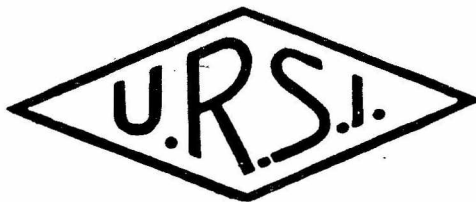


UNION RADIO-SCIENTIFIQUE INTERNATIONALE  
INTERNATIONAL UNION OF RADIO SCIENCE



Comptes Rendus des Assemblées Générales de l'URSI  
Proceedings of URSI General Assemblies

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## INTRODUCTION

### ACKNOWLEDGEMENT

The XX General Assembly of URSI was held at the Hyatt Regency Hotel in Washington, D.C., in August 1981. In introducing this account of the proceedings, it is appropriate to offer our sincere thanks:

- to our hosts, the URSI Member Committee in the United States of America, under the sponsorship of the National Academy of Sciences,
- to the Organising Committee and the Accompanying Persons Committee which were responsible for the detailed planning of the excellent local arrangements in Washington, D.C.,
- to the Chairmen and Vice-Chairmen of the URSI Commissions who successfully planned the programme for the scientific sessions, and to the session chairmen and the speakers,
- to the organizers of the Open Symposia and the Open Series which attracted many participants in the Assembly,
- to UNESCO for the subvention which made it possible to ensure the presence, at the General Assembly, not only of senior URSI scientists, but also of a group of young research scientists,
- to the other international Unions and scientific organizations which sent representatives to the Assembly.

### OUTLINE OF THE ASSEMBLY

The representatives of the Member Committees of URSI, who form the URSI Council, met in Washington, D.C. on five occasions between 7 and 19 August. 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.

The Opening Meeting was held at the Kennedy Centre on 10 August. The addresses given by the Foreign Secretary of the National Academy of Sciences, the Director of the National Science Foundation, the President of URSI, the Director of CCIR and other personalities are reproduced on pp. 13-33).

The scientific programme included not only the normal scientific sessions arranged by the nine URSI scientific Commissions, but also three Open Symposia which included many contributed papers. These Symposia dealt with the following topics:

- Remote sensing of the Earth and its environment;
- Millimeter and submillimeter waves;
- Mathematical models in wave propagation.

In addition there was an Open Series on the Interactions between electromagnetic waves and biological systems.

The URSI Awards for distinguished work during the period 1975-1980 were presented, at a special session, to:

- Prof. D.S. Jones (UK): Balzh.van der Pol Gold Medal;
- Dr. J. Fejer (USA): John Howard Dellinger Gold Medal;
- Dr. H. Rishbeth (UK): Appleton Prize.

Three General Lectures of common interest to all participants were given by outstanding scientists. The subjects were:

Radio science and oceanography (E.D.R. Shearman);  
Solar power satellite and telecommunications (W.E. Gordon);  
High energy astronomy (H. Friedman).

At the formal Closing Meeting, the outgoing President, on behalf of the Board, expressed his thanks to all those who had contributed to the success of the XX General Assembly. The Secretary General announced the names of the newly elected officers and summarised the main decisions of the Council. Finally, the incoming President, Prof. W.E. Gordon, expressed his appreciation of the honour which his election represented and looked forward with pleasure to the XXI General Assembly in Florence, Italy, in 1984. In conclusion he declared the XX General Assembly of URSI closed.

## LIST OF URSI OFFICE BEARERS AND OFFICIALS OF MEMBER COMMITTEES

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

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

### HONORARY OFFICERS

#### Honorary Presidents

Sir Granville Beynon (UK)  
Prof. H.G. Booker (USA)  
Prof. W. Dieminger (FR Germany)  
Prof. I. Koga (Japan)  
Mr. J.A. Ratcliffe (UK)

#### Secretary General Emeritus

Dr. C.M. Minnis (UK)

## BOARD OF OFFICERS

President:	Prof. W.E. Gordon (USA)
Past President:	Prof. W.N. Christiansen (Australia)
Vice-Presidents:	Prof. A.L. Cullen (UK) (Treasurer)
	Dr. A.P. Mitra (India)
	Prof. S. Okamura (Japan)
	Prof. A. Smolinski (Poland)
Secretary General:	Prof. J. Van Bladel (Belgium)

## OFFICERS OF COMMISSIONS AND COMMITTEES

### Commission A - Electromagnetic Metrology

Chairman: Prof. Dr. V. Kose (FR Germany)  
Vice-Chairman: Prof. S. Hahn (Poland)

### Commission B - Fields and Waves

Chairman: Prof. Dr.-Ing. H.-G. Unger (FR Germany)  
Vice-Chairman: Prof. J. Bach Andersen (Denmark)

### Commission C - Signals and Systems

Chairman: Prof. J.K. Wolf (USA)  
Vice-Chairman: Prof. K. Géher (Hungary)

### Commission D - Electronic and Optical Devices and Applications

Chairman: M. J. Le Mézec (France)  
Vice-Chairman: Prof. W.A. Gambling (UK)

### Commission E - Electromagnetic Noise and Interference

Chairman: Prof. S. Lundquist (Sweden)  
Vice-Chairman: Prof. F.L.H.M. Stumpers (Netherlands)

### Commission F - Remote Sensing and Wave Propagation - Neutral Atmosphere, Oceans, Land, Ice

Chairman: Dr. D. Gjessing (Norway)  
Vice-Chairman: Dr. F. Fedi (Italy)

### Commission G - Ionospheric Radio and Propagation

Chairman: Dr. P. Bauer (France)  
Vice-Chairman: Dr. J. Aarons (USA)

### Commission H - Waves in Plasmas

Chairman: Dr. M. Petit (France)  
Vice-Chairman: Prof. R.L. Dowden (New Zealand)

### Commission J - Radio Astronomy

Chairman: Dr. V. Radhakrishnan (India)  
Vice-Chairman: Dr. R. Wielebinski (FR Germany)

Standing Finance Committee

Chairman: Dr. Ing. H.J. Albrecht (FR Germany)

Standing Committee on URSI Membership

Chairman: Prof. S. Okamura (Japan)

Standing Committee on URSI General Assemblies

Chairman: Prof. A. Smolinski (Poland)

Committee on Developing Countries

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

URSI-CCIR-CCITT Liaison Committee

Chairman: M. M. Thué (France)

Group for Coordination of the Scientific Programme of URSI

Chairman: Sir Granville Beynon (UK)

URSI REPRESENTATIVES ON OTHER SCIENTIFIC ORGANIZATIONS

ICSU General Committee and General Assembly: Prof. W.E. Gordon (USA)

COSPAR Executive Council: Prof. K. Rawer (FR Germany)

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

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

SCAR: Mlle G. Pillet (France)

SCOR: Dr. J.P. Apel (USA)

FAGS Council: Dr. C.M. Minnis (UK), Dr. J.C. Ribes (France)

BIH Directing Board: Mr. J.McA. Steele (UK)

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

IUCAF: Dr. J.W. Findlay (USA), Dr. B. Robinson (Australia)

CPEM: Dr. H. Hellwig (USA).

PRESIDENTS AND SECRETARIES OF URSI MEMBER COMMITTEES

ARGENTINA:

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

Secretary: Prof. V.A. Padula-Pintos, CAERCEM, Julian Alvarez 1218, 1414 Buenos Aires.

AUSTRALIA:

President: Prof. R.H. Frater, CSIRO, Division of Radiophysics, P.O.Box 76, Epping N.S.W. 2121.

AUSTRIA:

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BELGIUM:

President: Mr. M. Gewillig, Directeur-Generaal, Technische Diensten van de BRT, Reyerslaan 52, B-1040 Brussel.

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Secretary:

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Secretary: Prof. Dr. B. Popović, Electrotechnical Faculty, P.O.  
Box 816, Beograd.

## OPENING MEETING

Monday morning, 9 August 1981

The Opening Meeting was held at the Kennedy Centre, in Washington D.C., in the presence of about 1,000 participants and guests.

The ceremonial opening was performed by the US Marine Band and the Color Guard.

During the first half of the programme, the Chair was taken by Dr. C.G. Little, President of the US National Committee of URSI, who introduced three speakers: Dr. G. Hyde, Chairman of the Organizing Committee for the XX General Assembly, Dr. Th.F. Malone, Foreign Secretary of the National Academy of Sciences, and Dr. J.B. Slaughter, Director of the National Science Foundation. The President of URSI, Prof. W.N. Christiansen, replied briefly to the welcoming remarks made by these speakers.

After a Musical Interlude of classical guitar and American banjo, which was much appreciated by the audience, the President took the Chair and invited Prof. J. Van Bladel, Secretary General of the Union, to present his Report. He then delivered the Presidential Address. Mr. R.C. Kirby, Director of CCIR, was invited to address the Meeting, and Prof. W.E. Gordon, as Chairman of the Steering Group for the Coordination of URSI Scientific Programme, made some remarks on the scientific activities during the General Assembly.

### WELCOME

by Dr. C. Gordon Little,  
Chairman, US National Committee for URSI

Mr. President, distinguished Officers of URSI, honoured delegates, ladies and gentlemen,

As Chairman of the US National Committee, it is a great honour and pleasure for me to welcome you to the XX General Assembly of URSI. It is now almost a quarter of a century since the General Assembly was last held in the United States, in Boulder, Colorado, in 1957. We are glad to have this opportunity of welcoming you again; we look forward with anticipation to our meetings; we hope that you will all enjoy the programme at scientific meetings and tours, and other tours and social events, that has been prepared.

A word, Mr. President, about the URSI flag displayed on the platform. I am happy to inform you that it is the selfsame flag that was used in Australia on the occasion of the X General Assembly; I feel that it is particularly appropriate that it grace the platform at this General Assembly, conducted under the direction of a distinguished Australian President.

I feel that it is also particularly appropriate that it is at this General Assembly, held here in the United States, that the US National Committee is able to announce a new Award honouring a distinguished US radio scientist. Friends and colleagues of Professor Booker, an Honorary President of URSI, donated money to the US National Academy of Sciences to enable an outstanding young scientist to be selected, on the occasion of each General Assembly, to attend it as Henry G. Booker Fellow. I am happy to have this opportunity of announcing this new Award, and to announce that Dr. John Armstrong, of the Jet Propulsion Laboratory of Pasadena, California, has been selected by the US National Committee as the XX General Assembly Henry G. Booker Fellow.

I am also happy to have this opportunity of announcing that the National Museum of American History has prepared a new exhibit on the history of Radio Science in honour of the General Assembly. This exhibit is available daily at the Museum building on Constitution Avenue between 12th and 14th St., NW.

Mr. President, we in the United States are very proud of the contributions that URSI, and radio scientists around the world, have made over the years - contributions that have enriched mankind greatly. And so, Mr. President, it is with particular pleasure that we welcome you all to the United States, to Washington, D.C., and to the XX General Assembly of URSI.

ADDRESS BY DR. THOMAS F. MALONE

Foreign Secretary, National Academy of Sciences

President Christiansen, Officers and guests on the podium,  
Delegates to the XX General Assembly, Ladies and Gentlemen:

Academy President Frank Press joins me in welcoming the XX General Assembly of URSI to Washington, D.C. - the home city of the National Academy of Sciences, the US adherent to URSI. This morning, Frank is chairing a meeting of the Academy Council in Woods Hole, but he asked me to assure you of his best wishes for a productive General Assembly.

There are several reasons for the warmth of our welcome. URSI is one of the senior Unions of the International Council of Scientific Unions, with roots that go back to 13 October 1913 when nine scientists met in Brussels and, with great prescience, drew up a preliminary programme of research that established the foundation for the explosion in radio communication that is one of the major developments of the Twentieth Century. Cooperation that transcends national boundaries and disciplinary limits, mutual sharing of information, and a judicious blend of extending knowledge by deliberate inquiry and practical application of that knowledge to improve the quality of human life, have been hallmarks of your activities over the last seven decades. These attributes have, in fact, set a pattern for the scientific enterprise that, when followed, has caused that enterprise

to flourish and contribute to society.

Secondly, it has been just 34 years since you last gathered in our nation's capital for a General Assembly. We are delighted to have you here again. And what an eventful 34 years that has been! From radio communications over long distances that were occasionally troubled by poorly understood ionospheric peculiarities your imaginative leadership profoundly influenced the intensive and illuminating enterprise -- the International Geophysical Year -- that dramatically changed our perception of Spaceship Earth and its environs. Your early recognition that our knowledge base needed to be extended as we emerged into the Radio Astronomy Age prompted you to take aggressive and successful measures to protect frequencies for scientific observations that have opened up the universe to systematic exploration and may one day enable us to describe its origin.

On one of the buildings in this city you will find inscribed the words "the past is but a prologue to the future" which -- translated into the vernacular means "you ain't seen nothing yet". Those simple words describe in a profound way the opportunity and responsibility of URSI. Advances in communications science over the next two decades is almost certain -- incredible as it may seem -- to equal or exceed progress over the past seven decades. What a challenging and glorious future lies immediately ahead for each of the more than 1,000 scientists gathered here this week, as the power of communications is wedded to that of data handling and computer processing. While some of the details of Alvin Toffler's Third Wave may be open to argument, the central thrust of his vision of the future can no more be dismissed than were the then seemingly science fiction predictions of communicating satellites by Arthur Clarke decades ago. Even a cursory reading of the titles of papers to be presented during your Assembly provides ample assurance that your research is thoughtfully and imaginatively laying the intellectual foundation for the information age we are now entering.

Thirdly, I am pleased to renew acquaintance with colleagues I have come to know with respect and affection in the meetings of the General Committee of the International Council of Scientific Unions. Your distinguished President, Professor Christiansen, (widely and well-known in ICSU circles as "Chris") continues a splendid tradition of constructive leadership by URSI in the deliberations of ICSU. We need to strengthen the financial underpinnings of ICSU during the 1980s and nourish its unique partnership with UNESCO and the other Specialized Agencies. To do this effectively we must anticipate needs five or ten years into the future as best we can perceive them.

I am confident that the combined efforts of the US National Committee under the chairmanship of my long-time friend, Dr. Gordon Little and the Organizing Committee for this Assembly, under the leadership of Dr. G. Hyde, will attend to your every need while you are with us. We look forward to your visit to the building that houses our National Academy of Sciences, when the Theater Chamber Players of Kennedy Center will entertain you in the Academy's Auditorium. We hope you will come early in order to stand before the statue of Albert Einstein that graces the southwest corner of our property. This is but one of the places of interest we hope you will explore and enjoy while you are in our nation's capital.

And so, we welcome you and hope your stay with us is both personally pleasant and scientifically rewarding. I have mentioned several reasons why our words of welcome are more than perfunctory -- apart from the fact that you are observing the 50th anniversary of Jansky's discovery and are on the eve of the silver jubilee of the IGY. There is, however, one special reason we are proud -- and hopeful -- to have you in our midst. It rests with the closing sentence in a paper in 1957 written by URSI Honorary President J.H. Dellinger in preparation for the XII General Assembly to be held in Boulder, Colorado that year. He wrote:

"Although we devote ourselves to a purely technical field, we are  
"making a real contribution to those currents of good will and  
"international friendliness which must grow mightily to give  
"this world a happier future".

Just as we all know that war begins in the minds of men, so do we know that the seeds of peace must be planted in these same minds. During occasional wakeful hours in the still of the night, I sometimes wonder if instead of simply commemorating IGY, we could profitably turn our attention to another global scientific enterprise -- as yet undefined -- that would challenge and unite this troubled world of ours -- as did the IGY 25 years ago. Were this to be done, a special opportunity for leadership would be presented to URSI. I know your response would be positive.

Anyway, may your scientific discussions be fruitful -- and nourish the seeds of peace!

ADDRESS BY DR. JOHN B. SLAUGHTER

Director, National Science Foundation

Dr. Tom Malone has welcomed this distinguished group to the United States on behalf of the National Academy of Sciences. I would like to extend greetings from the National Science Foundation, which has provided major support for the United States participation in the International Council of Scientific Unions (ICSU), of which URSI was one of the earliest members.

As you may know, the National Science Foundation is the principal agency of the US government for funding basic scientific research -- primarily at our own colleges and universities, but also abroad, and, to a lesser degree, at small US non-profit research organizations and even private industry.

The National Science Foundation has always given high priority to the support of international scientific organizations, and has welcomed both international teams and individual scientists from many nations to the advanced research facilities it supports. We continue to attach great importance to cooperative research among nations.

As an engineer, I have a deep personal interest in URSI, especially since this is the field in which science and engineering merge almost indistinguishably. Indeed, radio science is an area in which

not only science and engineering, but also basic and applied science, theory and experiment, and computers and communication science come together.

Today is, in fact, an occasion for remembering. The last meeting of URSI in the United States took place in 1957, during the International Geophysical Year which will celebrate its 25th Anniversary next year. During the IGY, you will recall, the US and the Soviet Union each launched 3 successful scientific earth satellites. The annual report for 1957 of the National Science Foundation noted that the US had to rely on volunteer amateur radio buffs to help track the satellites -- in "Operation Moonbeam". The chief finding of those satellites was that energetic particle radiation is particularly dense above the atmosphere.

In 1957, for the first time in history scientists observed the sun continually from radio and optical stations around the world. They determined the amount of energy in solar flares partly by measuring the absolute change in transmission through the ionosphere at radio frequencies, and they began to comprehend the tremendous variability of solar activity from measurements in the upper atmosphere. Through their observation of whistlers, scientists confirmed that the Earth's ionosphere extended far beyond the boundaries hitherto mapped out.

And in Antarctica, where Operation Deep Freeze was in its second year, scientists measured earthquakes and took seismic profiles that gave rise to a theory that Antarctica is not a continuous continent, but that West Antarctica consists of a series of land masses.

In those days, we still didn't have satellite measurements of the upper atmospheric and ionospheric environment. Neither did we have much of the sophisticated ground-based equipment we now take for granted. And although we had already developed considerable theory about the ionosphere we had no real proof of what was going on and no awareness of many of the important physical phenomena occurring there. Finally, we had none of the sophisticated computers that now enable us to process data and quickly interpret its meaning.

I want to emphasize that the National Science Foundation has strongly and generously supported two of the major thrusts in the radio sciences: remote sensing of the atmosphere and radio astronomy. Other agencies of the United States are, and will be, involved in the important subjects of several of your symposia, including the use of satellites for communications and new biomedical uses of microwaves and radio waves. The National Science Foundation has an interest in these areas. But our principal focus has been support of facilities for incoherent-scattering radar and radio telescopes. Since much of the scientific knowledge being gained at these facilities will be discussed in detail at your various symposia, I will briefly describe what and where the facilities are.

The world's largest radio/radar telescope is the 300-meter diameter fixed spherical antenna at the National Astronomy and Ionosphere Center (NAIC) near Arecibo, Puerto Rico. It is operated by Cornell University under contract with the National Science Foundation, and out of a total 182 visitors there last year, Arecibo received 41 scientists from foreign countries. The Arecibo facility

has been continually upgraded, with new observational techniques and computer programmes recently added. The big dish at Arecibo is extremely sensitive. It enabled scientists to discover the binary pulsar in 1974, and with measurements gathered there over the past 6 or so years, we now know that the rate of orbital energy loss from the binary system agrees with that predicted by Einstein's General Theory of Relativity. This is the best indication we have to date that gravitational radiation does indeed exist.

Some of you may have the opportunity to visit the NSF-supported National Radio Astronomy Observatory facility at Green Bank, West Virginia, which was formally opened in 1957. Green Bank was constructed and is operated by Associated Universities, Inc. (AUI), under contract with the National Science Foundation. The National Science Foundation does not itself operate research facilities; it only funds them. AUI is a non-profit organization formed shortly after World War II to operate large-scale research facilities on behalf of the whole academic community.

Green Bank, located at an elevation of 800 meters in Deer Creek Valley, is considered one of the best locations for radio astronomy in the US, since it is shielded over a wide range of frequencies by 1200 meters high mountains and surrounded by a National Radio Quiet Zone. There are two major radio telescopes at Green Bank: a 91-meter meridian transit telescope and a 43-meter fully steerable telescope. Astronomers from many nations use these telescopes.

The National Science Foundation also supports an observatory built in 1968 at Kitt Peak near Tucson, Arizona, where the high altitude and dry climate are particularly well suited to its 11-meter millimeter-wave radio telescope. US astronomers first found complex molecules in space, with this telescope. Based on astronomers' experience with the radio telescope at Kitt Peak, France, Germany, England and Japan are now building their own millimeter telescopes.

And based on knowledge gained with radio interferometers at both Green Bank and in the Netherlands, the National Science Foundation built the recently completed Very Large Array telescope - a complex of 27 antennas in a y-shaped configuration about 40 kilometers across in New Mexico. The world's most powerful and precise radio interferometer, the VLA has a resolving power equal to that of the largest optical telescopes. It has recently been used to map the radio brightness distributions of several radio galaxies and head-tailed galaxies. During 1980, the National Radio Astronomy Observatory and the Very Large Array received 378 visitors from 111 institutions, including 29 foreign observatories. Some of you here today probably came directly to Washington from last week's symposium of the International Astronomical Union in Albuquerque, New Mexico, where new research findings at the VLA were discussed. The National Science Foundation assisted financially in the arrangements for this symposium.

The National Science Foundation, as you are perhaps aware, is very active in radio spectrum management and argued at international meetings for the protection of certain frequency bands for specific astronomical research purposes, of particular concern to URSI.



Since the 1960s, the National Science Foundation has supported the use of remote sensing, incoherent-scattering radars to explore the constituents, velocities and temperature of the upper atmosphere, including the interaction of the solar wind with the Earth's geomagnetic fields. These powerful instruments complement the work of satellites in giving us a true picture of the upper atmosphere.

European radars are situated primarily for east-to-west measurements of the upper atmosphere, and American instruments for north-to-south measurements. Some important regions have yet to be explored by the remote sensing techniques. Incoherent-scatter radars supported by the National Science Foundation are located at:

1. Millstone Hill, Massachusetts. This radar facility, located near Boston, was recently upgraded, with a new antenna put into operation. It has support from both Department of Defense and NSF.

2. Arecibo, Puerto Rico. This instrument was built by the Department of Defense and is now supported by NSF. The dish was recently resurfaced.

3. Jicamarca, Peru. The incoherent-scatter radar in this location was built by and formerly supported by NOAA. All US support from several agencies, is now arranged through NSF.

