Symposium on Signals, Systems and Electronics
ISY	International Space Year
ITU	International Telecommunication Union
IUCAF	Inter-Union Commission on the Allocation of Frequencies to Radio Astronomy and Space Science
IUGG	International Union for Geodesy and Geophysics
IUWDS	International Ursigram and World Days Service
JINA	Journées Internationales de Nice sur les Antennes
MAP	Middle Atmosphere Programme
MHD	Magnetohydrodynamics
MST	Mesosphere-Stratosphere-Troposphere
NAO	National Astronomical Observatory (Japan)
NASA	National Aeronautics and Space Administration (U.S.A.)
NOAA	National Oceanic and Atmospheric Administration (U.S.A.)
NRAO	National Radio Astronomy Observatory (U.S.A.)
PSMSL	Permanent Service for Mean Sea Level
QBSA	Quarterly Bulletin on Solar Activity
RWC	Regional Warning Centre
SCAR	Scientific Committee on Antarctic Research
SCOR	Scientific Committee on Oceanographic Research
SCOSTEP	Scientific Committee on Solar-Terrestrial Physics
SIDC	Sunspot Index Data Centre
SPIE	Society of Photo-optical Instrumentation Engineers
STEP	Solar-Terrestrial Energy Programme
TAI	International Atomic Time Scale
TWAS	Third World Academy of Sciences
UNESCO	United Nations Education, Scientific and Cultural Organization
UTC	Universal Time Coordinated
VLBI	Very Large Base Interferometry
VLF	Very Low Frequency
VLSI	Very Large Scale Integration
WARC	World Administrative Radio Conference
WCRP	World Climate Research Programme
WDC	World Data Centre
WGMS	World Glacier Monitoring Service
WHO	World Health Organization
WITS	World Ionosphere/Thermosphere Study
WMO	World Meteorological Organization