4. Chatanika, Alaska. Formerly supported by DOD, now being prepared for transfer to Greenland. It will record energy in the Polar Cusp region, where there is relatively direct entry of solar plasma. Once this very high latitude radar facility is relocated, it will have a unique diagnostic capability for studying problems at the forefront of thermospheric, ionospheric and magnetospheric physics through the 1980s. The relocation will be carried out by SRI International, a non-profit corporation that performs contract research for industry, government and foundations in the US and abroad. The SRI team, from the Radio Physics Laboratory, has been working in the field of atmospheric and ionospheric research since 1957.

There are, of course, many other programs supported by the National Science Foundation in which radio science plays an integral part. Our operations in Antarctica, for instance, could not occur without sophisticated radio communications. And the basic research NSF funds in areas like semi-conducting materials and wave theory are important to the development of radio science... so there has been a very useful exchange going on. I have already mentioned the great involvement of radio science with Engineering, which has recently been given new emphasis at the National Science Foundation. Even the construction of radio observatories is, in a way, an engineering feat... something we might remember this 50th anniversary of Jansky's first instrument, which URSI will be celebrating this week.

If I could have a wish for the future of radio science it would be this: that it become even more fully integrated, even more international. I look to the day when there is a global network of all kinds of observatories, a linking of scientific facilities throughout the world. I would hope, and expect, that URSI's meetings in Washington this week will be another step toward that end. May you have a very successful General Assembly.

REPLY BY THE PRESIDENT OF URSI,  
PROF. W.N. CHRISTIANSEN

Thank you, Dr. Little, Dr. Hyde, Dr. Malone and Dr. Slaughter for your addresses of welcome.

URSI is very grateful to the US National Committee and the US Academy of Sciences for inviting URSI to hold its XX General Assembly in Washington, D.C.

The US National Committee of URSI is unsurpassed in the Union in its scientific activities and there is no activity in the international field of radio science in which it does not play a major rôle. Our last General Assembly held in the United States took place almost a quarter of a century ago in Boulder, Colorado and those of us who were there remember with great pleasure that very fine meeting. Perhaps, at that Assembly, some of the foreigners were left in some confusion after the addresses of welcome as to whether Colorado was part of the United States or whether in fact the United States were a part of Colorado but, in this XX General Assembly in historical Washington, D.C., there will be no confusion regarding the country in which we are meeting.

URSI members from all countries have an intense interest in the United States if for no other reason than that there are few radio research laboratories in the world that have not some testing, measuring or computing equipment designed and usually built in the United States. In the turning of scientific discoveries into new technology that can make possible more advanced scientific research, the United States leads the world by a wide margin. For foreign radio scientists, this Assembly provides a welcome opportunity to see at first hand some of the outstanding scientific work done here. Hence we have many reasons to welcome the invitation of the US National Committee.

Apart from radio science, many participants are looking forward to visiting or revisiting the magnificent collections of paintings close by in Washington.

A reading of the splendid programme for this General Assembly shows the great amount of careful work that has gone into its preparation. This has involved a great many people, the Steering Group for Coordination of the URSI Scientific Programme, the US National Committee of URSI, the Organizing Committee for the General Assembly, the Commission Chairmen and Vice-Chairmen, and many others.

Participants in General Assemblies, unless they have been involved in the organizational work themselves, find it hard to realize the amount of self-sacrificing labour that has gone into the planning and organizing of the meeting. We are indeed grateful for all this work and I wish to thank again the US National Committee for their invitation and the speakers today for their presence at the opening of this Assembly.

ADDRESS OF THE PRESIDENT,  
PROF. W.N. CHRISTIANSEN

In URSI General Assemblies, preceding the triennial report on Union activities by the Secretary General, the President by tradition is given the opportunity to make some general remarks.

At this XX General Assembly I have very much pleasure in greeting all those assembled. We are delighted that two of our Honorary Presidents, Professors Dieminger and Booker, are here with us, but unfortunately Mr. Ratcliffe was not able to be here. We are very pleased indeed that Mrs Silver has been able to join us today.

I wish to welcome warmly the representatives of other scientific organizations. The CCIR is represented by its Director, Dr. Kirby, who will speak to the Assembly later. Professor Nicolet represents the International Council of Scientific Unions, Dr. Radhakrishnan, the International Astronomical Union, Dr. Evans the International Union of Geodesy and Geophysics, Dr. Carpenter the International Association of Geomagnetism and Aeronomy, Dr. Kaimal the International Association of Meteorology and Atmospheric Physics, Dr. Helliwell and Dr. Pillet the Scientific Committee on Antarctic Research, Dr. Russell the Committee on Space Research, Dr. Waterman the Scientific Committee on Solar-Terrestrial Physics and Dr. Bargellini the International Astronautical Federation. It is very gratifying that many of these representatives are very active in URSI as well as in the organization which they represent at this meeting. The Royal Irish Academy of Dublin is here for the first time and we welcome also the young scientists who are here with the help of the US National Committee, of URSI and ICSU. At its meeting on Friday last, the Council of URSI accepted the two formal applications for membership submitted by the Council for Scientific Research of the Republic of Iraq and by the Academy of Athens, Greece. It is my pleasure to welcome the representatives of these two new Member Committees.

On your behalf I should like to send messages of greetings to Madame Le Corbeiller, widow of Prof. van der Pol, Mr. Ratcliffe, Dr. Minnis and Prof. Hontoy, who have all made great contributions to our Union but are unable to be with us.

Finally I should like to welcome and congratulate our medal winners. The van der Pol Gold Medal was won by Prof. Jones. The Dellinger Gold Medal has been awarded to Dr. Fejer, and the Appleton Prize to Dr. Rishbeth. These awards will be presented on Wednesday in the Regency Ballroom at 5.30 pm.

At every General Assembly, the President has the sad duty to list the losses in our membership during the last three years. During this triennium our losses have been very heavy. Two of our Honorary Presidents, Dr. Smith-Rose and Monsieur Decaux, and some of our most active colleagues have left us. During his life-time, Dr. Smith-Rose saw radio develop from a laboratory curiosity to a technique that has a major influence on the lives of most of the people of the world. He was a member of the Radio Society of Great Britain before the first world war, but his activity in the field in which he is best known,

Radio Direction Finding, commenced in 1920 and he presented a major report on this at the URSI meeting in 1927. His work on direction finding led into problems concerning the propagation of radio waves, especially at UHF and VHF. Dr. Smith-Rose was Chairman of two of our Commissions, and was elected President of URSI in 1960 and an Honorary President in 1966. He was engaged in many activities associated with our Union, e.g. IUCAF and particularly in CCIR.

M. Decaux, who was five years younger than Dr. Smith-Rose, was another of our Vice-Presidents. He was the last link of URSI with Général Ferrié who was our first President. M. Decaux commenced work in 1924 under Général Ferrié to establish a service of absolute frequency measurement. At that time the possible accuracy was only one part in 10,000! During his lifetime the accuracy of measurements increased one billion times. His influence extended far beyond France and beyond URSI, as his knowledge was used by CCIR, IAU and IUGG.

Another of those associated with the earliest days of URSI was Professor Le Corbeiller who died last year.

The death of Dr. John Saxton was a serious blow to URSI. He was our efficient Chairman of the URSI-CCIR-CCITT Liaison Committee and of the URSI Standing Finance Committee. His interests for many years were in tropospheric radio propagation and he served as Chairman of Commission II of URSI in this connection.

Professor Woonton of Canada, well known in URSI, was elected Chairman of Commission VII at Sydney in 1952 and later became a Vice-President of the Union.

Professor Rivault, one of the pioneers of ionospheric research in France, was very active in Commission VIII and was Chairman of the Commission from 1969 to 1972.

In addition to these former office-bearers in the Union, we lost a number of radio scientists who were active in URSI and have made great contributions to our science. Dr. Chapman of Canada who was awarded our Dellinger Gold Medal for his outstanding ionospheric work, the Japanese ionosphericist Dr. Aono, the Australian Professor Webster and Dr. Barnett of New Zealand whose pioneer work with Appleton will be long remembered. Of our members whose interests were mainly in non-ionized media we have lost Professor Goubau of Germany, and later of the United States, Professor Checcacci of Italy and Dr. John Wright of the United States. Finally solar radio astronomy has lost one of its best-known figures Dr. Stephen Smerd.

Our losses during these three years have been very heavy. We shall stand for a few moments in honour of our colleagues no longer with us.

Some people here today are attending an URSI General Assembly for the first time and some are attending their first meeting of an International Scientific Union. It seems to me, therefore, that it might be useful to say a little about the purpose of International Unions and of our Union in particular.

Most countries have their own learned societies where scientists and engineers can meet to discuss new discoveries and developments. However these discussions usually involve only scientists of one

country. Early in this century there was a strong movement to form international bodies where scientists of all countries could meet. Such a body would have a purpose additional to that of providing an international forum. It would provide a means of forming international working groups that could tackle problems that were international, i.e. problems that needed simultaneous action by scientists in different parts of the world.

The first four of these Unions were formed just after the first world war sixty-two years ago. One of this four was URSI. Since then an additional fourteen Unions have been set up and, in addition, an umbrella organization, the International Council of Scientific Unions (ICSU) was formed.

Sixty years ago radio communication was in its infancy and was conducted at what we now regard as very long wavelengths. The mode of propagation of radio waves around the Earth was not well understood although it was suspected that there must be some conducting layer in the upper atmosphere to guide the radio waves around the curved surface of the Earth. The generation and detection of radio waves was effected in rather a primitive way and radio frequency measurements even at the low radio frequencies were not very accurate. Lightning discharges in the atmosphere caused severe interference with long-wave radio reception. Loop direction-finders were known but very severe errors in indicated bearings were found at night. The state of the art of radio communication at that time is described very well in the novels of Saint-Exupéry who was one of the earliest group of pilots of international airmail. The problems I have mentioned were all studied in the early days of URSI.

Soon however a new field was opened by radio amateurs who discovered that long-distance radio communication was possible by means of low-power short-wave transmissions. Scientists soon confirmed the existence of ionized conducting layers in the Earth's atmosphere and a study of the ionosphere for many years became the dominant sphere of interest of URSI. The reason for this lay not only in the extreme importance of long-distance communication, but also in the relation between ionospheric changes and other geophysical phenomena and solar activity.

Most of the scientific investigation of the ionosphere was done by URSI scientists. Some of these scientists became interested in aspects of geophysics and solar astronomy, i.e. in the fields of interest of two other International Unions - Astronomy and Geophysics. The essentially fluid boundaries between the sciences and between the Unions was recognized by URSI from the start. In 1922 a Commission of Cooperation was set up and, in 1928, the Commission was instructed to cooperate with international bodies concerned with geophysics, solar physics and meteorology. Inter-Union bodies have been set up during the whole life-time of URSI.

I shall give special mention to another of the fields of scientific discovery that was pioneered in URSI, and which overlapped the field of another Union. The reason for the special mention is that a session is being held during this General Assembly to commemorate the discovery fifty years ago by a US radio engineer, Karl Jansky, of radio emissions reaching the Earth from outer space. Jansky was investigating radio interference to the transatlantic telephone circuits

which occurred every day at about the same time. By logging the time that this happened, he found that the interval between the occurrences was not exactly 24 hours but a little less. It was in fact 24 hours in sidereal time. The extraordinary inference was that this noise was coming from some fixed direction with respect to the stars. This discovery was followed up by only one person - another US radio engineer - Grote Reber, still active in radio astronomy in Australia. He built the first radio telescope in his backyard and made the first map of the source of radio emission - the Milky Way. URSI set up a Commission in 1949 concerned with radio emissions from outer space, in the first place mainly from the Sun, which had interested the Union for many years.

One of the effects of this new interest to radio engineers was to make them very dissatisfied with the resolving power or beam-width of existing antennas. Up to this time  $1^\circ$  beam-width was considered highly directive but this was quite hopeless for a detailed study of the sky. By the 1952 General Assembly of URSI in Sydney, new antennas had been developed with a beam-width of about  $1/20^\circ$  and with the passage of years the detail available is now not  $1/20$  of a degree but one twenty-millionth of a degree. Radio spectroscopes were developed for the first time and many other new techniques introduced into radio.

Radio astronomers at one stage were being persuaded to leave URSI and let the IAU deal with radio astronomy. However this was resisted by those interested mainly in developing new radio methods for astronomy and a suitable compromise was reached with the IAU as it had been in connection with the ionosphere with the IUGG.

We shall continue to have inter-Union problems of this nature. Our interest in shorter and shorter wavelengths has now brought us into the use of extremely short electromagnetic waves for communication, i.e. light waves for communication. This ancient means of human communication has recently become of even greater importance because of the introduction of what are essentially radio techniques into the production, transmission and reception of light. Should URSI move outside its boundaries into this field? Yes, we say, we shall move anywhere our techniques are likely to produce new knowledge and improve human communication.

Thus URSI is always flowing over its previous boundaries and I hope will continue to do so, not in any sense taking over from other scientific bodies, but in pioneering new fields. If we do this URSI will not grow old.

Before I stop I should mention that we have had organizational difficulties in the Union during the last three years. These will be discussed by the Secretary General in his Report. After the serious illness of Prof. Hontoy who was elected as Secretary General at the last General Assembly, the Board managed to obtain a new honorary General Secretary in Belgium, Prof. Van Bladel who has managed to surmount the difficulties of being suddenly thrust into a new job while heavily engaged in University work and also being separated in space from the Secretariat in Brussels. We must thank Prof. Van Bladel and our wonderful Madame Stevanovitch for the efficient running of the Secretariat under very difficult conditions. We are deeply grateful to Dr. Minnis who from time to time untangles some of the knots of URSI

and is always ready to help. Our Treasurer, Prof. Gordon, has had a very heavy load, operating as he was from a long distance and, in addition, he has chaired the Steering Group for the Coordination of the URSI Scientific Programme of our Union. We are particularly grateful to him also.

During the last three years, therefore, we have had a number of difficulties in our own organization and one can see others looming up in the years ahead. However I am sure that the new Board that is to be elected at this Assembly will overcome these and URSI will continue to be the great pioneering Union that it has been during six decades.

#### REPORT OF THE SECRETARY GENERAL,

PROF. J. VAN BLADEL

It is the Secretary General's duty to give a brief and factual report on the scientific activities, the finances, and the administrative situation of the Union. This Report is traditionally presented partly in English and partly in French, the two official languages of URSI.

The scientific activities are of a four-fold nature:

- the sponsorship and organization of meetings between General Assemblies,
- the efforts of groups such as the Inter-Union Working Groups,
- the activities of the Member Committees within their own territory,
- the scientific programme at the General Assembly.

With respect to the meetings between Assemblies, let me remind the delegates that sponsorship occurs according to three modes, Mode A, without financial participation; Mode B, with a fixed, but modest, grant; Mode C, with shared financial responsibility - not exceeding 50% for our Union - and proportional participation in surplus or deficit.

Detailed guidelines can be obtained from the Secretariat, which handles the applications. The well-oiled procedure involves the Treasurer, the Commission Chairmen and the Board of Officers.

During the last triennium, URSI sponsored about 50 scientific meetings. Some of these were very actively planned and originated by one of our Commissions. This was the case, for example, for the well-attended Commission B Symposium on Electromagnetic Theory, organized in Munich as the latest in a series of triennial events started in 1953. Another example is the Commission F meeting on the Effects of the Lower Atmosphere on Radio Propagation, held in Lennoxville. Some Commissions, of which E is an example, prefer to organize URSI sessions at meetings put together by other scientific bodies. It is the wish of our Union that such direct and active involvement of the Commissions be increased between General Assemblies. It is perhaps appropriate to mention the number of meetings sponsored by our various

Commissions: 3 for Commission J; 4 for Commissions A, B and D; 5 for Commissions E and H; 7 for Commission F; and 9 for Commissions C and G.

Lack of time does not allow me to discuss the activities of the numerous working groups and liaison committees which contribute so much to the rôle of URSI as an international body. Their efforts will be reported at length at the URSI Council. A typical example is the Symposium on Active Experiments in Space Plasmas, put together by the URSI Working Group H.2.

In the same vein, only a few words can be said concerning the programmes organized directly by the Member Committees, and which vary widely according to the nature of their scientific interests and their particular geographical circumstances. The very successful bi-annual meetings of the US Committee are known to all of us. The Committee in the Federal Republic of Germany has an annual gathering in Kleinheubach. The Swedish Committee plans a two-day event this coming September to commemorate the 50th anniversary of its creation. The Spanish Committee organized a two-day Symposium last October, designed to give a new international impetus to the practice of radio science in Spain. The President of the Spanish Committee kindly invited me to attend the meeting, and to say a few introductory words. The list of these activities could be extended, but the time has now come to mention the programme of the General Assembly.

Its general structure will be discussed by Vice-President Gordon, who chaired the Steering Group in charge of the programme. The main problem, as always, has been to find a balance between the specific concerns of URSI, to wit an up-to-date critical review, given by a few experts, of recent progress in the very broad fields covered by our Commissions, and the desire to provide a forum for contributions from a large number of radio scientists, in particular from the younger members of our community. The solutions arrived at were strongly influenced by a Questionnaire answered by the participants in the Helsinki General Assembly, and distributed six months after the event. This grassroots poll of the URSI constituency will be repeated this year, but the Questionnaire is now included in the registration papers. May we urge you to fill it in, and to either drop it in one of the ballot boxes, or send it to the Brussels Secretariat later on. Your efforts will be invaluable for the planning of the 1984 Assembly.

Avant de quitter le sujet de l'Assemblée générale, permettez-moi de mentionner un programme qui a été revitalisé ici à Washington, celui des Jeunes Scientifiques. Avec l'aide financière du Conseil International des Unions Scientifiques, l'ICSU, et surtout celle du Comité Américain, nous avons pu allouer des bourses de 300 dollars à une trentaine de nos jeunes collègues, dont une douzaine appartiennent à des pays en voie de développement. Quatre d'entre eux ont obtenu, en plus, une subvention de voyage du COSTED, le Comité pour la Science et la Technologie dans les pays en voie de développement. Cet effort est particulièrement bienvenu étant donné l'intérêt croissant que notre Union porte à l'aide scientifique qu'elle peut apporter au Tiers-Monde et à l'extension, prudente mais résolue, du nombre de ses membres.

Passons maintenant à une analyse rapide des problèmes adminis-



tratifs de l'URSI au cours des trois dernières années. On se rappellera que notre Union disposait, dans la première moitié des années soixante-dix, d'un Secrétaire général appointé, travaillant à plein temps. A partir de 1978, cette fonction a été transformée en un mandat électif, similaire à celui des autres membres du Bureau, et à temps tout-à-fait partiel. Le Professeur Hontoy, élu à cette fonction, ne l'a acceptée que moyennant un transfert d'une partie des responsabilités du Secrétaire général à d'autres membres du Bureau. La mise en place du nouveau système ne s'est pas faite sans difficultés. Plusieurs d'entre nous savent que le Professeur Hontoy est tombé malade dès octobre 1978, et que la maladie l'a contraint à démissionner de ses fonctions en septembre 1979. Au cours de cette première et difficile année, le Secrétariat a été maintenu en place grâce au dévouement du Dr. Minnis, prédecesseur du Prof. Hontoy, qui a bien voulu reprendre du service vu l'état d'urgence. Depuis deux ans, nous sommes revenus à une solution plus normale. L'expérience de ces deux années a montré, et on aurait pu s'en douter, que la dispersion des responsabilités s'est accompagnée de bruit dans les canaux d'information. Pour éviter cette légère confusion, nous avons dû revenir quelques pas en arrière, et décider que la correspondance soit à nouveau centralisée au Secrétariat, afin que celui-ci puisse retrouver sa fonction traditionnelle de centre d'archives et d'acheminement des données. La comptabilité journalière, en particulier, qui avait été confiée au Trésorier, est revenue à Bruxelles depuis janvier. Il s'est avéré, en effet, que l'expédition des documents comptables ainsi que l'envoi des explications nécessaires, nous coûtait plus d'efforts que la tenue des livres elle-même. Ici, encore, le Dr. Minnis s'est généreusement mis à notre disposition pour faciliter cette double transition.

I have just mentioned that the farming out of responsibilities to Members of the Board has only partially decreased the work of the Secretariat. In fact, the load put on the shoulders of our very capable administrative assistant, Mrs Stevanovitch, has become markedly heavier than in the past, particularly at times of peak activity, such as the period encompassing the General Assembly. Mrs Stevanovitch has borne this load with remarkable fortitude, sense of duty and good spirits.

Let me conclude by saying a few words about the financial situation of our Union. Thanks to the wisdom of the Treasurer and his Finance Committee, the income of the last triennium has been sufficient to cover expenses. I hope that these gentlemen will be as far-sighted with respect to the period 1982-84, plagued as we are by the instability of the main national currencies, and the vagaries of the rates of inflation. I might mention that the relations between the Secretariat and the Treasurer are of central importance. Although the detailed, mechanical accounting procedures are back in Brussels, where most expenditures originate anyhow, the Treasurer remains responsible for the global yearly accounts, all decisions involving principles, and the general financial strategy.

I believe this survey has shown clearly that an organization such as ours, with vast scientific interests but negligible material assets, lives through the devotion and good will of the ensemble of its members. Our assets are human assets, and we would soon wither if we could not count on the competence and administrative ability of

our Officers, Commission Chairmen and Committee members. To give strength to this Commonwealth, may we urge you to participate in the life of URSI by following the activities of the Council and the Commissions. The Agenda of most meetings are scheduled to be posted on the Bulletin boards, and you are always welcome to communicate your views to your national delegates.

REMARKS OF THE DIRECTOR OF CCIR,

DR. R.C. KIRBY

Mr. President, Mr. Secretary General, Distinguished Officers of URSI, Ladies and Gentlemen:

The International Union of Radio Science, one of the oldest and most distinguished international scientific unions, has important relations with many scientific and technical disciplines and their organizations. But no relationship is closer to URSI's traditional radio science activities than that with the ITU's International Radio Consultative Committee. This is why I am privileged to participate in this XX General Assembly and to bring the greetings and warm wishes of the CCIR.

CCIR and URSI share much common ancestry and a history of more than fifty years of cooperation. They are, by design and by needs, very different organizations, but their bond remains strong and fruitful. Leadership from radio science is still found among the leadership in international telecommunications, and URSI studies remain vital to the work of CCIR. No fewer than six Chairmen and Vice-Chairmen of CCIR Study Groups are present here participating in URSI.

During the past decade CCIR has increasingly filled its rôle in preparing the technical bases for ITU Administrative Radio Conferences, in which frequency allocations and radio regulations are adopted as international law. Such technical preparation for international radio conferences was one of CCIR's earliest objectives. During the 1970's it became an intense activity in preparation for five world and regional conferences for satellite communications, maritime radio, broadcasting, and finally the famous World Administrative Radio Conference, WARC-79.

Recommendations on propagation data, for example, suggested the appropriate frequency bands for different service requirements, and certain propagation prediction methods become an integral part of procedures for frequency planning laid down by regulation. CCIR's recommendations on radio astronomy led to protection of certain frequency lines of natural origin. Recommendations and reports on modulation, protection ratio, antenna performance and frequency tolerance, guide the regulatory provisions for bandwidth and orbit utilization. For satellite broadcasting, CCIR studies already provided the basis for an international plan of frequency assignments and orbit utilization.

Decisions taken by the WARC-79 are now greatly influencing the work and course of CCIR. Some ninety Resolutions and Recommendations of the WARC-79 request studies for future radio regulation, technical criteria for spectrum utilization, and preparation for more than ten international radio conferences are to be held in the next five or six years.

A world conference for the mobile services will be held in 1983 to harmonize regulations for aeronautical, maritime, and land services, to improve distress and safety provisions, and to take account of new technology and systems. CCIR studies concern the technical and operational aspects of distress and safety communications, digital selective calling, maritime radio telephony connected to the land telephone network, numerical identification of ships, and other topics.

Another 1983 conference, of particular interest to the Region of Americas, will plan the broadcasting satellite service in North, Central and South America. Studies are underway on system technology, propagation factors, antennas and receivers, as well as studies on frequency sharing and orbit planning.

Following expansion of the VHF broadcasting band to 87.5 to 108 MHz in Europe and Africa, a regional conference in 1982 will revise the broadcasting station plan. CCIR is studying the sharing criteria, as well as compatibility with aeronautical radio navigation service operating in the adjacent band just above 108 MHz.

A world conference on short-wave broadcasting is scheduled for 1984 and will plan the use of high frequency broadcasting channels. CCIR is reviewing the technical factors and also examining the possibilities for future single sideband broadcasting.

In 1985 there will be a world space conference relating to the use of the geostationary satellite orbit and the planning of the space services using it. This important conference is the focus of attention of ITU countries, large and small, as it has the objective "to guarantee in practice for all countries equitable access to the geostationary satellite orbit and the frequency bands allocated to the space services". CCIR is expected to provide the technical principles, criteria, and parameters required for planning the space services. These studies of course concern sharing criteria, but place emphasis on techniques for more intensive utilization of the orbit, and on optimization of spacing, so as to provide more possibilities for utilization by all countries.

Thus technical preparation for international radio conferences has become big business and CCIR has had to review its organization and working methods with this in mind.

But the Study Groups continue, with the advance of technology, to develop the recommendations needed for efficient, compatible operation of radio systems in international telecommunication. In television broadcasting, for example, it is hoped that a world standard for digital television transmission can be adopted this autumn at the meeting of the broadcasting study groups. Such a standard for the studio-transmitter links, and for exchange of programmes, would finally bring together in the realm of digital technology, the diverse analog standards in use throughout the world, and would provide a

standard for digital video tape recording.

In the mobile maritime service, a digital selective calling system has been adopted and a draft recommendation prepared for an automated VHF/UHF maritime telephone system. An important trial programme is now underway for using low power distress transmitters in the International Maritime Satellite System.

In the field of microwave radio relay systems, CCIR is currently developing radio frequency channelling arrangements for digital and mixed analog/digital systems.

These few examples illustrate work toward system standards, and like the conference preparations, are mainly of an engineering nature. There are still others of a scientific nature of interest to URSI.

Important propagation questions remain, especially for tropical regions of the world where much telecommunications development is taking place. For both terrestrial and earth-space links, it is important to have systematically good estimates of rainfall effects above 10 GHz, requiring both adequate meteorological data and improved interpretation of propagation effects. Attenuation, scattering and cross-polarization are all important as these affect interference and frequency reuse. The importance of these topics cannot be overstressed for telecommunication development in tropical regions in view of the need to avoid overcrowding of the lower frequency microwave bands. New rain climatological maps are being prepared, and a working party is meeting on this subject even during the course of the URSI General Assembly. Duct propagation is also of critical importance in the planning of microwave links and broadcasting services in Africa, the Gulf regions, and in certain other regions. It is important to know what allowances can be made in the design of links and services in such regions, and to be able to predict usefully the interference effects.

The concept of the solar power satellite raises important questions for international telecommunications. The CCIR is expected to advise ITU on the technical problems which might be posed by the prospect of relaying at microwave frequencies, power at the level of about 5 gigawatts collected in the geostationary satellite orbit and concentrated in a narrow beam to Earth at say, about 2.5 GHz. I note with interest Professor Gordon's lecture on this topic scheduled for Friday morning.

In the area of communication theory and the studies of Commission C, there continues a strong CCIR interest in the fields of digital signal processing and of multi-user channels. One of the resolutions of WARC-79 asks CCIR to give special attention to new techniques for multi-user channels, such as packet radio, spread spectrum and other techniques for aggregating a number of users in the same bandwidth.

The work of Commission E should assure a good scientific base for studies of electromagnetic noise and interference, and is widely applicable to CCIR questions. The programme of papers at the present Assembly is especially interesting, dealing as it does with both theoretical models and measurements of man-made noise and noise of natural origin.

It would seem that Commission J should not relax its attention to the relationship between radio astronomy and the problems of geostationary satellite orbit utilization to be considered in the world conference of 1985.

I have mentioned a few scientific topics of interest to CCIR, omitting many of importance, especially in metrology and ionospheric radio.

In touching upon scientific topics of interest both to URSI and CCIR it is time to pay tribute to certain scientific leaders shared by URSI and CCIR who have died since the last General Assembly. Dr. R.L. Smith-Rose was Chairman of CCIR work on propagation (Study Group 5) and Professor B. Decaux was Chairman of CCIR studies on standard time and frequency. I must make special mention of the recent death of Dr. John Saxton, eminent scientist in the United Kingdom, whose death seventeen months ago was a great loss both to URSI and CCIR. Dr. Saxton was a leader in both organizations, being Chairman of Study Group 5 on propagation, and of the CCIR Special Preparatory Meeting for the WARC-79. He was Chairman of the CCIR-URSI Liaison Committee.

This chairmanship has now been undertaken by Mr. Marcel Thué of France, distinguished Chairman of the CCIR/CCITT joint study group on vocabulary. Mr. Thué has already become very active in this task and has prepared an outline of cooperation between URSI and CCIR. Some results are already reflected in the programme of this Assembly, and Mr. Thué also has a very detailed list of topics being studied in CCIR to which URSI contributions would be useful.

I have outlined three CCIR activities, the technical preparation for international radio conferences, the development of recommendations for the interworking of radio systems, and the study of basic technical questions to guide future development. There is a fourth field, of growing importance, "technical cooperation" with developing countries. ITU has more than 150 member countries, of which only 40, mostly technically advanced, participate in the technical work of the CCIR study groups. But CCIR results are increasingly expected to be relevant to all member countries of ITU. Succeeding CCI Plenary Assemblies, and the ITU Administrative Council, stress repeatedly the need for CCI's to increase the relevance of their work to developing countries.

Each CCIR Study Group identifies its recommendations and reports of special interest. Questions have been invited from developing countries and their regional organizations. CCIR Study Groups are preparing special material. Study Group 1 is developing a handbook on computer utilization in spectrum management; Study Group 4 is preparing a handbook on satellite system planning. The broadcasting study groups are drafting a handbook on sound and video recording techniques. The propagation study groups are supporting a seminar on propagation in tropical regions to be held in Africa in late 1981 or early 1982.

So what has this to do with science? I believe CCIR's increasing commitments to radio conference preparation, to system standards, and to technical cooperation for developing countries, mean that the link with URSI becomes ever more important to assure a continuing base of

radio science and its international exchange for telecommunications development.

The technical programme of the XX General Assembly has great significance for telecommunication. I wish you a most successful meeting.

#### REMARKS ON THE SCIENTIFIC PROGRAMME

BY PROF. W.E. GORDON, VICE-PRESIDENT OF URSI

Mr. President, Distinguished Guests, Ladies and Gentlemen:

It is a great pleasure to welcome you to the scientific activities of URSI at this XX General Assembly. An Assembly is a peak in URSI activities that occurs every three years, but it is richly sustained by the many symposia sponsored or cosponsored by URSI between Assemblies.

At this Assembly some 600 papers, selected by Commission Chairmen and their colleagues, will be presented to inform you, to provoke discussion and to stimulate interest in scientific areas of opportunity. May I take a moment to express the gratitude of the Steering Group for the Coordination of URSI Scientific Programme to the Commission Chairmen, to their session organizers and the local arrangement committee for their untiring efforts, friendly cooperation and prompt responses to requests from the Steering Group in assembling the scientific programme. A special word of thanks to Dr. Hal Altshuler and Dr. Tom Senior for their responsible preparation of the programme and abstract booklets.

The scientific work is presented in sessions of single Commissions, in joint sessions between Commissions on topics of mutual interest, in open symposia on subjects selected for their special importance, and in programmes a portion of which are included in this Assembly and another portion in adjacent meetings elsewhere. You should know that virtually every member of URSI has contributed one or more papers to the programme, however, this was not a criterion in selecting papers.

Although we are about to participate in an intensive exchange of information and ideas at this Assembly, let me remind you that over the past three years each of the nine Commissions of URSI has averaged one or more scientific symposia a year and the total number is about 50 which attests to the scientific vitality of the Union. At this Assembly the Commissions will plan for symposia over the next three years befitting the continuing developments in the fields of URSI.

We each by our presence here have the special opportunity to grow as we hear of exciting developments, as we discuss new ideas in our areas of special interest, and as we find ways of making radio science better serve mankind. The Steering Group hopes that the scheduled programme for this XX General Assembly serves you well,

that you find yourselves stimulated, perhaps exhausted at the end of the Assembly. Welcome to the heart of URSI's activities, the scientific sessions.

## CLOSING MEETING

Wednesday morning, 19 August 1981

The Closing Meeting of the General Assembly was held at the Hyatt Regency Hotel in Washington, D.C., on the morning of 19 August 1981.

### ANNOUNCEMENTS

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

- (a) the results of the elections for the Board of Officers, and Chairmen and Vice-Chairmen of Commissions for the period 1981-1984 (see page 39);
- (b) the decision of the Council to confer the title of Honorary President on Sir Granville Beynon and Professor I. Koga (see page 42);
- (c) the decision of the Council to confer the title of Secretary General Emeritus on Dr. C.M. Minnis (see page 42);
- (d) the admission of Greece and Iraq as Members of URSI (see page 40);
- (e) the creation of a Standing Committee on Developing Countries;
- (f) the decision to hold the XXI General Assembly of URSI in Florence, Italy, in 1984, at the invitation of the Italian URSI Committee.

### CLOSING REMARKS OF THE PRESIDENT

This Assembly has been a most successful and happy occasion. The planning of the scientific programme has been excellent, we have had some outstanding new work described, we have had for the first time a large group of young scientists who have been assisted to attend the conference, and finally the social arrangements made for the participants and the accompanying persons have been most pleasant. All this, of course, has been the result of an enormous amount of work by a great number of people.

Starting with the scientific programme we have the hard and fruitful work over the last three years by the Steering Group of our Union: Professors Gordon, Stumpers and Van Bladel, and Sir Granville Beynon with the help of our Commission Chairmen.

The organization of the Assembly has been an enormous task, done with very great efficiency by the Committee under Dr. G. Hyde, as Chairman and Mr. Dow as Executive Secretary. The great number and variety of tasks of the Committee were carried out by Dr. Altschuler, Mr. Arens, Mr. Hagn, Profs Lang, Senior and Taylor, Drs Weinschel, Young and Westerhout. Mrs Nancy Kelso took on the heavy task of planning and carrying out the programme for accompanying persons. The women know how hard and well she worked. We are deeply grateful for the wonderful work of all these people - all done so efficiently and



pleasantly.

Then during the conference we have had Mrs McGuire's group in the registration and information area, always ready to help patiently and in the most friendly way. Behind the scene has been Mrs Pam Wood and her assistants hard at work giving secretarial assistance to RSI's Officers, to our Secretary General, Prof. Van Bladel. He and our Executive Secretary, Mrs Stevanovitch, with the frequent help of our colleague Dr. Geneviève Pillet, have worked day and night preparing all the documentation for the Council and Board of Officers.

URSI is particularly grateful to the US National Committee and to Dr. Gordon Little. Without their help the meeting could not have taken place. We must also thank the US National Academy of Sciences who invited us here.

I am sure that I have forgotten to mention some people in my list of those who have helped us, so I must add our thanks to the Unknown Helpers.

We have had a wonderful time in Washington, both in our working time and during the periods that we have had to see some of the remarkable art collections and museums of this city. We have all been struck by the friendliness of everyone towards us. We foreigners leave your country with warm memories of our visit.

I have come to the end of my term as President of URSI and it is my very pleasant duty to hand over this task to Professor Gordon who is well known to you all.

#### ADDRESS BY THE INCOMING PRESIDENT

I am most honored by the action of your Council to serve you as President of URSI for the next three years. I look forward to working with you, and with the Board of Officers, Past President Prof. Christiansen, Vice-Presidents Dr. Mitra, Prof. Smolinski, Prof. Cullen, Prof. Okamura, and the Secretary General Prof. Van Bladel.

URSI has some special opportunities as we look ahead. Radio in radio science has expanded to include optics as telecommunication sciences grow, and remote sensing now ranges from the solar system on the one hand to exploring the human body on the other hand.

For the first time a large number of young scientists including many from the developing countries have participated in the Assembly. We expect that URSI can contribute to their growth and can assist them in developing telecommunications and the supporting radio sciences in their countries.

Finally URSI has a strong, working relationship with CCIR and we propose to assure the strength of that interaction and add to it in areas where appropriate.

Many of us will be meeting in smaller groups during the next three years at URSI sponsored symposia as we continue our collaboration and exchanges, and I hope that all of us will have the pleasure of meeting again at the XXI General Assembly in Florence in

1984. Bon voyage as you travel homeward.

Arrivederci a Firenze!

## REPORTS OF MEETINGS

### URSI BOARD OF OFFICERS

The incoming Board met in Washington, D.C. on 18 August 1982. Those present were: Prof. W.E. Gordon (President), Prof. W.N. Christiansen (Past President), Prof. A.L. Cullen, Dr. A.P. Mitra, Prof. S. Okamura and Prof. A. Smolinski (Vice-Presidents), Prof. J. Van Bladel (Secretary General). Prof. F.L. Stumpers and M. Voge also attended.

#### 1. Appointment of Treasurer

In accordance with Art.36 of the Statutes, Prof. A.L. Cullen was designated as Treasurer of URSI for the period up to the end of the XXI General Assembly.

#### 2. Division of Responsibilities within the Board

It was agreed that the responsibilities should be distributed between the individual members of the incoming and the outgoing Board as follows:

- 1) Relations with ICSU: Prof. W.E. Gordon.
- 2) Financial matters: Prof. A.L. Cullen.
- 3) Publications, excluding *Review of Radio Science*: Prof. J. Van Bladel.
- 4) Advisory Panel on URSI Awards: Prof. S. Okamura.
- 5) COSTED, URSI Committee on Developing Countries and Young Scientists Programme: Dr. A.P. Mitra.
- 6) Committee on URSI Membership: Prof. S. Okamura.
- 7) Committee on Future General Assemblies: Prof. A. Smolinski.
- 8) Relations with Engineering Societies: Prof. A. Smolinski and Prof. F.L. Stumpers.
- 9) Relations with International Telecommunication Union and its technical committees: Prof. F.L. Stumpers, in consultation with M.M. Thué, Chairman of the URSI-CCIR-CCITT Committee.
- 10) Liaison with UNESCO: M. J. Voge.

#### 3. Steering Group for Coordination of URSI Scientific Programme

It was agreed that the composition of this Group would be considered later by the President, in consultation with the other members of the Board.

#### 4. Approval of Sponsorship of Scientific Meetings

The Board considered the recommendations for sponsorship of symposia submitted by the Commissions and agreed to grant the sponsorship of the Union to a number of them. More information will be requested from the organizers of the other meetings.

#### 5. Executive Secretary

The Board agreed to give the title of Executive Secretary to Mrs Y. Stevanovitch.

## SUMMARY REPORT ON MEETINGS OF THE URSI COUNCIL

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

### 1. Membership of the URSI Council, August 1981

*President:* Prof. W.N. Christiansen

*Representatives of Member Committees:*

Argentina:	Prof. S. Radicella
Australia:	Prof. R. Frater
Austria:	Univ. Doz. Dr. R. Leitinger
Belgium:	M. M. Gewillig
Brazil:	Dr. P. Kaufmann
Bulgaria:	Dr. T. Panteleev Dachev
Canada:	Dr. E.V. Jull
Czechoslovakia:	Prof. V. Zima
Denmark:	Prof. J. Bach Andersen
Egypt:	Dr. I. Mandour
Finland:	Prof. M. Tiuri
France:	Dr. M. Petit
German D.R.:	Dr. A. Iwainsky
Germany, F.R. of:	Dr. H.J. Albrecht
Hungary:	Prof. K. Géher
India:	Dr. P. Bhavsar
Ireland:	Prof. W.D. Ryan
Israel:	Dr. J. Shapira
Italy:	Prof. G. Barzilai
Japan:	Prof. S. Okamura
Netherlands:	Prof. H. Blok
New Zealand:	Prof. R.L. Dowden (alternate: Prof. Mc.A. Stanbury)
Nigeria:	Dr. O. Oyinloye
Norway:	Dr. D.T. Gjessing
Peru:	Dr. C. Calderon
Poland:	Prof. S. Hahn (alternate: Dr. J. Dobrowolski)
Portugal:	Dr. L.F.G. Oliveira
South Africa:	Dr. D.G. Nicolson
Spain:	Prof. M. Rodriguez Vidal
Sweden:	Prof. S. Lundquist
Switzerland:	Prof. F. Gardiol
Taiwan:	Prof. Mei-Hwa Wang (alternate: Prof. Chu-I Chang)
United Kingdom:	Prof. A.L. Cullen
USA:	Dr. C.G. Little
USSR:	Prof. M.E. Zhabotinskij
Yugoslavia:	Dr. Lj. Cander

*Secretary:* Prof. J. Van Bladel

*Observers:* Dr. May Kaftan (Iraq)

Prof. G. Fikioris (Greece)

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

## 2. Formation of Temporary Committees

### *Publications Committee:*

Prof. T.B.A. Senior (USA) Chairman  
Prof. R.L. Dowden (New Zealand)  
Prof. K. Géher (Hungary)  
M. M. Thué (France)  
The Secretary General ex officio.

### *Drafting Committee:*

Prof. A.L. Cullen (UK)  
Dr. J.V. Evans (USA)  
M. M. Thué (France)

### *Advisory Group on Proposed Fusion of Commissions G and H:*

Prof. E.V. Jull (Canada) Convener  
Prof. S. Lundquist (Sweden)  
Prof. S. Okamura (Japan)

### *Advisory Group on Remote Sensing:*

Dr. C.G. Little (USA) Convener  
The Members of the Inter-Commission Working Group on Remote Sensing: Dr. J.O. Thomas (UK), Dr. D.L. Croom (UK), Dr. D.T. Gjessing (Norway), Prof. J. Bach Andersen (Denmark), Dr. B. Landmark (Norway), Dr. M. Crochet (France)  
The Chairmen and Vice-Chairmen of URSI Commissions  
The URSI Representative on SCOR (Dr. J.P. Apel (USA))  
The Chairman of IUCRM (Dr. S. Wickerts (Sweden)).

## 3. Election of Board of Officers

The results of the elections were as follows:

*President:* Prof. W.E. Gordon (USA)

*Vice-Presidents:* Prof. A.L. Cullen (UK)  
Dr. A.P. Mitra (India)  
Prof. S. Okamura (Japan)  
Prof. A. Smolinski (Poland)

*Secretary General:* Prof. J. Van Bladel (Belgium).

Professor W.N. Christiansen remains a member of the Board as Past President. The Board later designated Prof. A.L. Cullen as Treasurer.

The Council decided to confer the title of Honorary President on Sir Granville Beynon (UK) and Prof. I. Koga (Japan), and to confer the title of Secretary General Emeritus on Dr. C.M. Minnis (UK).

## 4. Election of Chairmen and Vice-Chairmen of Commissions

The names of candidates for election were submitted by the respective Commissions and the elected Officers are listed on page 7.

#### 5. Admission of Member Committees

The Council agreed unanimously to accept the applications for membership received from the Academy of Athens, Greece, and from the Council for Scientific Research of Iraq. Both Committees will adhere to URSI in Membership Category 1.

#### 6. Finances

The Treasurer expressed his appreciation of the prompt payment of their annual contributions by almost all Member Committees, which greatly facilitated the management of URSI finances.

The Council received a detailed report on finances prepared by the Treasurer. This included the audited accounts for the years 1978, 1979 and 1980.

These documents were considered by the Standing Finance Committee which submitted its Report and recommendations for the next triennium. They are reproduced on pp.44-48.

#### 7. Young Scientists Programme

The Members of the Council were informed that, for the implementation of this programme, funds had been made available by the US Committee for URSI, by ICSU/UNESCO and by URSI itself. In addition, COSTED supported a few young scientists from developing countries by providing funds to cover their travel expenses to Washington. The young scientists who received assistance came from the following countries: Australia, Brazil, China, Denmark, Finland, France, India, Iran, Italy, Netherlands, Nigeria, Poland, Spain, Sweden, Taiwan, United Kingdom and USSR.

The Council agreed that a similar programme should be arranged for the next URSI General Assembly to be held in Florence, Italy, in 1984.

#### 8. Future Assemblies

For the 1984 General Assembly, invitations had been received from the URSI Committees in Italy (Florence) and in Sweden (Uppsala).

The results of the vote were 98 votes for Italy and 83 votes for Sweden. The XXI General Assembly of URSI will therefore be held in Florence, Italy, in late August 1984.

The Council noted the invitations received from the URSI Member Committees in India, Israel and New Zealand for the 1987 General Assembly, and referred them to the Standing Committee on Future Assemblies. The final decision will be made by the Council in 1984.

#### 9. Standing Committee on Developing Countries

Dr. A.P. Mitra, Chairman of the Committee, submitted a report on the discussions which had taken place during the Assembly. A draft programme of activities was presented to the Council. This recommended the organisation, in developing countries, of workshops and training programmes arranged in conjunction with scientific symposia, possibly in collaboration with CCIR.

It was agreed that the Committee would undertake the preparation of two publications:

1. A "Handbook on HF Propagation", particularly relevant to the equatorial regions, to be prepared in such a way as to be used for teaching in universities in developing countries.
2. A "Directory of Radio Science Groups in Developing Countries". Indeed part of the difficulties of URSI to undertake effective programmes for developing countries is the absence of adequate information on the existing radio science activities in these countries.

The Committee recommended also the organisation of an "Open Symposium on Radio Science Problems for Developing Countries" at the time of the XXI General Assembly in 1984. The programme would include a number of specially prepared lectures on 2 or 3 topics of special concern to developing countries. It would be associated with a Training Programme on a specific topic.

#### 10. Relations with the International Telecommunications Union

The rôle of the URSI-CCIR-CCITT Liaison Committee in maintaining close relations with the technical bodies of the ITU was reviewed. Following the untimely death of Dr. J.A. Saxton, Chairman of the Committee, M. M. Thué had kindly accepted to replace him. The members of the Committee are all individuals with close connections with both ITU and URSI, and it was felt that this would serve to improve the cooperation, the main aspects of which are:

- 1) the organisation of symposia which deal with topics of direct interest to CCIR and CCITT;
- 2) the rôle of URSI as a scientific adviser to CCIR in the study of many specialized problems.

#### 11. Fusion of Commissions G and H

An ad hoc Advisory Group had been formed under the chairmanship of Dr. Jull to consider the proposal of the French URSI Committee (CNFRS) to unite Commissions G and H. This Committee submitted its recommendations to the Council which adopted them with minor changes. It was agreed that the period between the XX and the XXI General Assemblies would serve as a trial period during which the two Commissions would closely collaborate, and that a final decision would be taken in 1984 in the light of experience.

The Resolution adopted by the Council appears on p.97 of this Volume.

#### 12. Remote Sensing

Dr. C.G. Little, who had been designated by the Council to chair the ad hoc Advisory Group on Remote Sensing, reported on the work of his Group which had to consider the proposal to form, within URSI, a new Commission on Remote Sensing. A large number of individuals, including the Chairmen and Vice-Chairmen of all URSI Commissions, had been consulted. The main recommendations were: a) to modify the title of Commission F on Wave Phenomena in Non-ionized Media so as to

include remote sensing of neutral atmosphere, oceans, land and ice; b) to form an Inter-Commission Coordinating Group on Remote Sensing to coordinate the activities internal to URSI; c) to explore the possibilities to set up an inter-organization body to foster the research in the area of remote sensing.

The decisions taken by the Council regarding the coordination of research in remote sensing and the rôle of the Inter-Union Commission on Radio Meteorology are given in Resolutions U.14 and U.15 (see p. 98).

### 13. Influence of Man's Activities on Telecommunications

A discussion meeting had been convened during the Assembly by Prof. K. Rawer, but the report had not been available in time for consideration by the Council. The question of the possible continuation of the Inter-Commission Working Group on this subject was referred to the Board of Officers.

### 14. Solar-Terrestrial Physics

The Council discussed at some length the rôle of SCOSTEP in the coordination of interdisciplinary projects. It was agreed that URSI should continue to offer cooperation, in particular in the organisation of the 5th International Symposium on Solar-Terrestrial Physics which will be held in conjunction with the COSPAR Meeting in Ottawa in 1982, and which is being cosponsored by SCOSTEP, COSPAR, IAU, IUGG, IUPAP and URSI.

### 15. Relations with other Scientific Unions

Reference was made to the proximity of dates of the URSI General Assembly and the Scientific Assembly of IAGA, which made it difficult for scientists associated with both organizations to attend the meetings.

The Council agreed that a better coordination should be achieved in the future in the planning of meetings held by URSI, IUGG, IAGA, IAMAP, SCOSTEP and COSPAR. It decided to pass a Resolution reaffirming Lima Resolution C.1 which already dealt with this problem.

### 16. Honorary Officers

The Council decided unanimously to confer the title of Honorary President on Sir Granville Beynon, President 1972-1975, and on Prof. I. Koga, President 1963-1966, and the title of Secretary General Emeritus on Dr. C.M. Minnis, Secretary General 1968-1978.

### 17. Federation of Astronomical and Geophysical Services (FAGS)

It was pointed out that the problem of funding the activities of the Services would be more acute in the coming years as the support provided by ICSU/UNESCO was likely to be seriously reduced, if not suppressed. Two of these Services are of interest to URSI: the Bureau International de l'Heure (BIH) and the International Ursigram and World Days Service (IUWDS).

It was agreed that, for the time being, the Council should adopt



formal resolutions assessing the value of the services rendered to the scientific community by BIH and IUWDS, and that a formal letter should be drafted jointly by the three interested Unions (IAU, IUGG and URSI) inviting ICSU to reconsider its position.

## REPORT OF THE STANDING FINANCE COMMITTEE

### 1. Accounts for the years 1978-1980

The Standing Finance Committee has examined the accounts of URSI for the years 1978-80 as audited by Gimson and Co. (for 1978 and 1979) and by Scott Wise (for 1980). The summarized accounts, as presented to the Council, are consistent with the annual audited accounts. It is recommended that the latter be published in the *Proceedings of URSI General Assemblies* Volume XIX (see page 49).

The Committee notes the excess of income over expenses for the three years as \$27,000, and this becomes a part of the reserve for the XX General Assembly.

The Committee recommends the approval of the audited accounts for 1978, 1979, 1980 and wishes to place on record its appreciation of the careful way in which the Treasurer and the Board of Officers have managed the finances of the Union during these three years.

### 2. Budget for 1982-1984

2.1 Budget predictions are made extremely difficult by the existence of two major unknowns:

- (a) the inflation rate in the country of main URSI expenditure, Belgium, and
- (b) the value of the US dollar with respect to other currencies, in particular to the Belgian franc.

Over the past decade, both quantities have been variable.

2.2 Attempts should be made to maintain eventual increases in membership dues at a minimum and affordable level, taking note of an apparent worldwide trend of reducing public expenditure.

2.3 In framing the budget for the forthcoming three years, the Committee is of the opinion that above conditions require URSI expenditures to be reduced where feasible. As an initial example, it is suggested to establish and apply guidelines for the reimbursement of travel expenses, including the requirement of detailed cost estimates with information on the use of other resources; a supporting statement by the applicant's URSI Member Committee should be attached to such cost estimates.

2.4 As a provisional model, the Standing Finance Committee presents a Plan A for income and expenditure, assuming:

- (a) that the US dollar will remain steady in value; and
- (b) that the rate of inflation will average 8% per year.

Membership dues amount to \$520, 560 and 610 per unit for the years 1982, 1983 and 1984 respectively; this corresponds to the assumed rate of inflation. With the reduction in travel and other expenditure the plan would provide for realistic but modest increases in the level of

scientific activities.

2.5 In Table 1 representing Plan A, administrative expenditure has been based on the assumption that the Secretariat will remain in Brussels. It is expected that the annual dues payable to ICSU will remain at 2.5% of our Members' contributions.

2.6 At the cost of reduced scientific activities or a considerable reduction in travel expenses appearing under "Scientific Activities", a Plan B may be based on constant dues of \$520, yielding amounts of \$15,000, 15,000 and nearly zero for symposia in the years under consideration.

2.7 On the other hand, in a Plan C, dues of \$520, 610 and 660 may result in amounts for scientific activities of \$15,000, 35,000 and 31,000 respectively.

### 3. Recommendations

3.1 In view of the above considerations, the Committee recommends the adoption of Plan A. However, the lack of predictability of the economic situation should require relevant factors to be monitored closely and appropriate budget corrections to be made annually by the Board. It should be kept in mind that membership dues will have to remain at \$520 for 1982. Increases for 1983 and 1984 may vary with respect to the proposed Plan, depending on an ad hoc analysis of both, inflation rate and value of the US dollar, relative to assumptions contained in the Plan.

3.2 It is furthermore recommended that preparatory and other costs related to General Assemblies be recovered through the registration fee.

3.3 Attention is drawn to the need of keeping administrative expenditure at a reasonable level with respect to the entire budget. For example, attempts should be made to maintain the office at its present location unless an even more favorable solution can be found.

3.4 With additional reference to 2.3 above, travel expenses of any kind should be reduced and maintained at a minimum level.

### 4. Publication of accounts

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

The Standing Finance Committee:

Assisted by:

H.J. Albrecht (Chairman)

W.E. Gordon (Treasurer)

A.P. Mitra

J. Van Bladel (Secretary General)

M. Petit

S. Radicella

Table 1 - URSI BUDGET 1982-1984

	1982	1983	1984	Total
<u>INCOME</u>			\$(000)	
ICSU/UNESCO Grant	10.5	11.6	12.8	34.9
Member Committees (1)	113.0	122.0	132.0	367.0
Sales of publications	2.0	1.4	1.5	4.9
Interest: dollars (2)	4.0	8.0	10.0	22.0
francs	5.0	5.0	5.0	15.0
less van der Pol Gold Medal Fund	(0.7)	(0.7)	(0.8)	(2.2)
\$(000)	<u>133.8</u>	<u>147.3</u>	<u>160.5</u>	<u>441.6</u>
<u>EXPENDITURE</u>				
Board, Steering Committee	7.5	8.3	-	15.8
Publications	11.0	13.0	14.0	38.0
<u>Scientific Activities</u>				
Symposia	15.0	24.0	20.0	59.0
Representation of URSI	1.2	1.5	1.8	4.5
Grants: IUCAF, IUCRM, FAGS	2.7	3.0	3.3	9.0
XXI General Assembly	-	-	64.0	64.0
ICSU Dues	2.8	3.1	3.3	9.2
<u>Administration</u>				
Salaries, etc. (3)	50.8	55.0	59.8	165.6
Office equipment	0.5	1.0	0.5	2.0
Audit fee	3.9	4.2	4.5	12.6
Office expenses	14.8	16.0	18.0	48.8
Loss on exchange	<u>1.0</u>	<u>1.0</u>	<u>1.0</u>	<u>3.0</u>
Total expenditure	111.2	130.1	190.2	431.5
Surplus(+) Deficit (-)	<u>+22.6</u>	<u>+17.2</u>	<u>-29.7</u>	<u>+10.1</u>
\$(000)	<u>133.8</u>	<u>147.3</u>	<u>160.5</u>	<u>441.6</u>
Balance on 1 January	140.8 <sup>+</sup>	163.4	180.6	-
Income - Expenditure	<u>+22.6</u>	<u>+17.2</u>	<u>-29.7</u>	-
Balance on 31 December	\$(000) <u>163.4</u>	<u>180.6</u>	<u>150.9</u>	-

<sup>+</sup> From 1981 accounts.

Notes:

- (1) It is assumed that there will be 217 unit contributions and that the value of the unit will be: 1982, \$520; 1983, \$560; 1984, \$610.
- (2) About half the assets will be invested outside Belgium so as to increase the yield.
- (3) It is assumed that the rate of inflation in Belgium will be 8% per year.

Supplementary Note by the Treasurer on  
the URSI Budget for the Years 1982 - 1984

The allocation for administration in 1982 shown in the 1982-84 Budget approved in Washington is \$70,000. Since the cost of administration in URSI is incurred in Belgian francs, the amount expressed in US dollars must depend on the exchange rate. The figure of \$70,000 was calculated some six months before the Washington General Assembly. By the time of the Assembly, the rate of exchange had changed from 31 Belgian francs/dollar, on which the Washington budget was based, to a figure closer to 40 Belgian francs/dollar. If this latter rate had been used, the figure for administration would have been reduced from \$70,000 to \$54,000, and consequently a higher allocation could have been adopted for scientific activities. One cannot, of course, be absolutely certain that the exchange rate will be maintained at around 40 Belgian francs/dollar, even in the near future, and certainly not throughout the full three-year period between Assemblies. For this reason, the Finance Committee has wisely recommended that the relevant factors be closely monitored and that corrections to the budget be made annually by the Board of Officers. However, there are grounds at present for thinking that an exchange rate of 40 rather than 31 Belgian Francs/dollar is likely to be closer to the actual rate during the period up to the next budget review. It therefore seems worthwhile to pursue the consequences of adopting the higher rate, and that is the purpose of this present note.

On the assumption that no further change in the exchange rate takes place before 1984, and allocating the whole of the reduction in the dollar cost of administration to scientific activities, the Washington budget can be revised as shown below, and only the essential details are shown. All costs are shown in units of \$1,000.

Scientific Activities

(unit \$1,000)

	<u>Washington</u>	<u>Washington (revised)</u>
1982	37.4	64.5
1983	49.8	69.7
1984	39.1	45.8 (annual)
	-	29.4 (Assembly)
	<u>126.3</u>	<u>209.4</u>
General Assembly	<u>64.0</u>	<u>34.6</u>
	190.3	244.0

Administration

1982	70.0	54.0
1983	76.2	58.3
1984	<u>82.8</u>	<u>63.0</u>
	<u>229.0</u>	<u>175.3</u>
\$ (000)	<u><u>419.3</u></u>	<u><u>419.3</u></u>

It should be noted that the revised allocation of \$34,600 for the 1984 General Assembly refers only to administration. In accordance with past practice, part of the Scientific Activities Fund will be used to cover expenses relating to scientific activities during the Assembly. When the Washington and Helsinki budgets are compared, percentage increases for the new triennium, as compared with the 1979-81 triennium, are as set out below.

	Washington (as approved at Aug.1981)	Washington (revised)
Scientific		
Activities	+ 4.7%	+34.3%
Administration	+49.4%	+14.4%

Finally, however, it must be emphasized that although one may believe, as I do, that the suggested revised budget is rather more realistic than that adopted at Washington, some unforeseen and unpredictable change in the exchange rate could alter the whole situation.

I must express my thanks to Professor W.E. Gordon, President and former Treasurer, to Dr. H.J. Albrecht, Chairman of the Standing Finance Committee, and especially to Dr. C.M. Minnis, for much invaluable information and advice and for their helpful comments on an earlier draft.

1 February 1982

A.L. Cullen  
Treasurer.

URSI ACCOUNTS FOR THE YEARS 1978, 1979 AND 1980

The Standing Finance Committee examined the audited Accounts of Income and Expenditure for the calendar years 1978, 1979 and 1980. In its Report, reproduced elsewhere, the Committee recommended the approval of the Accounts and their publication in the *Proceedings*.

The URSI account books for 1978 and 1979 were kept in Belgian francs, but the accounts are presented in US dollars using the UN rate of exchange in force at 31 December each year, as shown below:

<u>Value of US\$1 on 31 December</u>	
<u>Year</u>	<u>Belgian francs</u>
1977	35
1978	30
1979	28.5
1980	31

INTERNATIONAL UNION OF RADIO SCIENCE

Income and Expenditure Accounts  
for the years ended 31 December 1978, 1979, 1980

Year ended 31 December 1978

	\$	\$	\$
<u>INCOME</u>			
Subscriptions: Member Committees		86,070	
Interest, <u>less</u> interest attributable to:			
Pension Fund	7,412		
Balth. van der Pol Gold Medal Fund	(1,076)		
	<u>(324)</u>		
		6,012	
Sale of publications		223	
Allocation from UNESCO Subvention to ICSU		12,000	
Surplus on symposia in 1977		3,096	
Gain on exchange (net)		<u>2,618</u>	
Total Income			<u>\$110,019</u>
<u>EXPENDITURE</u>			
<i>Scientific Activities</i>			
Meetings:			
Board of Officers	5,535		
Miscellaneous	<u>829</u>		
		6,364	
XIX General Assembly:			
Scientific Symposia and Sessions of Commissions	14,113		
Organisational expenses	<u>11,853</u>		
		25,966	
Publications:			
URSI Inf. Bull. Nos 205-207	5,897		
Extra copies of No 206 for Assembly	1,500		
INAG Bulletin	500		
URSI Brochure (Spanish edition)	200		
International Reference Ionosphere 1978 (net)	240		
Electron density profile analysis	<u>100</u>		
		8,437	
Grants:			
IUCAF	1,250		
IUCRM	<u>300</u>		
		1,550	
Total: Scientific Activities (carried forward)			42,317



	§	§	§
(brought forward)			42,317
<i>Administration</i>			
Salaries (including social security and supplementary pension provision)		55,222	
Office expenses			
Rent, heat, repairs, etc.	2,793		
Stationery and office supplies	621		
Insurance	684		
Telephone	807		
Postage	944		
Bank charges	351		
Entertainment	86		
Audit and accountancy	2,000		
Miscellaneous	<u>38</u>		
		<u>8,324</u>	
Total: Administration			63,546
ICSU Dues			<u>2,152</u>
Total Expenditure			108,015
Excess of Income over Expenditure for the year			<u>2,004</u>
			<u><u><u>§110,019</u></u></u>

	§
Balance in hand at 1 January 1978	88,922
<u>Add gain on appreciation of B. franc</u>	<u>14,821</u>
Revised balance in hand at 1 January 1978	103,743
Excess of income over expenditure for the year	<u>2,004</u>
Balance in hand at 31 December 1978	<u><u><u>§105,747</u></u></u>

Year Ended 31 December 1979

	\$	\$	\$
<u>INCOME</u>			
Subscriptions: Member Committees		84,080	
Interest, <u>less</u> interest attributable to:			
Pension Fund	8,692		
(1,233)			
Balth. van der Pol Gold Medal Fund	<u>(437)</u>		
		7,022	
Sale of publications		702	
Allocation from UNESCO Subvention to ICSU		8,000	
Gain on exchange (net)		<u>1,538</u>	
Total Income			<u>\$101,342</u>
<u>EXPENDITURE</u>			
<i>Scientific Activities</i>			
Symposia:			
Ionisation of gases, Grenoble	527		
EM Compatibility, Rotterdam	1,132		
Information theory, Grignano	526		
Solar-terrestrial forecasts, Boulder	542		
60th Anniversary Colloquium, Brussels	<u>4,951</u>		
		7,678	
Committees, etc.:			
Radiation Units, Vienna	552		
IUGG General Assembly, Canberra	437		
Miscellaneous	<u>555</u>		
		1,544	
Other Meetings:			
Board of Officers, Brussels	7,841		
XX Assembly Steering Committee, Brussels	<u>2,651</u>		
		10,492	
Publications:			
URSI Inf. Bull. Nos 208-211	5,310		
Proc. XIX Gen. Assembly 1978	6,491		
Proc. 60th Anniversary Colloquium	6,176		
International Reference Ionosphere 1978 (net)	<u>920</u>		
		18,897	
Grants:			
IUCAF	1,250		
IUCRM	<u>300</u>		
		1,550	
Total: Scientific Activities (carried forward)			40,161

	§	§	§
(brought forward)			40,161
<i>Administration</i>			
Salaries (including social security and supplementary pension fund)		45,960	
Office expenses			
Rent, heat, repairs, etc.	2,943		
Stationery and office supplies	1,167		
Insurance	726		
Telephone	1,083		
Postage	1,274		
Bank charges	366		
Entertainment	347		
Audit and accountancy	2,632		
Questionnaire (XX Assembly)	1,103		
Administrative travel	305		
Miscellaneous	<u>35</u>		
		11,981	
Total: Administration		57,941	
Commission F (Secretariat)		55	
ICSU Dues		<u>2,102</u>	
			60,098
Total Expenditure			100,259
Excess of Normal Income over Expenditure			1,083
			<u>8101,342</u>
Excess of Normal Income over Expenditure			1,083
<u>Add Extraordinary Income</u>			
Registration Fees Account (Helsinki)			
Balance at 1 January 1979	5,238		
<u>Add Supplementary Fees</u>	<u>173</u>		
		5,411	
<u>Less cost Review of Radio Science (1,923)</u>			
Deduct sales	<u>91</u>		
		(1,832)	
			3,579
Surplus EM Theory Symposium 1977			<u>70</u>
Excess of Total Income over Expenditure			4,732
Balance in hand at 1 January 1979	105,747		
<u>Add gain on appreciation of B. franc</u>	<u>5,565</u>		
Revised balance in hand at 1 January 1979			111,312
Balance in hand at 31 December 1979			<u>8116,044</u>

Year Ended 31 December 1980

	\$	\$	\$
<u>INCOME</u>			
Subscriptions: Member Committees		98,158	
Interest, <u>less</u> interest attributable to:			
Balth. van der Pol Gold Medal Fund	11,294 (554)		
		10,740	
Sale of publications		1,078	
Allocation from UNESCO Subvention to ICSU		10,000	
	Total Income		<u>8119,976</u>
<u>EXPENDITURE</u>			
<i>Scientific Activities</i>			
Symposia:			
CPEM, Braunschweig	762		
EM Waves, Munich	418		
EM Compatibility, Wroclaw	834		
Oceanography from Space, Venice	1,000		
Middle atmosphere dynamics, Urbana	1,000		
Remote sensing, Kansas	1,000		
IRI Workshop, Budapest	764		
Equatorial aeronomy, Puerto Rico	1,500		
Waves in Plasmas, Nagoya	500		
MM Wave technology, Grenoble	1,024		
Pulsars, Bonn	500		
		9,302	
Committees, etc.:			
Board of Officers	6,170		
Representation of URSI	226		
XIX General Assembly	229		
		6,625	
Publications:			
60th Anniversary (supplement)	1,103		
Proc. XIX Gen. Assembly (supplement)	1,621		
URSI Inf. Bull. Nos 210-215	6,271		
URSI Statutes	1,407		
INAG Bulletin	500		
		10,902	
Grants:			
IUCRM	300		
IUCAF	1,250		
FAGS	1,000		
		2,550	
Total: Scientific Activities (carried forward)			29,379

	g	g	g
(brought forward)			29,379

*Administration*

Salaries (including social security and supplementary pension provisions)	43,798	
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Office expenses

Rent, heat, light, etc.	4,307
Stationery and office supplies	1,194
Insurance	1,363
Telephone	1,872
Postage	1,465
Bank charges	274
Entertainment	467
Audit fee	3,343
Office equipment	3,477
Miscellaneous	490
Administrative travel	<u>2,091</u>

20,343

Hulp der Patroons: Fees

361

Bookkeeper: Fees

2,115

Total: Adminsitration

66,617

Loss on depreciation of B. franc

10,584

ICSU Dues

2,454

Total Expenditure

109,034

Excess of income over expenditure for the year

10,942

g119,976

Balance on hand at 1 January 1980	g	116,044
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Excess of income over expenditure for the year	<u>10,942</u>
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Balance on hand at 31 December 1980	<u><u><u>g126,986</u></u></u>
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BALANCE SHEET

	31 Dec. 1978		31 Dec. 1979		31 Dec. 1980	
	£	£	£	£	£	£
<u>Assets</u>						
Belgian francs	65,531		41,079		29,511	
US dollars	26,794		16,665		34,422	
		92,325		57,744		63,933
Belgian Govt Loans		82,727		99,068		91,079
Petty Cash & Stamps		588		362		153
Sundry debtors		153		994		5,020
		175,793		158,168		160,185
<u>Less</u>						
Creditors	38,308		34,494		25,631	
Balth. van der Pol						
Gold Medal Fund	5,887		7,630		7,568	
Pension Fund	20,875		-		-	
Registration Fees						
Fund	4,976		-		-	
		(70,046)		(42,124)		(33,199)
Total: URSI Funds		<u>£105,747</u>		<u>£116,044</u>		<u>£126,986</u>

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

	1 Jan. 1979		1 Jan. 1980		1 Jan. 1981	
	£	£	£	£	£	£
<u>Reserve Fund</u>						
General	-		-		-	
Closure of Secretariat	52,053		62,175		69,032	
		52,053		62,175		69,032
<u>Fund for Scient. Activities</u>						
XIX Gen. Assembly (Reg. Fees)	-		3,579		-	
XX Gen. Assembly	10,000		24,000		50,884	
Symposia, etc. in 1979, '80, '81	33,333		15,000		-	
Special Symposium Fund	10,000		10,070		7,070	
		53,333		52,649		57,954
Unallocated		361		1,220		-
Total: URSI Balances		<u>£105,747</u>		<u>£116,044</u>		<u>£126,986</u>

## REPORT OF THE PUBLICATIONS COMMITTEE

Meetings of the Committee were held on 11 and 13 August 1981. The membership was Prof. T.B.A. Senior (Chairman), Prof. R.L. Dowden, Prof. K. Géher and M. M. Thué. The meetings were also attended by Prof. J. Van Bladel (Secretary General) and (first meeting only) Mme Y. Stevanovitch (Administrative Secretary).

### 1. URSI Information Bulletin

The Bulletin is an essential means of communication with member countries. The names and addresses of responsible individuals, information about forthcoming URSI and URSI-sponsored meetings, etc. is vital, and must be distributed. The distinctive cover is also helpful in providing recognition. Over the last triennium, the cost has been approximately \$1,600 per issue of 1,300 copies. Since this includes the cost of preparation as well as printing and distribution, the cost is not felt to be excessive.

The Committee recommends that the Bulletin be continued in its present form. It further recommends that once each year the Bulletin include a list of all forthcoming URSI-sponsored meetings that the Secretariat is aware of, the listing to include dates, title of meeting, location, and the name and address of the contact person. To facilitate this, Commission Chairmen are urged to send such information to the Secretariat in a timely fashion. It is suggested that the Secretariat explore the cost saving that could result from reducing the number of issues to three per year.

### 2. Proceedings of the 1981 Assembly

The Committee recognizes the importance of publishing the Proceedings as a record of the business transacted at the Assembly, and therefore recommends that the Proceedings of the 1981 Assembly be published in a form similar to Volume XVIII. However, in view of the unusually high quality of the paper, type-setting, etc. of previous volumes, the Committee also recommends that the Secretariat explore possible cost-saving measures consistent with the maintenance of a document of reasonable quality.

### 3. URSI Brochure and Statutes

New versions of these were published in 1980, and copies of the former were distributed to all registrants at this Assembly. Since there are copies of both documents still available, it is not anticipated that there will be any need for a new printing prior to the next General Assembly.

### 4. Review of Radio Science

The Review of Radio Science 1978-1980 was available prior to this Assembly and distributed to all registrants. It is understood that the cost of printing is covered by part of the registration fee that had been allocated for this purpose. There are copies still available that can be obtained for \$20 each by application to the URSI Secretariat.

The Committee expressed its thanks to Prof. S.A. Bowhill (the General Editor) and to the Commission Editors and Contributors for their work on behalf of this Review.

From the contacts that individual members of the Committee made, it appears that the present Review has been well received and appreciated. These Reviews are certainly among the most significant scientific publications of URSI. The Committee therefore recommends that another issue be prepared for the 1984 Assembly in substantially the same form, having approximately the same balance of textual material and (selective) references. It further recommends that Professor Bowhill be again asked to serve as General Editor.

Because of the importance of the triennial Reviews and the considerable amount of work that goes into their compilation, the Committee recommends that a systematic procedure be developed to assure wider distribution of future Reviews. It is particularly desirable that they be available in as many libraries as possible. Since the Committee is pessimistic about achieving this through advertisements and notices of availability, it recommends that the American Geographical Union (AGU) be asked to include and distribute the next Review as a supplement to the 1984 volume of the journal "Radio Science". This should be done at no cost to URSI and would be additional to distribution to all registrants at the 1984 General Assembly. To achieve this, the next General Editor should be authorized to contact Prof. Akira Ishimaru (Editor "Radio Science") and AGU to discuss arrangements.

Preparation of past Reviews has tended to be a 'last minute' effort, with some Commissions expressing uncertainty about what is required of them. This is largely unnecessary, since the significant deadlines for the next Review will be similar to those for the last one, displaced three years. The Committee therefore recommends that Commission Chairmen appoint their Editors well ahead of time, e.g. within the next year, and that these Editors then appoint Contributors so as to spread over a greater time the burden of assembling the Review. Such prior planning would enable all deadlines associated with the Review to be kept as late as possible, thereby addressing the problem raised by Prof. R.L. Dowden on behalf of the New Zealand National Committee (see Addition to Doc. C/4.1, Section 8).

##### 5. National Contributions

The Review of Radio Science is an international document. Representatives of members countries are requested to send information about their country's contributions at the time, and in the manner, indicated by the General Editor of the Review. There is no requirement for separate publication of national summaries.

##### 6. INAG Bulletin

The Committee recommends that the annual support of the INAG Bulletin be continued. It is presently \$500, and in view of the representations of Dr. W.R. Piggott about the effect of any increase whatsoever, the Committee could countenance an increase to \$525.



## 7. International Reference Ionosphere (IRI)

Papers presented at the URSI/COSPAR Workshop on the International Reference Ionosphere in Budapest in 1980 will be published by WDC-A in the UAG series. As an indication of URSI support, the Committee recommends a nominal (token) financial contribution.

### PRESENTATION OF URSI AWARDS

Thanks to the generosity of the donors, three awards are presented on the occasion of each General Assembly of URSI:

- the Balthasar Van der Pol Gold Medal, sponsored by Mme Le Corbeiller, widow of Professor Van der Pol;
- the John Howard Dellinger Gold Medal, sponsored by the URSI Committee in the United States; and
- the Appleton Prize, sponsored by the Royal Society in London.

During a special late afternoon session on 12 August, the awards were handed over and each of the laureates gave a short outline of the research work for which the award had been made.

The winners of the awards in 1981 were as follows:

#### BALTH. VAN DER POL GOLD MEDAL:

Prof. D.S. Jones, Department of Mathematics at the University of Dundee, Scotland, UK, for his recent work on electromagnetic theory and, in particular, on the development of a number of analytical approaches, the careful attention given to the accuracy of numerical techniques, and the formulation of problems to ensure unique solutions.

#### JOHN HOWARD DELLINGER GOLD MEDAL:

Dr. J. Fejer, Max-Planck-Institut für Aeronomie at Lindau, F.R. of Germany, for his work on ionospheric modifications, parametric instabilities, ionospheric irregularities and incoherent scatter.

#### APPLETON PRIZE:

Dr. H. Rishbeth, Appleton Laboratory, Slough, UK, for his work on the formation, composition and dynamics of the F region of the ionosphere.

## BUSINESS TRANSACTED BY COMMISSIONS

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

### COMMISSION A - ELECTROMAGNETIC METROLOGY

Chairman: Prof. S. Okamura (Japan)

Vice-Chairman: Prof. V. Kose (Fed. Rep. of Germany)

#### REPORT ON BUSINESS MEETINGS

##### 1. Nomination of Vice-Chairman

The result of the vote for Vice-Chairman was as follows, in order of preference:

1. S. Hahn (Poland)
2. S. Leschiutta (Italy)

##### 2. Time and Frequency

Much discussion was held on the Helsinki Recommendation A.4 - "Conferences on Time and Frequency" which concerned, in part, a suggestion of reduced meetings on this subject during the intervals between General Assemblies, but difficulties of such coordination and reduction by only the effort of URSI was pointed out.

It was reported that the meetings on Time and Frequency held in Canberra (Australia) and New Delhi (India) had demonstrated a great activity in this field in South East Asia and other developing countries. A Time and Frequency Conference in Australia which will be held either before the next General Assembly, or in late 1984 or early 1985 was announced.

Regarding the work of the Bureau International de l'Heure (BIH), a recommendation of support was adopted by the Commission. This was submitted to the Council which adopted it as a Council Recommendation (see U.20).

##### 3. Biological Effects

Prof. S. Rosenthal reported the activities of his Working Group, and the Symposium in Jouy-en-Josas (France) in 1980. He also mentioned that the Bioelectromagnetics Society (BEMS) would hold the meeting on 10, 11 and 12 August and then URSI "Open Series on the Interaction of Electromagnetic Waves with Biological Systems" on 13 and 14 would follow.

He also reported the desire of the Bio-Effects Working Group to have a full symposium to be held in conjunction with the next General Assembly in Florence, Italy, in 1984, and to hold several smaller meetings during the next three years, worldwide.

It was agreed to maintain the Working Group during the next triennium (see Rec.A.3).

#### 4. Conference on Precision Electromagnetic Measurements

Prof. Kose reported on the Conference on Precision Electromagnetic Measurements which was held in 1980 in Braunschweig F.R. of Germany. The Commission agreed that the Chairman of Commission A should have a seat on the Executive Board of CPEM. It was not certain whether the proposed CPEM-1984 (in the Netherlands) could be coordinated with the XXI General Assembly of URSI.

#### 5. URSI Register of National Standards Laboratories

Mr. Steele, on behalf of Mr. A. Bailey, Chairman of the Working Group on National Standards Laboratories, stated that the National Physical Laboratory would continue to hold all the assembled data bank. Commission A recognized the valuable rôle of the URSI Register and decided to maintain the Working Group until 1984. It recommended further that funds be made available to ensure the continued production of the Register (see Rec. A.1).

#### 6. Review of Radio Science

Mr. Steele reported difficulties in preparing the Commission A chapter in the *Review of Radio Science* due to lack of cooperation from several countries. Members of the Commission expressed their appreciation of the efforts by Mr. Steele and Dr. Romero-Sierra.

Dr. Leschiutta was designated for Editor of the *Review of Radio Science 1981-1984*.

#### 7. SI Units

It was pointed out that numerous speakers and authors at the Assembly were not adhering to the use of SI units in their presentations. A recommendation urging the exclusive use of SI units was submitted to the Council which adopted it as a Council Recommendation (see U.18).

#### 8. Working Group on Time Domain Waveform Measurements

On the proposal of Dr. Nahman, the Commission decided to set up a Working Group on Time Domain Waveform Measurements (see A.2) and appointed Dr. Nahman as Chairman of the Group.

#### 9. Remote Sensing

It was noted that a proposal had been made for the creation of a Commission on Remote Sensing. The opinion of Commission A was negative.

### SUMMARY OF SCIENTIFIC SESSIONS

Session AE1: "Signal and Noise Measurements"

Organizer, Chairman and Reporter: D.F. Wait

This session was stimulating and was attended by about 50 people. The first three papers described significant new techniques to measure signal-to-noise ratio of noisy, band limited digital signals (D. Halford, NBS), measurement of phase noise on pulsed S-band generators (F. Labaar, TRW), and some special measurements of signal-to-noise

needed to combine the signals (from different earth terminals) returning from the Voyager II encounter with Uranus, 1986 (L.D. Howard, JPL). The last three papers of the session described the electromagnetic compatibility measurements demanded by new regulations on radiation emissions from controlled devices. The last paper wrapped the EMC papers up neatly by describing some well constructed measurements (D. Heirman, Bell Laboratories).

Session A1: "Precise Time Transfer"

Organizer: C.C. Costain

Chairman and Reporter: G. Becker

The session was held in its scheduled form. The three authors dealt with the various satellite time transfer methods.

Beehler gave an excellent review on the methods. Costain discussed the time transfer results achieved with the Symphonie satellite since 1978 and explained his new idea of using communications satellites for a low signal level time transfer. Winkler reported on the Global Positioning System and the LASSO project. With the present 6 GPS satellites a time transfer with a random uncertainty of 10 ns is already possible.

The discussion revealed that it is too early to standardize the methods to be preferably used.

Session A2: "High-stability Time and Frequency Standards"

Organizer, Chairman and Reporter: C.C. Costain

The session was devoted to the discussion of high accuracy primary cesium standards and other highly stable devices for accurate timekeeping which are at present in use or under development. In the paper "Primary Cesium Time Standards" G. Becker (FRG) reviewed the performance of the NRC CsV and the PTB CsI primary time standards which have agreed to  $2 \times 10^{-14}$  over the past four years. He pointed out the possibility that variations of frequency with humidity were responsible for the seasonal variations in the rate of TAI. He outlined the plans for a new primary Cs clock being constructed at PTB which will refocus and detect only the cesium atoms in the  $m=0$  state. F.L. Wall (USA) summarized the results and advantages of passive H masers in his paper "Timekeeping with passive H masers". Fluctuations of less than 5 ns over a 30 day period were reported for the NBS masers. J. Vanier (Canada) reported on "Active Hydrogen Masers", on efforts to improve the longer term stability by auto-tuning, and on several investigations of the wall shift and the variations. Cryogenic H-masers at a few degrees Kelvin are predicted to have the potential for stabilities 100 times better than present masers. D. Wineland (USA) in the paper "Ion Storage and Optically Pumped Standards" discussed the very interesting possibilities of using optical pumping instead of magnet for state selection in cesium beam standards. Storage devices in which ions are cooled to mK by laser appear to have exciting future possibilities.

Unfortunately, the air controllers strike made it impossible for K.M. Baird (Canada) to present the final paper "Infrared and Optical Standards".

Session A3: "Circuit Measurement"

Organizer, Chairman and Reporter: T. Okoshi

Two papers dealing with electronic circuit measurements and two papers on optical circuit measurements were presented in this session. Because the subjects of the latter two papers overlapped with those of Session CD2 (Optical Systems and Components) held concurrently, the start of A3 was delayed by one hour so that those interested in optical technology could move from CD2 to A3 after the former ended.

In the first paper, S. Okamura reviewed the history of the international comparison of RF measurement standards. After that Dr. Altschuler of NBS gave some comments on the necessity of the investigation of ultrasonic power measurement and that of accelerating the international comparison activity. Stimulating discussions followed. Then three papers by G.F. Engen, L.G. Cohen and T. Asano were given each accompanied by fruitful discussions. The number of attendants was about 25; sometimes increased to about 30.

Session A4: "Application of Optical Fibers to Measurements"

Organizer and Chairman: A.J. Rogers

Reporter: T. Okoshi

Seven papers had originally been scheduled to be presented in this session. However, the third paper to be read by V. Vali and M.F. Berg, and the fourth paper by H.J. Arditty and E. Spitz, were withdrawn.

In the first paper, J.A. Bucaro of Naval Research Laboratory gave a birds-eye-view talk on the optical fiber sensors. Their unique versatility in the installation and high sensitivity were emphasized. In the second paper, K.B. Dyott of Andrew Corporation described a newly developed single-polarization single-mode optical fiber, which features an elliptical core made of  $\text{GeO}_2$ .

Next, A.L. Harmer of Battelle Research Center reported a new displacement/strain/pressure sensor which resembles the conventional electrical strain gauge, but using optical fiber instead of wire. In the fourth paper, B. Culshaw of UC London reported various techniques for improving the stability of optical fiber transducers. The final paper presented by J.S. McCormack of GEC described a class of new optical sensors of temperature, displacement, etc. using luminescent materials.

Session A5: "Cryogenic Measurements"

Organizer, Chairman and Reporter: V. Kose

Particularly in the last three years outstanding progress has been achieved in the cryogenic measurements field. The detection resolution of DC-SQUIDS (Superconducting Quantum Interference Devices) reached the fundamental limit  $\hbar/2$  ( $\hbar$  Planck's constant) given by Heisenberg's uncertainty principle. Superconductor-insulator-superconductor devices used as ultra low noise mixers experimentally approached the quantum limit, which has been theoretically discovered

recently. The large scale integration of cryogenic circuits favors high speed metrology and high speed computation, which are superior to any room temperature technique. The discovery of the quantized Hall effect in two-dimensional electrical conductors at low temperatures has a great impact in physics and electrical metrology.

## COMMISSION B - FIELDS AND WAVES

Chairman: Prof. L.B. Felsen (USA)

Vice-Chairman: Prof. H.-G. Unger (FRG)

### REPORT ON BUSINESS MEETINGS

#### 1. Chairman and Vice-Chairman 1981-84

It was agreed unanimously that Prof. H.-G. Unger (FRG) should succeed as Chairman. The result of the vote for Vice-Chairman was, in order of preference, J. Bach Andersen (Denmark), P.J.B. Clarricoats (UK) and A.E. Karbowiak (Australia).

#### 2. Electromagnetic Theory Symposium

During the period a successful symposium had taken place in Munich in 1980. The site for the following symposium in the series in 1983 was discussed preliminarily, based on invitations from Spain, Israel and Australia. It was decided to postpone the decision until further information was available, and make a ballot by mail. The question was raised whether it could be possible to make a more long-range planning of the symposia, since two years sometimes would not be enough.

#### 3. Other Symposia and Conferences

The Commission recommends that URSI sponsors or co-sponsors the following:

- European Conference on Optical Communication, Cannes, 21-24 Sept. 1982;
- European Microwave Conference, Helsinki, 13-17 Sept. 1982;
- 7th Colloquium on Microwave Communication, Budapest, 6-10 Sept. 1982.

#### 4. Remote Sensing

Commission B supported the ad hoc Advisory Group on Remote Sensing in the recommendation, that URSI should set up an Inter-Commission coordinating group on remote sensing, and specially expressed, that activities in Inverse Scattering should be accounted for within this framework. Drs R. Stone (USA) and A.K. Jordan (USA) were suggested as members of the Coordinating Group.

#### 5. Optical Techniques

Commission B has had a sustained interest in Optical Waveguide problems and would like to interact with other Commissions having similar interests. The Council agreed to the formation of an Inter-Commission Working Group on Optical Techniques, and Profs. Clarri-

coats (UK) and Karbowski (Australia) were designated as representatives of Commission B.

#### SUMMARY OF SCIENTIFIC SESSIONS

Commission B had organized a number of scientific sessions for Commission B alone, including special session time for discussions. Furthermore there were joint sessions with A and J, and Commission B interest in the Open Series on Interactions of Electromagnetic Waves with Biological Systems and Open Symposium on Mathematical Models in Radio Propagation. Most of the scientific sessions are reported in the following.

##### Singularity Free Field Tracking (N. Markuvitz)

This session considered the class of wave propagation problems that exhibit distinct fast and slow space-time scales and hence permit the use of approximate procedures that exploit this distinction. Geometric optics, Fourier transform, complex and hybrid wave, and quasi-particle field representations encounter singularity difficulties in the vicinity of caustics, foci, cusps, and similar critical transitions. In the complex transform plane, the transition regions are usually indicative of the presence of multiple saddle points and of poles or branch points near the saddle points. The various methods discussed differ in their manner of describing and treating the transition regions. Methods based on geometric or ray-optic ansatz's exhibit singularities near the transition and are patched locally via canonical solutions that remove the singularities. Modal or Fourier transform based methods being global methods exhibit the analytical behavior near the transition regime, albeit in integral forms that have to be evaluated.

R. Mittra discussed a direct numerical Fourier transform procedure for treating wave scattering by taking two-dimensional slices of a scattering object and updating along the propagation direction by alternate evaluations in transform and configuration space. C.H. Chapman described the use of the transform technique for pulsed wave propagation in horizontal stratified media. He pointed out that if the one-dimensional transform solutions, obtained either numerically or analytically, are first integrated over frequency and then over transverse wavenumber space, then singularity free results in physical space are more simply obtained than by the converse order of integration. G.A. Deschamps outlined the so-called Maslov method which is a ray-optic method that employs exact rays in  $k_r$  phase space and patches local geometric optic singularity regions in real space by projecting them into appropriate sub-spaces of the overall phase space. J.M. Arnold described an interesting graphical procedure for treating local ray complexes near generic transition regions and forming global spectral integrals for field descriptions in these regions via geometric optic constructs. L.B. Felsen described a transform method whereby regions of the spectrum can be rephased either in terms of a finite set of modes or of rays; this hybrid wave representation being employed differently according to the region of space considered. N. Marcuvitz discussed quasi-particle

representations of waves in a phase space transverse to the direction of wave propagation and compared the case of paraxial beam propagation with more exact larger angle descriptions.

During a subsequent discussion period, Arnold elaborated on his earlier presentation with extensions to an inhomogeneous medium. F. Tappert presented a summary of his originally scheduled talk. He displayed computed ray trajectories from a steady-state point source in an oceanographic channel and noted the difficulty of evaluating wave amplitudes near caustic and cusp regions from such plots; he then indicated how use of the parabolic equation provided a numerical algorithm that yielded non-singular amplitude behavior in the transition regions. Discussion centered on differences between uniform ray-optic methods described by Arnold and Deschamps as contrasted with the various transform or modal methods used by the other speakers. Relative accuracy at finite  $k$  of asymptotic ray techniques vis-à-vis the transform procedures, difficulties when two caustics are close to one another, long range phase accuracy of the parabolic equation method, etc., were some of the points brought forward during the discussion. Three separable and non-separable geometries were suggested for future consideration with the intent of displaying differences in accuracy, computational time, and conceptual framework of the various methods discussed.

#### Scattering and Diffraction (Thomas B.A. Senior)

All of the papers listed on the programme were presented, and the session was well received and attended. The session concluded with a 50-minute discussion period in which all six papers were discussed in sequence. Some of the points brought out in the discussion were as follows:

Paper 1: Low Frequency Scattering (Ralph E. Kleinman). There is a growing body of analytical results relating second (and higher) order terms in the low frequency expansion to the first (lowest order) one, but the higher order terms as a whole have only a limited amount of practical utility.

Paper 3: Status of Systems of Wiener-Hopf Integral Equations (A.E. Heins). This produced a number of comments. Dr. E. Lueneburg (Canada) described some recent work by A. Hurd and himself on parallel plate ducts (2 half planes) with hard and soft boundary conditions, and Prof. P.L.E. Uslenghi (USA) summarized his recently developed solution for a thick impedance half plane with a perfectly conducting end face. Both problems lead to a system of Wiener-Hopf integral equations. The speaker (A.E. Heins) emphasized that, at the moment, there is no way to know a priori whether the matrices resulting from a system of W-H equations possess the vital property of commutability, and illustrated this by a sequence of examples involving a bifurcated waveguide.

Paper 4: Dyadic Green's Functions - Current Views on Singular Behavior (R.E. Collin). In spite of differences in representation, the "accepted" results present in the literature are equivalent and correct. The speaker (R.E. Collin) concurred that the singularity problems can be avoided by sticking to vector and scalar potentials.



Paper 5: Dielectric Wedge Far Field Reflection Coefficients (S.Berntsen). The analysis of this problem has now reached the stage at which computed results can, apparently, be obtained. The expansion of the near edge behavior differs from Meixner's general result in the second term, and this finding should be checked against the results of other analyses based, for example, on static considerations.

Paper 6: The Rayleigh Hypothesis in Scattering and Diffraction (P.M. van den Berg). The practical significance of the criterion would now seem to be the fact that its satisfaction allows computations to be made more efficiently. Nevertheless, for other than very specific geometries it appears that there are no necessary and sufficient conditions for the a priori use of the underlying assumptions about the field expansions.

Antennas (P.J.B. Clarricoats). Mittra reviewed the status of synthesis procedures for reflector antennas showing that the assertion by Kimber "that no exact procedure is possible" is correct. However, approximate methods may give adequate results and in the discussion the work of Westcott (UK) was cited as an example. Other examples were provided from the floor.

James reviewed the status of microstrip antennas. Considerable progress has occurred in recent years but many important theoretical and practical problems remain to be solved. Considerable potential is offered by microstrip arrays with applications in radar, satellite receiving stations and microwave mobile communication systems.

Mailloux' review of arrays involved microstrip and flush mounted antennas. Substantial progress has been made in the design of arrays with very low sidelobes but pattern control was identified as a main target for further study. Adaptive antenna arrays will be significant in next generation systems, but these must be made wideband.

Clarricoats examined recent progress in the design of feeds for microwave reflector antennas. The demands of new systems had resulted in increased specifications for antennas, the thrust of these being transferred to the feed. Hybrid feeds have been developed operating at dual frequencies with low cross-polarisation and some have been produced with elliptical shaped patterns. Key problems were identified, the most challenging of which spring from the demands of satellite systems and radar.

Appel-Hansen's review of antenna measurement techniques included a list of 12 methods. Progress in near-field scanning methods was included in the detailed examination. Together with the compact range it offers an important alternative to far-field measurements. The increased use of antennas at millimeter wavelength stimulated new methods and challenges existing techniques.

Landstorfer and Lindenmeier's review of VHF antennas identified computer aided methods for enhancing gain in a compact antenna. Curved elements offer advantages and these designs are being taken up commercially. Active antennas offer advantages in receiving applications and the review included a discussion of the optimisation of signal/noise ratio.

### Transient Fields (K.J. Langenberg)

The general aspect of the session was to contribute to the physical understanding and interpretation as well as modelling of transient scattering data, either for the electromagnetic or the acoustic case. Another scope was the relationship between different methods and approaches and their critical assessment.

1. During fall of 1980 a meeting on the state-of-the-art of the Singularity Expansion Method was held at the University of Lexington/Kentucky which brought together theoreticians, mathematicians and experimentalists. L.W. Pearson organized that meeting and summarized the results in the first talk of Session B6. Progress has been made in the evaluation of the entire function for certain geometries, branch cut contributions and interpretation of the singularities. A variety of applications ranging from EMP (Electromagnetic Pulse) to NDT (Non-destructive Testing) was also discussed.

2. U. Uberall presented his resonance theory of scattering starting from eigenfunction expansions in the frequency domain and interpreting the resonances in terms of SEM. The method is especially useful for penetrable objects such as dielectric and elastic scatterers. His latest results were for spheroids applying a T-matrix approach leading to a discipline called radar spectroscopy. The coincidence of theoretical and experimental data obtained by B. Hollmann seemed to be somewhat accidental and there is also controversy about the one-to-one correspondence of resonances to certain creeping-wave modes.

3. To show the relationship of resonances to certain peaks in the impulse response of a scatterer B. Tittmann presented a number of experimental results for the scattering of ultrasonic pulses by voids in a titanium specimen. One has to look forward to the processing of these data in terms of SEM.

4. Approximate methods to compute transient scattering were presented by E.M. Kennaugh. He extended his ramp response concept to the so-called K-pulse which is essentially based on the SEM-parameters of a scatterer. Additionally, he was able to compute the first layer resonances of a sphere using the creeping ray as provided by GTD.

5. A very useful and elegant technique to obtain transient results analytically, the so-called Caguiard's method has been extended by Y.H. Pao to nonplanar scattering surfaces. He presented results for a line source and a point source situated in front of a soundhard cylinder. Because Debye's approximation of Hankel functions is involved, the question has still to be answered up to what time the results would be valid.

6. In contrast to that analytical method, the numerical solutions of space-time-integral equations have found wide attention. Their numerical and inverse aspects are well-known, and this time C.L. Bennett should contribute to the special aspects of their application to penetrable objects, especially elastic scatterers, but it seems that the case of mode conversion from longitudinal to transverse waves is very difficult to handle because of numerical instabilities whereas the acoustic case can be considered to be solved.

7. The crucial point in transient field theory and experiment is

the extraction of that information from experimental time records which is predicted by theory and which could yield a characterization of the scatterer. That is the point where signal processing methods in terms of parametric modelling of time series come in. D.G. Dudley gave a critical overview on that subject with the essential result that it is highly recommendable to use prewhitening procedures of the noise in connection with linear predictors than higher sophisticated non-linear estimators.

### Inverse Scattering

The purposes of this session were to review the progress and developments in Inverse Scattering, to organize these results and identify trends, and to prepare for future research and applications. (The order of presentation was changed from the published programme in order to better achieve these goals. Since Prof. Bolomey and his co-authors were not present, their paper was summarized by the Session Chairman.

1. Survey of Applications and Experimental Progress (G. Tricoles and W.M. Boerner (USA)). This paper surveyed the many different methods and applications of inverse scattering and attempted to organize the voluminous literature (more than 500 references) in this area. The experimental problems associated with inverse scattering are now better understood; the applications to imaging appear to be the most highly developed. Target identification problems received much attention; methods using comparisons of target scattering resonances with a catalogue of known target resonances were discussed. Diagnostic methods for inhomogeneous media were reviewed; these are important for geophysical and biophysical and biological applications.

2. Numerical Methods (C.L. Bennett (USA)). This paper reviewed several numerical methods that are used for inverse scattering. It is immediately apparent that numerical methods and physically motivated methods, are closely related; this paper reviewed essentially numerical methods, such as moment methods, eigenfunction methods, and time-domain methods. The integrals arising from physical optics approximations were used to illustrate these methods.

3. Physically Motivated Approximations (J. Bolomey, C. Pichot, D. Lesselier, W. Tabbara (France)). This third paper considered four examples of physically-motivated methods in detail:

Perfectly conducting bodies

1. high-frequency
2. low - -

Dielectric bodies

1. high-frequency
2. low - -

The geometrical model used was an ellipsoid. The importance of polarization, angular and frequency dependence of the data was emphasized

4. Theoretical Considerations (P. Sabatier (France)). This paper discussed the fundamental mathematical considerations of inverse scattering from the viewpoint of functional analysis. By considering the

mappings between the space of functions representing scattering data and the space of functions representing the physical systems, it is possible to study the properties and domains of applicability of inverse scattering methods, e.g. physical optics, spectral (Gelfand-Levitan) and regularizing methods. These latter methods are used to compensate for the "ill-posedness" of inverse methods. It is possible to obtain a unified mathematical description of all these problems by using causality considerations. The applicability of inverse scattering theories can then be evaluated.

The discussion period was organized to address future applications of inverse scattering methods. The most promising short-term approaches seem to be iterative applications of direct scattering methods. The long-term approaches seem to be most promising in the study of non-linear problems and the multi-disciplinary applications of inverse scattering.

#### Numerical Methods (R.F. Harrington)

The first paper, "Numerical Solution of Transient Problems" by C.L. Bennett (USA), discussed all commonly used methods for solving electromagnetic scattering problems in the time-domain. Examples are given for both the integral equation solution and the direct solution of the differential equation. It was agreed that the integral equation solution was more accurate, but the differential equation solution was better for problems involving inhomogeneous media.

The second paper, "Computational Aspects of the T-Matrix approach" by A. Bostrom and G. Kristensson (Sweden), was given by Dr. Kristensson. He discussed the extended boundary condition method of Waterman. The method is good for calculating the electromagnetic scattering from bodies not greatly perturbed from spheres or some other reference shape. Another advantage of the method is that it is easily extended to the multiple body case.

The third paper, "Surface Patch Modelling of Bodies for Numerical Solution" by D.R. Wilton (USA), discussed the solution of arbitrarily shaped bodies in frequency domain, and triangular expansion functions were discussed. This approach appears to be the best one for bodies of arbitrary shape.

The fourth paper, "Recent Developments in the Unimoment Method" by K.K. Mei (USA), discussed differential equation solutions in the frequency domain. The unimoment method of Dr. Mei was emphasized. It was agreed that the differential equation approach was well-suited for electromagnetic scattering problems involving inhomogeneous media.

The final paper, "Comparison of some Computational Techniques in Scattering and Diffraction" by P.M. van den Berg, discussed error criteria for numerical solutions. It was shown that use of the Rayleigh hypothesis was valid only for bodies of certain geometrical shape and parameters. The T-matrix approach had similar restrictions. Establishment of an error criterion for integral equations was shown to place restrictions on either the testing functions or the expansion functions in a numerical solution. It was not agreed that the establishment of an error criterion was necessary for convergence of a numerical solution.

In the discussion period some questions involving clarification of the speakers' papers were raised, but no general conclusions were agreed upon by attendees. An additional short paper, "Scattering by Thin Two-dimensional Bodies" was given by Dr. Frenkel (Israel) to illustrate a method for incorporating the edge condition in scattering to improve the convergence of the solution.

#### Random Media (K. Furutsu)

Upon consideration of the Chairman's request of Commission B, the session was organized with an emphasis on the theories of waves in the waveguides with random medium and/or wall characteristics, and also within the limitation of three speakers. The following papers were presented: "Acoustic Propagation in Randomly Fluctuating Oceans" by F.D. Tappert (USA); "A Review of Recent Theories of the Fourth- and Higher-order Coherence Functions for Unguided and Guided Random Waves" by I.M. Besieris (USA); and "Transport Theories for Unguided and Guided Random Waves" by K. Furutsu (Japan).

Topics in the session included: an assessment of the generalized Huygens-Fresnel principle, the higher-order moments of irradiance in turbulent air with the associated irradiance distribution (all of which have not always been paid much attention in the area of Random Media), the path integral method, an actual aspect of the acoustic propagation in oceans, an interesting problem of caustics in random media.

The area of problems associated with the waves in the random waveguides is quite inclusive, containing not only independent problems of rough surfaces and random media, but also their combined effects, which constitute an essential point of solving the problems and, nevertheless, have not been considered very much.

An important open problem associated with the transport equations is the boundary equations on a boundary of medium discontinuity, which is particularly important when applying the transport equations to the volume scattering problems.

#### High Frequency Diffraction Techniques (R. Mittra)

The following topics were discussed: Limitations of ray theory (S.W. Lee, G.A. Deschamps, J. Boersma); Wave propagation (L.B. Felsen); Spectral domain techniques for high-frequency diffraction (Y. Rahmat-Samii, R. Pogorzelski, R. Mittra); GTD in radar scattering (R.G. Konyonmjan, K. Mitzer, L. Peters, T.B.A. Senior).

#### Open Waveguiding Structures (H. Blok)

The following topics were discussed: Microstrips and stripline structures (I. Wolff); Planar dielectric waveguides and other surface-wave structures (T. Itoh); Periodic waveguide structures and leaky wave propagation (T. Tamir); Step discontinuities in dielectric waveguides (D. Chang); Ray and modal approaches to guided propagation (L. B. Felsen); Beam wave techniques in multimode waveguides (P. Lagasse).

## COMMISSION C - SIGNALS AND SYSTEMS

Chairman: Prof. V. Zima (Czechoslovakia)

Vice-Chairman: Prof. J.K. Wolf (USA)

### REPORT ON BUSINESS MEETINGS

#### 1. Nomination of Vice-Chairman

The Official Members expressed their views in secret ballot, and recommended that the Council select one of the two nominees in the following order of preference:

Prof. K. Géher (Hungary)

Prof. J.C. Lacoume (France).

#### 2. Sponsorship of Meetings

The Commission recommended that URSI should co-sponsor the following meetings:

- a) IEEE International Symposium on Information Theory, Les Arcs, France, 21-25 June 1982.

The International Scientific Committee will have a strong URSI representation. The following subjects will be included in the programme: Classical and quantum communication systems; Complexity; Cryptography; Data compression; Data networks; Detection and estimation; Error control coding; Multi-user information theory; Pattern recognition; Shannon theory; Stochastic processes; Applications.

- b) 6th Summer Symposium on Circuit Theory, Prague, Czechoslovakia, 12-16 July 1982.

The International Scientific Committee will have a strong URSI representation. The following subjects will be included in the programme: Digital signal processing; Active and non-conventional analog filters; Synthesis of circuits and systems for automation of measurements in communications.

Beyond the scope of the symposium, a summer course in digital signal processing and digital measurements in communications for young scientists from developing countries will be held.

#### 3. Open Symposium at the 1984 General Assembly

Prof. Lacoume proposed the organization, during the XXI General Assembly, of an Open Symposium on Multipoint Measurements and Processing, including a) multispectral analysis, and b) optimum array processing. Commissions G and H, and perhaps Commission J, would be interested.

#### 4. Review of Radio Science 1978-1980

Chapter 4 "Signals and Systems" in the current edition was considered as satisfactory for the needs of Commission C. It was recommended that the individual Member Committees take care of public-

zing the parts of the issue in their countries. It was stated that the material is proper as an introductory orientation for students at Universities.

#### 5. Cooperation between URSI and CCIR

The Commission was informed that Mr. M. Thué (France), as Chairman of the URSI-CCIR-CCITT Liaison Committee, had prepared a list of important questions, put forward by the Study Groups of CCIR, which deserved the attention of Commission C. The next Chairman of the Commission, Prof. J.K. Wolf, was asked to find the ways how Commission C could satisfy the growing interest of CCIR.

#### TITLES OF SCIENTIFIC SESSIONS

- Random processes and optimum coding  
Organizer: J.K. Wolf (USA)
- Telecommunications and digital signal processing  
Chairman: V. Cappellini (Italy)
- Spread spectrum communications  
Chairman: M. Pursley (USA)
- Computer communications networks  
Chairman: R. Pickholtz (USA)
- Satellite communications  
Chairman: D.T. Tang (USA)
- Optical communications  
Chairman: M.I. Schwartz (USA)
- Microelectronics circuits and systems (with Commission D)  
Chairman: G.F. Moschytz (Switzerland)
- Optical systems and components (with Commission D)  
Chairman: K. Mouthaan (Netherlands)
- Impulse noise and its effect on communications (with Commission E)  
Co-Chairmen: A.A. Giordano (USA) and V. Zima (Czechoslovakia)
- Hardware for fast signal processing I  
Chairman: G.W. Farnell (Canada)  
Organizer: J. Le Mézec (France)
- Hardware for fast signal processing II  
Chairman: R.H. Frater (Australia)

## COMMISSION D - PHYSICAL ELECTRONICS

Chairman: Prof. G.W. Farnell (Canada)

Vice-Chairman: M. J. Le Mézec (France)

### REPORT ON BUSINESS MEETINGS

#### 1. Nomination of Vice-Chairman

As a result of an election, it was recommended to the Council that Prof. W.A. Gambling be named Vice-Chairman.

#### 2. Programme for the XX General Assembly

The programme for this Assembly was summarized by J. Le Mézec who noted a few problems caused by the strike of air controllers. The Steering Group for the Coordination of the Scientific Programme was commended for its work in integrating the overall programme and, in particular, for avoiding conflicts between similar material presented by different Commissions. It was noted that several sessions in the direct areas of concern to Commission D were organized by other Commissions without consultation with Commission D. In line with the service function of Commission D, most of the scientific sessions were organized jointly with other Commissions.

#### 3. Sponsorship of Meetings

The Commission voted to continue sponsorship of the International Conference on Infrared and Millimetre Waves, and to ask URSI to be a cosponsor of the 8th European Conference on Optical Communication with involvement of Commission D because of the Conference material on sources, detectors and fibres.

#### 4. Remote Sensing within URSI

The issue of how to treat the topic of remote sensing within URSI was discussed. It was felt that Remote Sensing was important to URSI and that the Union should take positive action in this field. While no formal vote was taken there was a split between members favouring a new Commission and those favouring a strong Inter-Commission Committee at least as an interim measure.

#### 5. Rôle of Commission D within URSI

The rôle of Commission D within URSI was discussed at length. It was agreed that URSI was not a natural scientific home for people working in the areas covered by the mandate of Commission D, and thus it was likely that the Commission would continue as a service operation bringing new device developments to the attention of the users in the other Commissions. The main focus of this activity ought therefore to be at the General Assembly and to take the form of joint and tutorial sessions to attract participation from the other Commissions.

It was agreed that optical frequency techniques and devices should be part of URSI's domain of interest and that Commission D should be central to such activity. To this end the Commission recommended to the Council that the word 'optical' be included in its title, perhaps by changing the title to "Electronic and Optical



Devices and Applications".

The interest in optical techniques would be in addition to such areas as sources and detectors for the microwave, millimetre and sub-millimetre ranges of the spectrum, microelectronics and other device technologies for signal processing.

#### 6. Open Symposia at XXI General Assembly

The following topics were suggested for open symposia at the XXI General Assembly in 1984:

- a) Techniques for data and signal processing for communication;
- b) Optical techniques for communication, sensing and processing.

#### TITLES OF SCIENTIFIC SESSIONS

The following scientific sessions and Open Symposium were organized jointly by Commission D and the other Commissions noted.

- Open Symposium on Millimetre and Submillimetre Waves, organized by Dr. K.J. Button, and consisting of sessions on
  - 1. Free electron maser and gyrotron
  - 2. Radio astronomy applications
  - 3. Measurements of power and noise power
  - 4. Ultra low-noise millimetre-wave receivers
  - 5. Methods of measurement of complex dielectric properties of solids and liquids.
- Scientific Sessions (Commission Organizer: J. Le Mézec) on
  - 1. Microelectronic circuits and systems (with Commission C)
  - 2. Hardware for fast signal processing I (with Commissions C and J)
  - 3. Hardware for fast signal processing II (with Commissions C and J)
  - 4. Optical systems and components (with Commission C).

#### COMMISSION E - ELECTROMAGNETIC NOISE AND INTERFERENCE

Chairman: Mr. G.H. Hagn (USA)

Vice-Chairman: Prof. S. Lundquist (Sweden)

#### CHAIRMAN'S REPORT

##### 1. Activities of Commission E, 1978-1981

The Commission has been active in several ways:

- a) Co-sponsorship or cooperation in the following international scientific meetings:
  - 1) Electromagnetic Compatibility, Wroclaw 1978
  - 2) Third Symposium and Technical Exhibition on Electromagnetic Compatibility, Rotterdam 1979
  - 3) Solar-Terrestrial Predictions, Boulder 1979
  - 4) Electromagnetic Compatibility, Wroclaw 1980
  - 5) IEEE International Symposium on Electromagnetic Compatibility, Baltimore 1980

- 6) Fourth Symposium and Technical Exhibition on Electromagnetic Compatibility, Zurich 1981.

Commission E organized one or more scientific sessions at 2), 4), 5) and 6).

- b) The provision of responses to requests for information or comment from the CCIR through working groups.
- c) The preparation of the Commission E Chapter of the *Review of Radio Science 1978-1980*.
- d) The organization of scientific sessions for the Washington Assembly.

Commission E encouraged the holding of national scientific meetings between Assemblies to supplement the international meetings it co-sponsors. Such meetings were held in the USA, France, Japan, and Poland.

## 2. Working Group on Man-Made Radio Noise

This Working Group, chaired by Dr. A.D. Spaulding (USA), met in Helsinki, and it has worked by correspondence since 1978 to provide comments on CCIR Study Question 46/1 on radio noise.

## 3. Working Group on Natural Noise

This Working Group, chaired by Prof. S. Lundquist (Sweden), has worked by correspondence since it was established in 1978 at the Helsinki Assembly. Coordination with CIGRE and other groups was effected.

## 4. Status of Helsinki Resolutions

Commission E participated in all of the international symposia planned at the Helsinki Assembly.

## 5. Terms of Reference 1982-1984

The terms of reference for Commission E for the next triennium are:

- a) natural and man-made sources of noise;
- b) the composite noise environment;
- c) the effects of noise on systems performance;
- d) the lasting effects of transients on equipment performance;
- e) the scientific basis of noise and interference control;
- f) spectrum utilization.

## 6. Plans for 1982-1984

Commission E plans to participate in the following international meetings:

- a) Sixth International Wroclaw Symposium on Electromagnetic Compatibility, Wroclaw, June 1982.
- b) IEEE EMC Society, San Francisco, September 1982.
- c) Fifth Symposium and Technical Exhibition on Electromagnetic Compatibility, Zurich, March 1983.
- d) IEEE EMC Society, Washington, October 1983.
- e) Seventh International Wroclaw Symposium on Electromagnetic Compatibility, Wroclaw, June 1984.

f) International Conference on Electromagnetic Compatibility,  
Tokyo, October 1984.

In view of the large number of meetings covering the terms of reference of Commission E (at least two per year) it is the policy of Commission E to strengthen these meetings scientifically rather than to organize competing URSI meetings.

SCIENTIFIC PROGRAMME

During the XX General Assembly, Commission E held six scientific sessions (including about 36 presentations). Joint sessions were held with Commissions A, C and H. Attendance was typically 25-50, and the discussions were lively. The programme consisted of the following sessions:

- Signal and noise measurements (joint with Commission A)  
Organizers: D. F. Wait (USA) and M.L. Crawford (USA);  
Chairman: D.F. Wait (USA)  
6 papers.
- Man-made noise  
Organizer and Chairman: A.D. Spaulding (USA)  
7 papers.
- Man-made Noise Working Group  
Chairman: A.D. Spaulding (USA)
- Natural noise I  
Organizer: S. Lundquist (Sweden)  
Chairmen: S. Israelsson (Sweden) and F. Horner (UK)  
8 papers.
- Natural noise II  
Organizers: H. Ishikawa (Japan) and G.H. Hagn (USA)  
Chairman: F. Horner (UK)  
4 papers.
- Interaction of natural and man-made ELF/ULF disturbances with the ionosphere and magnetosphere (joint with Commission H)  
Organizer: W.M. Boerner (USA)  
Chairman (papers): P. Lefeuvre (France)  
Chairman (panel): R.A. Helliwell (USA)  
4 papers and panel discussion.
- Natural Noise Working Group  
Chairman: S. Lundquist (Sweden)
- Impulse noise and its effect on communications (joint with Commission C)  
Organizer and Chairman: A.A. Giordano (USA)  
6 papers.

SUMMARY OF MINUTES OF BUSINESS MEETINGS

Commission E thought it might need to elect a new Chairman and Vice-Chairman and therefore six persons were nominated:

1) Prof. H. Ishikawa (Japan); 2) Prof. E. Nano (Italy); 3) Prof. B. Schanning (GDR); 4) Prof. F.L.H.M. Stumpers (Netherlands); 5) Mr.W.L. Taylor (USA); 6) Prof; H. Volland (FRG).

Both Prof. Volland and Prof. Schanning wrote to the Chairman before the General Assembly and withdrew. The Official Members present (or their written designated proxies) voted by written ballot on the remaining candidates, and the results were:

- 1) Prof. F.L.H.M. Stumpers ( Netherlands);
- 2) Prof. E. Nano (Italy);
- 3) Mr. W.L. Taylor (USA);
- 4) Prof. H. Ishikawa (Japan).

Reports on national activity were given by representatives of Japan, USA, UK, France and Sweden. Written reports were prepared by representatives of Japan, USSR, and Israel, and these were distributed. Prof. F.L.H.M. Stumpers reported on the successful European EMC Symposia held between URSI Assemblies, and the Chairman reported on the URSI session at the IEEE EMC Symposium on Baltimore, 1980. The terms of reference were revised (see Item 5, above) to include: the lasting effects of transients on equipment performance. This is interpreted to include damage to components as well as upsets to computer based systems from large transients such as those caused by lightning. The term on control was broadened to include both noise (sources) and interference (degradation produced).

Prof. H. Kikuchi, Commission E representative on the URSI Inter-Commission Working Group on the Influence of Man's Activities on Telecommunications, reported that he got 34 replies to his questionnaire about the most important problems of interest to Commission E: 1) Powerline radiation (16); 2) Ground and space transmitters at ELF/VLF/HF (10); 3) Solar power satellite (8). As a result, he organized and chaired an 8-paper URSI session on powerline radiation at the 1980 Wroclaw EMC Symposium. Prof. Kikuchi agreed to serve on this Working Group for the next 3 years.

The Working Groups on Man-made Noise (established in Warsaw, 1972), and Natural Noise (established in Helsinki, 1978) were continued with the same Chairmen (Drs Spaulding and Lundquist, respectively), and two new Working Groups were established:

- 1) Working Group on the Effects of Transients, Chairman to be appointed by Chairman of Commission E;
- 2) Working Group on the Scientific Basis of Noise and Interference Control, Chairman: C.E. Baum (USA).

Chairman Hagn, on behalf of the Commission, thanked Dr. A.D. Spaulding (USA) for serving as Commission E Editor for the *Review of Radio Science 1978-1980*. Dr. A.A. Giordano (USA) volunteered to serve as the Commission E Editor for the period 1981-83.

M. M. Thué, Chairman of the URSI-CCIR-CCITT Liaison Committee, thanked the Commission for past assistance to the CCIR, and he asked for a continuation of the support (e.g., the Working Group activities) and a broadening to include some CCITT topics.

Dr. Horner, Secretary of the Inter-Union Commission on the Allocation of Frequencies to Radio Astronomy and Space Science (IUCAF), reported that radio astronomy and remote sensing did well at the 1979 World Administrative Radio Conference (WARC-79). A Working Group is considering "out-of-band" emissions from transmitters and man-made noise (e.g., microwave ovens), for their potential to produce interference to protected bands (especially near 18 GHz).

The tremendous potential for interference to telecommunications and scientific experiments from solar power satellites (SPS) was noted.

Commission E has no objection to the joining of Commissions G and H. A new Commission on remote sensing was discussed. The consensus favoured such a new Commission; however, the scope of Commission F could be expanded to recognize remote sensing more explicitly. The views of Commission F were considered most important on this issue.

Resolutions were passed regarding the continuation of Commission E support to the work of CCIR, the support to developing countries through the activities of the Committee on Developing Countries chaired by Dr. Mitra, and the scientific value of maintaining the Boulder World Data Centre and the other World Data Centres in an adequate operating condition (see Res.E.1 and E.6, and Res. U.22).

#### COMMISSION F - WAVE PHENOMENA IN NON-IONIZED MEDIA

Chairman: Prof. A.T. Waterman (USA)

Vice-Chairman: Dr. D. Gjessing (Norway)

#### REPORT ON BUSINESS MEETINGS

##### 1. Nomination of Vice-Chairman

The following candidates as Vice-Chairman of Commission F were submitted to the Council, in order of preference:

1. Dr. K.S. McCormick (Canada)
2. Dr. F. Fedi (Italy).

##### 2. Remote Sensing

See Recommendation F.3.

##### 3. Inter-Union Commission on Radio Meteorology (IUCRM)

See Recommendation F.4.

##### 4. Scientific Committee on Oceanic Research (SCOR)

Commission F recommended that Dr. J. Apel (USA) be continued as URSI representative on SCOR.

##### 5. World Meteorological Organisation (WMO)

Commission F recommended that Dr. Ph. Waldeufel (France) be designated as URSI representative on WMO.

##### 6. Coordinating Committee for the Moon and Planets

Commission F did not find it appropriate to be represented on this Committee.

##### 7. Future Symposia

It was recommended that four symposia be held before the XXI General Assembly on the following topics:

- a) Two-parameter radar measurements of precipitation for radio

- propagation modelling;
- b) Signature problems in remote sensing of the Earth surface;
- c) Global scale forecasting using satellite data;
- d) Mesoscale observations and forecasting using all sensors.

#### 8. Working Groups

The Commission agreed to set up two Working Groups as follows:

- 1) Working Group on Beacon Satellites, under the chairmanship of Dr. G. Hyde (USA);
- 2) Working Group to study the terms of reference of Commission F with the following membership: P. Delogne and R.K. Crane (co-chairmen), F. Fedi and D.L. Croom.

#### TITLES OF SCIENTIFIC SESSIONS

- Scattering mechanisms of radio waves in middle atmosphere (with Commission G)  
Chairman: T.E. Van Zandt (USA)
- Optical propagation  
Chairman: A. Ishimaru (USA)
- Earth-satellite propagation: attenuation and depolarization impairments to communication systems  
Chairman: G. Hyde (USA)
- Earth-satellite propagation: radio meteorological aspects of attenuation modelling  
Chairman: R.K. Crane (USA)
- Interference problems due to propagation and their relation to the efficient use of the radio frequency spectrum  
Chairman: N. Abel (FRG)
- Earth-satellite propagation: site diversity improvement to attenuation impairments, tropospheric scintillation and other effects on the slant path  
Chairmen: R. Crane and G. Hyde (USA)
- Poster Session on special topics  
Chairman: R.J. Hill (USA)
- Reports on Inter-Assembly Symposia  
Chairman: P. Misme (France).

## COMMISSION G - IONOSPHERIC RADIO AND PROPAGATION

Chairman: Dr. B. Hultqvist (Sweden)

Vice-Chairman: Dr. P. Bauer (France)

### REPORT ON BUSINESS MEETINGS

#### 1. Nomination of Vice-Chairman

Voting for a new Vice-Chairman was carried out by correspondence before the General Assembly. Commission G decided during its first business meeting to recommend to the Council to elect as first alternative Dr. J. Aarons (USA) and as second alternative Dr. H. Rishbeth (UK).

#### 2. Terms of Reference

There are no changes of the terms of reference of Commission G for the next three-year period, but the proposed merging of Commissions G and H will require the drafting of new terms of reference for the new Commission before or during the next General Assembly.

#### 3. Merging of Commissions G and H

Commission G voted in favour of the merging of Commissions G and H. The official voting, with only Official Members participating, resulted in 10 for and 7 against. There was also an informal voting by hand raising with all those present (more than 60 persons) participating which gave a larger majority in favour of the merging than the official voting did.

#### 4. Remote Sensing in URSI

There was a discussion but no voting on this matter. The Business Meeting of Commission G appeared to be inclined towards fairly limited changes within URSI for providing better services to the incoherent scatter community (in the limited sense of the URSI special Working Group); in the first hand an extension of the terms of reference of Commission F. If there should be a new Commission, it should only deal with the land, sea and ice surfaces of the Earth. Inter-commission and inter-union organs may also be useful.

#### 5. Working Groups

The Commission decided to have eight Working Groups of its own in the period 1982-1984 and to be involved in one joint URSI/IAGA Working Group (on Active Experiments, with Commission H). The two URSI/IAGA Working Groups on the Structure and Dynamics of the Thermosphere, Ionosphere and Exosphere and on Neutral and Ion Chemistry and Solar Fluxes are recommended to be dissolved.

The Commission G Working Groups and their terms of reference are the following:

##### G.1 Ionospheric Network Advisory Group (INAG)

Chairman: Dr. W.R. Piggott (UK); Vice-Chairman: Dr. L.F. McNamara (Australia).

Terms of reference:

- to monitor, maintain and improve the standards of data produced

- by the Vertical Incidence (VI) ionosonde network;
- to promote the interchange of data through the WDC's or by direct contact between stations and users;
- to produce regularly a Bulletin to further its ends and to provide a link between administrations operating VI stations and the users;
- to revise the parameters and associated rules to match the needs of the users;
- to evaluate and make recommendations on the international importance of proposed, or existing stations as required;
- to encourage the development of new methods of exploiting VI ionosonde output;
- to encourage staff at VI networks stations by informing them on the use of their data and allied matters;
- to inform the VI network of developments in techniques which could be usefully deployed at VI ionosonde stations;
- to hold meetings to promote these ends in as many countries as possible.

G.3 Southern Hemisphere Atmospheric Studies Group (SHASG)  
Co-Chairmen: J.A. Gledhill (South Africa) and S. Radicella (Argentina).

Terms of reference:

- to maintain exchange of scientific information and to promote and coordinate radio observations and studies of the ionosphere in the Southern Hemisphere.

G.4 International Reference Ionosphere (IRI) (jointly with COSPAR)  
Chairman: K. Rawer (FRG); Vice-Chairman: A.D. Danilov (USSR).

Terms of reference 1982-84:

- to improve existing IRI, in particular:
  - new adaptive formula for subpeak plasma density (to be compared with true height, total electron content and incoherent scatter data);
  - new formula for electron temperature taking account of relation with electron density and of height (and, possibly, seasonal) influence;
  - better ion composition description based on larger data base, from rockets and satellites in particular;
  - describe lowest ionosphere cluster and negative ions;
- to widen height range by modelling at altitudes above 2000 km and in plasmasphere;
- to discuss limitations, high latitude conditions, perturbations;
- to start empirical modelling of ionospheric drift data;
- to cooperate with CCIR-IPW 6/3 for improvement of world-wide mapping of peak data;
- to prepare IRI sessions (2) at the 1982 COSPAR Meeting (Ottawa)
- to prepare subsequent third edition of IRI (probably 1983).



- G.6 Ionospheric Knowledge Needed to Improve Radiocommunication  
Chairman: C.M. Rush (USA); Vice-Chairmen: B.M. Reddy (USA) and  
E. Thrane (Norway).

Terms of reference:

- modelling the ionosphere for applications to radio systems and performance prediction.

- G.8 Incoherent Scatter

Chairman: M.J. Baron (USA); Vice-Chairman: M.M. Blanc (France).

Terms of reference:

- to foster communication, coordination and cooperation among workers in the field of incoherent scatter;
- to foster interaction and cooperation between the incoherent scatter community and the general upper atmospheric science community.

- G.10 International Digital Ionosonde Group (IDIG)

Chairman: J.R. Dudeney (UK); Vice-Chairmen: K. Bibl (USA) and  
J.W. Wright (USA).

Terms of reference:

- to act as a forum and channel of communication for individuals and administrations interested in the design, construction and application of digital ionospheric sounders;
- to stimulate international support of the digital sounding community's interests within the Scientific Unions;
- to promote standards for data acquisition, interchange and archiving where a user need is identified;
- to assist in the interchange of appropriate system specifications and software for data acquisition and analysis;
- to facilitate the planning of cooperative research campaigns;
- to encourage theoretical studies relevant to the design, development and application of digital sounding techniques.

- G.11 Panel on Southern Hemisphere Incoherent Scatter Facility  
(SHISCAT)

Chairman: J.A. Gledhill (South Africa).

Terms of reference:

- to plan a Southern Hemisphere Incoherent Scatter facility.

- G.12 Use of Beacon Satellite Transmissions

Chairman: R. Leitinger (Austria); Vice-Chairmen: L.Kersley(UK)  
and J.A. Klobuchar (USA).

Terms of reference:

- to further the international cooperation between scientists engaged in beacon satellite observations of the ionized environment of the Earth or in the interpretation of data from such observations, and scientists as well as engineers who need information on propagation errors for definition of system parameters and for error specification and correction.

## 6. Proposed Symposia and Workshops for 1982-1984

### 6.1 URSI as main sponsor

- Radio probing of the high latitude ionosphere and atmosphere: New techniques and new results, Fairbanks, Alaska in August 1982. Convener: R.D. Hunsucker (USA).
- Beacon satellite studies of the Earth's atmosphere, New Delhi, India, November 1982. Convener: R. Leitinger (Austria).
- Symposium on Equatorial Aeronomy, Kenya, probably 1983.

### 6.2 URSI sponsored Workshops intended to serve developing countries in particular

- Workshop on ionospheric modelling for propagation problems, Africa in 1982 or 1983. Convener: C.A. Reddy (India).
- Workshop on the use of beacon satellite transmissions, New Delhi, India, 1982, in connection with the Beacon satellite Symposium. Conveners: R. Leitinger (Austria) and T.R. Tyagi (India).

### 6.3 Co-sponsored symposia

- International Symposium on Solar-Terrestrial Physics, Ottawa, Canada May 1982.
- Symposium on Ionospheric Modification, at IUGG General Assembly, Hamburg, FRG, August 1983.
- Symposium on the Electrodynamics of the Polar Ionosphere and Magnetosphere, at IUGG General Assembly, Hamburg, FRG, August 1983.

## 7. Possible Session Subjects for Commission G at the 1984 General Assembly

The following proposals for session subjects were presented, but no decisions were taken:

- Wave analysis: multipoint measurements and processing
- Incoherent scatter
- Influence of the ionosphere on advanced radio systems
- Radio scintillations as a tool in ionospheric, magnetospheric, and astrophysical studies
- Modelling the ionosphere for applications to radio systems performance prediction
- International Reference Ionosphere
- Radio studies of the high latitude ionosphere
- Radio studies of the equatorial ionosphere
- Active wave experiments from ground and space.

## 8. Representative of Commission G on MONSEE

Commission G decided to recommend Dr. D.G. Cole (Australia) to replace Dr. G. Pillet (France) as Commission G representative in MONSEE.

### TITLES OF SCIENTIFIC SESSIONS

Some 110 scientific papers were presented in six half-day sessions of Commission G alone, four joint sessions with Commission H, two joint sessions with the URSI/IAGA Working Group on Active Experiments and one joint session with Commission F (in total 13 half-day sessions). The titles of the sessions were the following:

- Equatorial F-region ionospheric irregularities (with Commission H)
- Scattering mechanisms of radio waves in middle atmosphere (with Commission F)
- Equatorial E-region ionospheric irregularities (with Commission H)
- Aeronomic studies using digital ionospheric sounders
- Equatorial F-region scintillations (with Commission H)
- Ionospheric modification, I (with URSI/IAGA Working Group)
- Ionospheric modification, II (with URSI/IAGA Working Group)
- Influence of the ionosphere on radio systems, I
- Influence of the ionosphere on radio systems, II
- Incoherent scatter and theoretical studies of the auroral zone
- First results from EISCAT (with Commission H)
- Plasma irregularities and instabilities at high latitudes
- Morphology of the ionosphere at high latitudes.

### COMMISSION H - WAVES IN PLASMAS

Chairman: Prof. F.W. Crawford (USA)

Vice-Chairman: Dr. M. Petit (France)

### REPORT ON BUSINESS MEETINGS

#### 1. Nomination of Vice-Chairman

The Chairman reported that several nominations had been received by mail, as required. All were for Prof. R.L. Dowden (New Zealand). It was agreed that no further nominations should be taken, and that this single name should be submitted to the Council.

#### 2. Terms of Reference

These were described in the September 1975 issue of the *URSI Information Bulletin*, following the establishment of the Commission at the Lima General Assembly. An ad hoc sub-committee consisting of M. Petit, R.L. Dowden and E.R. Schmerling was charged with reporting on the suitability of these terms of reference, particularly in relation to those of Commission G.

This sub-committee reported as follows:

The following definitions are compatible with the understanding developed at the Lima General Assembly. Areas of overlap can be handled by joint meetings; duplication in the *Review of Radio Science* can be avoided by suitable editorial attention, e.g. allocating three chapters, as was done in the 1978-80 issue for Commissions A and B (Chapters 1 and 3) and Bioeffects (Chapter 2).

### Commission G: Ionospheric Radio and Propagation

Deals with the study of the ionosphere in order to provide the broad understanding of this medium necessary to radio communications. Included are the morphology of the ionosphere, its structure and variations, and the tools needed to measure its properties.

### Commission H: Waves in Plasmas

Deals with waves in plasmas in the broadest sense, and the interactions between these waves and charged particles, excluding the communications aspects that are the province of Commission G. Included are electromagnetic and electrostatic waves in interplanetary, planetary and laboratory plasmas.

### 3. Merger of Commissions G and H

During the first Business Meeting of the Commission, it was reported that the URSI Council had requested Commissions G and H to each consider the possible merger of the two Commissions, and to report their findings to the ad hoc sub-committee set up by the Council and consisting of E. Jull(Chairman), S. Okamura and S. Lundquist.

After considerable discussion, a motion to merge was defeated (1 for, 6 against, 1 abstention) by the Official Members, and (1 for, 14 against) by the others present. It was then agreed to set up the sub-committee noted in Para. 2.

During the second Business Meeting, the Chairman outlined the provisions of the Report on the Proposal to Merge Commissions G and H submitted to the Council by the ad hoc sub-committee. In the general discussion that ensued, the position was maintained that such a merger was not timely, and would not conduce to the best interests of Commission H, or URSI in general; many plasma physicists have been attracted to URSI by Commission H. Collaboration with Commission G would continue, as it would with any other Commission with common interests.

### 4. Working Groups

The representatives of the various Working Groups submitted brief reports to the Commission.

It was decided to maintain the Working Groups on Wave Analysis (H.1) and on Active Experiments (H.2), and to set up a new Working Group on Computer-Aided Wave Analysis (H.3).

The Commission decided also to maintain the two Inter-Union Working Groups (with IAGA) as follows: Passive Electromagnetic Probing of the Magnetosphere (URSI/IAGA.1), and Wave Instabilities in Space Plasmas (URSI/IAGA.2).

### 5. Sponsorship of Meetings

- . Requests for Commission H sponsorship had been received from:
- International Conference on Plasma Physics , Gothenburg, Sweden, June 1982 (Organizer: Prof. H. Wilhelmsson);

- XVI International Conference on Phenomena in Ionized Gases, Düsseldorf, FRG, August 1983 (Organizers: Prof. W. Böttcher and Prof. K. Suchy).

The Chairman noted that sponsorship was given to the last conference in each of these two series and that it was appropriate that Commission H sponsorship should be given again. This was agreed by the Commission.

#### 6. Programme for the XXI General Assembly, 1984

Topics recommended for inclusion in the Commission H programme are:

- Symposium on Wave Analysis (with Commission C)
- Symposium on Planetary Radio Waves (URSI/IAGA Working Group 2)
- Symposium on Wave Experiments on the Space Shuttle.

It was also agreed that time should be allocated formally in the Commission H programme for general discussion of topics of current interest.

#### 7. Overlap of URSI Assemblies and Meetings of Other Bodies

Noting the overlap between the current URSI meeting in Washington, D.C. and the IAGA meeting in Edinburgh, Commission H registered its strong objection to scheduling such meetings simultaneously.

### TITLES OF SCIENTIFIC SESSIONS

The contributions of Commission H to the General Assembly programme were as follows:

- Terrestrial kilometric radiation
- VLF and ELF wave-particle interaction
- Remote determination of plasma wave spectra
- Computer-aided plasma wave analysis
- Equatorial F-region ionospheric irregularities (with Commission G)
- Equatorial F-region scintillations (with Commission G)
- Incoherent scatter and theoretical studies of the auroral zone (with Commission G)
- First results from EISCAT (with Commission G)
- Plasma irregularities and instabilities at high latitudes (with Commission G)
- Morphology of the ionosphere at high latitudes (with Commission G)
- Interaction of natural and man-made ELF/ULF disturbances with the ionosphere and magnetosphere (with Commission E)
- Open Symposium on Remote Sensing (with Commissions B, F and G)
- Open Symposium on Mathematical Models in Radio Propagation (with Commissions B, F and G).

## COMMISSION J - RADIO ASTRONOMY

Chairman: Prof. H. Tanaka (Japan)

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

### REPORT ON BUSINESS MEETINGS

#### 1. Nomination of Vice-Chairman

The result of the vote was as follows, in order of preference:

1. R. Wielebinski (FRG)
2. V.S. Troitskiy (USSR)

#### 2. Activities 1978-1981

The Chairman reported on the main activities of Commission J during the last three years.

- 1) URSI Symposium on mm-Wave Technology, with emphasis on radio astronomy applications, Grenoble, 19-22 August 1980.
- 2) URSI co-sponsored IAU Symposia: No 95 on Pulsars, Bonn, 26-29 August 1980 and No 97 on Extragalactic Radio Sources, Albuquerque, 3-7 August 1981.
- 3) Preparation of the Chapter on Radio Astronomy for inclusion in *Review of Radio Science 1978-1980*.
- 4) Printing of Commission J internal report *Review of Radio Astronomy 1978-1981*.
- 5) About 200 letters were received and 100 letters including seven Commission J circular letters were sent out by the Chairman.

#### 3. Commission J Circular Letters

Following discussion in Helsinki, the Chairman had requested the Official Members to circulate copies of each Circular Letter among their national colleagues. However, this operation has not been adequate in all cases and the Chairman expressed the hope that, in future, the Official Members would be more responsible in circulating information and collecting opinions from scientists in their countries.

#### 4. Unwanted Effects of Man's Activities on Telecommunications

It was decided to request Dr. R. Wielebinski to continue to participate in the discussion group and to attend the meeting to be held during the Washington Assembly.

#### 5. Commission J Report

As in Helsinki in 1978, Commission J Internal Report was distributed in Washington, D.C. This Report is a simple collection of 36 national contributions from the Member Committees. Most of the contributions were prepared for the *Review of Radio Science* but some portions were retyped, expanded or updated to May 1981. The printing cost was covered partly by a grant from URSI and partly by purchasers.

The next Chairman was invited to consider doing it in the same way.

#### 6. Review of Radio Science

The Chairman, as the Commission J editor of the 1981 edition, expressed his thanks for the contributions from 24 countries. He noted that the editor's efforts would be reduced considerably if all the contributions were received before the deadline, and requested the Official Members to make every effort to help the next editor in this task.

#### 7. IUCAF Matters

It was noted that, due to the prolonged illness of Prof. J.P. Hagen, the URSI Board had appointed Dr. B.J. Robinson as a member of IUCAF. Commission J was unanimous in expressing its thanks to the members of IUCAF for their great efforts towards protecting frequencies for radio astronomy observations.

#### 8. Coordinating Committee on Moon and Planets

Dr. G. Levy was asked to prepare a recommendation regarding the possible participation of Commission J in the activities of this Committee. After having collected opinions on this matter, Dr. Levy reported that very few people had attended the Washington Assembly who were interested in this subject. It was felt, therefore, that Commission J was not in a favourable position to make any recommendation and it was decided not to take any action.

#### 9. Sunspot Index Data Centre (SIDC)

A recommendation of support to SIDC was adopted in view of the great importance of the work of this Centre for various aspects in Earth sciences, including solar radio astronomy.

#### 10. Giant Equatorial Radio Telescope (GERT)

The Commission adopted a recommendation supporting the international INISSE/GERT projects which involve several developing countries.

#### 11. URSI Membership

On proposal of Dr. A. Moffet, Commission J adopted a recommendation that the People's Republic of China be invited to become a member of URSI.

#### 12. Symposia between Assemblies

Suggestions for symposia were made as follows:

- Measurement and Processing for Indirect Imaging, to be held in Sydney, Australia, in 1983;
- Millimeter and Sub-millimeter Radio Astronomy, to be held in 1984 in connection with the XXI General Assembly of URSI.

It was pointed out that at the Patras General Assembly of IAU in 1982, there might be suggestions for other symposia, one or more of which could also be sponsored by URSI, depending on the relevance of the topic to URSI interests and activities.

### 13. Programme of Commission J in Washington

The programme for the Washington Assembly was discussed at length and views both critical and appreciative were expressed. It was agreed that the programme as planned was a good one and that, in future, poster sessions could also be considered.

### 14. Remote Sensing

At the request of the Chairman, Prof. Christiansen, President of URSI, provided a brief background to the subject and reported on the various options that had been proposed at the meeting of the Chairmen of URSI Commissions held on 9 August in Washington, D.C.

A lively discussion followed in which many people expressed their views both on the options and on their possible effects on the activities of Commission J. As a result it became clear that the general feeling of Commission J was one of support for the formation of a new Commission on Remote Sensing as long as its terms of reference and activities had little or no overlap with those of Commission J. The Chairman was requested to convey this feeling to the ad hoc Committee set up by the Council for this purpose.

### TITLES OF SCIENTIFIC SESSIONS

- History of radio astronomy celebrating the 50th anniversary of Jansky's observations. Chairman: W.T. Sullivan, III (USA).
- New developments in observatories and laboratories. Chairmen: H. Tanaka (Japan) and V. Radhakrishnan (India).
- Surface tolerances of large precision antennas (with Commissions A and B). Chairmen: J.W. Findlay (USA) and B.H. Bach (Denmark).
- Hardware for fast signal processing I. (with Commission C and D).
- Hardware for fast signal processing II (with Commissions C and D). Chairman: R.H. Frater (Australia).

### SHORT REPORT ON SCIENTIFIC ACTIVITIES IN WASHINGTON, D.C.

In general, about 100 people attended each scientific session. In addition to the scheduled scientific sessions, two workshops, both related to VLBI, were convened.

In the session on History of radio astronomy, highlights in the development of radio astronomy up until 1960 were outlined by six speakers as part of a celebration of the 50th anniversary of Jansky's original discovery. Approximately 200 persons heard talks by five distinguished "old-timers" and the Session Chairman. The talks covered Jansky and Reber (the latter not being able to attend) (Sullivan), solar work in Australia (Christiansen), early years at Jodrell Bank (Lovell, read by J.G. Davies), early radar, radio source, and galactic work in Australia (Kerr), Soviet radio astronomy (Salomonovitch), and the Dutch contributions (Westerhout). Afterward, a 50-minute videotape of the Australian Broadcasting Commission, entitled "Grote Reber: Wildcat Astronomer", was also shown. It is planned eventually to incorporate written versions of these talks into a book.



In the session on Surface tolerances of large precision antennas, A. Greve reviewed the present status of large precision antennas, and presented the surveying techniques developed at MPIFR and IRAM. Multi-target laser ranging and motor-drive adjusting techniques developed and being applied to the Nobeyama 45-metre telescope were described by M. Morimoto. The holographic method of surface measurement successfully applied to the 5-metre Texas telescope (H. Davis) and to the 25-metre telescope in UK (M.P. Gordwin) was reported, and the improvement in resolution in holographic method was described by von Hoerner. The effects of deterministic surface deviations on reflector antenna performance was described by Y. Rahmat-Samii. Application of large precision antenna to solar observations (P. Kaufmann) and status of Caltech 10-metre antennas (A.T. Moffet) were reported. A short extra paper was given by W.J. Welch at Berkeley on a holographic measurement of one of the Hat Creek 6-metre antennas by the Ryle and Scott method.

The session on Hardware for fast signal processing II addressed some of the signal processing and computational problems of the radio astronomy field and some of the instrumental techniques used in this and related areas. The requirements of synthesis radio telescopes were discussed by R.D. Ekers in relation to the Very Large Array telescope (VLA) in New Mexico, where 30,000 channels of data sequence are processed in a few seconds.

The problems of processing very long baseline interferometry data were discussed by two speakers. Here the signal bandwidths are currently 56 MHz with the need to correlate signals recorded on tape from remote stations. The Mark III correlator from Haystack was described by A. Rogers and the Block II system from CALTECH/JPL, by D. Rogstad.

Approaches for wide bandwidth high spectral resolution correlators for the large radio telescope at Nobeyama were described by Y. Chikada. These include acousto-optic techniques and a new spectro-correlator, where an FFT is performed on each data stream before correlating the resultant frequency channels for pairs of antennas. A bandwidth of 320 MHz is envisaged.

In the final paper in the session, W. Kofman described a high-speed correlator used for ionospheric studies. Due to delays resulting from the air strike, a paper by G.S. Moschytz on switched capacitor filters was included in this session, which was to be read in the session CD.1.

A workshop on "VLBI Correlators" was convened by M.S. Ewing, CALTECH, USA, on Wednesday 12 August. Approximately 20 persons discussed on correlators for future large scale VLBI networks. A majority of people attending were interested in the topics on: a) direct correlator vs. FFT correlator, and b) recording media, etc.

A workshop on the "Coordination of VLBI Research" was convened by K.J. Johnston of NRL, USA, on Thursday 13 August. At this workshop, the formation of a working group on this subject was discussed. The purpose of the proposed working group is the dissemination and coordination of information regarding proposed plans for operational systems and their technology for astrophysical and geophysical applications at an international level. About 25 persons attended from a

number of countries. Discussions were conducted in two parts. Firstly, plans and present status were presented by representatives of various countries, and large scale projects. Secondly, a possible form of coordination on the common use of VLBI arrays between astrophysical and geophysical applications was discussed. Although no definite conclusion was reached, it was unanimously agreed that an effort should be made to pursue the possibility of cooperation and coordination.

The three sessions devoted to the traditional reports on the new developments in observatories and laboratories were also open to short contributions on scientific studies. 44 papers were presented including about 30 institutions from all over the world. Reports included future plans being conceived, field experiences and raw data, which would not normally be reported in the literature and, therefore, contained useful or often vital information. In this respect, the sessions were highly successful. About 75% of above papers were on the ever-growing fields of interferometric observations and mm-wave astronomy, indicating continued efforts and interests in these fields.

Particularly noteworthy among the new facilities that have recently gone into operation were the VLA, the MTRL0, the Molonglo Synthesis Telescope and that at the Clark Lake Observatory. Among those that should be operational before the next General Assembly are the impressive mm-wave antennas at Nobeyama in Japan and the 30-metre diameter MPI telescope in Spain. A very interesting proposal for the future was a Gregorian feed system for the Arecibo telescope.

The most significant recent receiver developments were reported from NRAO and Dwingeloo. There were also many interesting astronomical results reported by the MTRLI group, and from the Onsala, Parks and Clark Lake Observatories. Finally, there were several theoretical papers on radioastronomical subjects, mostly from the Raman Institute in Bangalore.

The sessions concluded with a very useful report on the impact of WARC 1979 on Radio Astronomy.

## RESOLUTIONS AND RECOMMENDATIONS OF THE COUNCIL

### U.1 - Relations with other Scientific Unions

The URSI Council,

*considering*

- (a) the unfortunate proximity of the dates of the XX General Assembly of URSI and of the Scientific Assembly of the International Association of Geomagnetism and Aeronomy (IAGA);
- (b) the possibility of future coincidences of dates between URSI and other ICSU bodies having interests overlapping those of URSI;

*resolves* to reaffirm Section 9 of Resolution C.1 (1975) as follows:

- "9.(a) that other organizations interested in promoting international symposia on aspects of telecommunications be invited to cooperate in an arrangement whereby all such symposia fit into a reasonable overall schedule that not merely avoids formal duplication but constitutes sound international planning;
- " (b) that URSI should seek to establish a permanent coordinating body to implement this concept, and should publish at frequent regular intervals the agreed list of such meetings for several years in advance".

### U.2 - Admission of New Member Committees

The URSI Council,

*considering*

- (a) that the Council for Scientific Research of the Republic of Iraq has applied for membership of URSI in Category 1;
- (b) that the Academy of Athens, Greece, has applied for membership of URSI in Category 1;
- (c) that the conditions specified in Articles 2, 4 and 4 of the URSI Statutes are satisfied;

*resolves* to admit to membership of URSI, in Category 1:

1. the Committee which will be formed under the auspices of the Council for Scientific Research of the Republic of Iraq;
2. the Committee which will be formed under the auspices of the Academy of Athens, Greece.

### U.3 - URSI Finances

The URSI Council,

*noting* the recommendations of the Standing Finance Committee;

*resolves*

1. to approve the audited accounts of URSI for the years ended 31 December 1978, 1979 and 1980;
2. to approve the Income and Expenditure Budgets contained in Tables 2 and 3 of the Report of the Standing Finance Committee;
3. to adopt the unit contributions referred to as Plan A in Table 2 of this Report, namely:

1982	\$520
1983	\$560
1984	\$610;

4. to publish the Report of the Standing Finance Committee in the *Proceedings of URSI General Assemblies*, Volume XIX;
5. in view of the fluctuations in the world economic situation, to authorize the Board of Officers to make annually budget corrections as appropriate.

### U.4 - Standing Finance Committee

The URSI Council,

*considering* the importance of the task devolved on the Standing Finance Committee;

*resolves* to maintain this Committee and to appoint the following as members:

Dr. H.J. Albrecht (Germany, Fed. Rep.)	Chairman
Dr. A.P. Mitra (India)	
Dr. M. Petit (France)	
Dr. S. Radicella (Argentina)	
Prof. V. Zima (Czechoslovakia).	

### U.5 - Report of Publications Committee

The URSI Council

*resolves*

1. to accept the Report submitted by the Publications Committee, and to adopt the recommendations contained in it;
2. to publish the Report of the Publications Committee in the *Proceedings of URSI General Assemblies*, Volume XIX.

#### U.6 - Standing Committee on URSI Membership

The URSI Council,

*considering* that it is desirable to pursue the efforts towards encouraging the adherence of new Member Committees to URSI;

*resolves* to maintain the Standing Committee on URSI Membership, and to appoint the following as members:

Prof. S. Okamura (Japan)            Chairman  
Prof. R.L. Dowden (New Zealand)  
Prof. K. Géher (Hungary)  
Dr. May Kaftan (Iraq)  
Prof. V.V. Migulin (USSR)  
Prof. J.O. Oyinloye (Nigeria)  
Prof. M. Rodriguez Vidal (Spain).

#### U.7 - Committee on Developing Countries

The URSI Council,

*considering*

- (a) the recommendation made in 1980 by the Board of Officers to convene at the XX General Assembly a meeting of the representatives of Member Committees in developing countries to investigate the ways in which URSI could make a useful contribution to the advance of radio science in these countries, and to consider the possible formation of a Committee to deal with this problem;
- (b) the interest shown by the representatives of the Member Committees concerned during the meeting held in Washington, D.C.;
- (c) the recommendations and plan of action submitted by this group of representatives;

*resolves*

- 1. to set up a Committee on Developing Countries;
- 2. to appoint the following as members of this Committee:

Dr. A.P. Mitra (India)            Chairman  
Dr. May Kaftan (Iraq)  
Prof. K.P. Liang (Taiwan)  
Dr. I. Mandour (Egypt)  
Prof. J.O. Oyinloye (Nigeria)  
Prof. S. Radicella (Argentina)  
M. J. Voge (France);

- 3. to authorize the Committee to coopt a member to represent the Peruvian URSI Committee.

#### U.8 - URSI-CCIR-CCITT Liaison Committee

The URSI Council,

*considering* that it is desirable to develop further and to improve the cooperation between URSI and the Consultative Committees of the

International Telecommunication Union;

*resolves*

1. to maintain the URSI-CCIR-CCITT Liaison Committee;
2. to designate the following as members of the Committee:

M. M. Thué (France)      Chairman  
Dr. F. Fedi (Italy)  
Prof. W.E. Gordon (USA)  
Mr. G. Hagn (USA)  
Dr. C.M. Rush (USA)  
Prof. F.L.H.M. Stumpers (Netherlands).

U.9 - Standing Committee on URSI General Assemblies

The URSI Council,

*considering*

- (a) that invitations to hold the XXII General Assembly of URSI in 1987 have been received from Member Committees in India, in Israel and in New Zealand;
- (b) that tentative invitations to hold the XXIII General Assembly of URSI in 1990 have been received from Member Committees in France and in Sweden;

*resolves*

1. to maintain the Standing Committee on URSI General Assemblies, and to appoint the following as members of the Committee:

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

2. to refer the invitations mentioned above to the Committee.

U.10 -XXI General Assembly of URSI, 1984

The URSI Council,

*considering*

- (a) the invitations received from the Member Committees in Italy and in Sweden for the XX General Assembly of the Union in 1984;
- (b) the results of the ballot;

*resolves*

1. to accept the invitation of the Italian URSI Committee to hold the XXI General Assembly in Florence, Italy, in 1984;
2. to express to these two Committees its appreciation of their kind invitations.

U.11 - Designation of Honorary Presidents

The URSI Council,

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

*resolves* to confer the title of Honorary President on:

Sir Granville Beynon (President of URSI 1972-1975),  
Prof. I. Koga (President of URSI 1963-1966)

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

U.12 - Designation of Secretary General Emeritus

The URSI Council,

*considering* the exceptional services rendered to URSI by the former Secretary General during his tenure of office, and his subsequent generous help to URSI;

*resolves* to confer upon Dr. C.M. Minnis (Secretary General 1968-1978) the title of Secretary General Emeritus.

U.13 - Proposed Union of Commissions G and H

The URSI Council,

*noting* the recommendations of the ad hoc Committee set up to study the proposal of the French URSI Committee to merge Commissions G and H;

*resolves*

1. that this proposal to unite Commissions G and H be accepted in principle;
2. that the final decision on the proposed union be made at the XXI General Assembly on the basis of the experience of the next three years;
3. that, if formed, the name of the combined Commission be decided at the XXI General Assembly;
4. that a Committee composed of the Chairmen and Vice-Chairmen of Commissions G and H be formed to arrange joint sponsorship of meetings, symposia and sessions over the next three years, as well as joint reporting of results for the next *Review of Radio Science*;
5. that the Official Members for Commissions G and H of the Member Committees similarly combine their activities over the next three years;
6. that there be no reduction in the resources and conference time made available to the combined Commissions G and H during the trial period, and after the union if it occurs.

U.14 - Remote Sensing

The URSI Council,

*having considered*

- (a) the Report of the Inter-Commission Working Group on Remote Sensing chaired by Dr. J.O. Thomas, dated March 1981;
- (b) the Report of the ad hoc Advisory Group set up during the General Assembly in Washington under the chairmanship of Dr. C.G. Little;

*resolves*

- 1. to change the title of Commission F to "Remote Sensing and Wave Propagation - Neutral Atmosphere, Oceans, Land, Ice";
- 2. to encourage Commission C to accept responsibility for image processing and pattern recognition;
- 3. to form an Inter-Commission Coordinating Group on Remote Sensing to coordinate the activities internal to URSI;
- 4. to refer the question of the terms of reference and membership of the Inter-Commission Coordinating Group to the Coordinating Committee of URSI;
- 5. to accept the Commission B recommendation to include inverse scattering in the terms of reference of the Inter-Commission Coordinating Group referred to above;
- 6. to explore the possibilities, in consultation mainly with IUGG, to set up an inter-organization body to foster the research, organize and coordinate symposia in the area of remote sensing.

U.15 - Inter-Union Commission on Radio Meteorology (IUCRM)

The URSI Council,

*considering* para 6 of its Resolution U.14 on the coordination of activities in the area of remote sensing;

*resolves* to recommend the dissolution of the Inter-Union Commission on Radio Meteorology.

U.16 - Title of Commission D

The URSI Council,

*considering*

- (a) the wish of Commission D to make a major contribution, within URSI, to the devices and techniques involved in optical communication, sensing and processing;
- (b) the interest of this Commission in sources and detectors for the microwave, millimetre and submillimetre ranges of the spectrum, in microelectronics, cryoelectronics and in other devices for signal processing;

*resolves* that the word "optical" be included in the title of Commission D, and that this be changed to "Electronic and Optical Devices



and Applications".

U.17 - Inter-Commission Working Group for Coordination of URSI's Activities at Optical Wavelengths for Communication, Sensing and Processing

The URSI Council,

*considering*

- (a) that the optical portion of the frequency spectrum is of growing importance for many applications for which radio waves have been used chiefly heretofore;
- (b) that URSI is the logical Union to absorb such applications of optical frequencies;

*resolves* to establish an Inter-Commission Working Group to coordinate the activities of the Commissions at optical wavelengths for communication, sensing and processing.

U.18 - Use of International System of Units

The URSI Council,

*considering*

- (a) that recommendations urging the broadest acceptance and use of SI units were adopted at the XV and the XIX General Assemblies of URSI (Munich 1966 and Helsinki 1978 respectively);
- (b) that international and interdisciplinary communication will be greatly improved by the general use of SI units;

*resolves*

1. to urge strongly the exclusive use of SI units in papers, journal articles, and oral presentations at all meetings, conferences and symposia of which URSI is a cooperating sponsor;
2. to require the exclusive use of SI units in papers, journal articles, and oral presentations at all meetings, conferences and symposia of which URSI is the sole sponsor, in particular at URSI General Assemblies.

U.19 - International Ursigram and World Days Service (IUWDS)

The URSI Council,

*considering*

- (a) the most valuable services rendered by the International Ursigram and World Days Service (IUWDS) to the international scientific community by ensuring the speedy transmission of information on phenomena of interest to radio scientists, geophysicists and astronomers;
- (b) the major contribution being made by this body for the implementation of international cooperative research programmes such as the Solar Maximum Year, the International Magnetospheric Study,

and the Middle Atmosphere Programme;

*expresses* its appreciation of the excellent work done by this Service;

*views* with great concern the uncertainties regarding the future financing of the Service, and

*recommends* that the three Unions concerned, IAU, IUGG and URSI, jointly approach ICSU and UNESCO asking these organisations to make every effort to provide adequate financial support for the continuing full operation of IUWDS.

#### U.20 - Bureau International de l'Heure (BIH)

The URSI Council,

*considering*

- (a) that the Bureau International de l'Heure is charged by the 14th General Conference of Weights and Measures (Conférence Générale des Poids et Mesures (CGPM)) to determine the International Atomic Time Scale, TAI, on the basis of atomic clocks, operating throughout the world in accordance with the definition of the SI second;
- (b) that the Coordinated Universal Time, UTC, is derived from TAI, and that, according to the 15th CGPM, UTC has become the basis of civil time;
- (c) that TAI and UTC have a growing importance in science and technology;
- (d) that the number of clocks contributing to TAI has increased steadily and is now of the order of one hundred, with the result of an increasing burden to the BIH;
- (e) that the computation of TAI to the highest accuracy and stability necessitates considerable scientific study, e.g. on the weighting of contributions of clocks of different qualities and the detection of causes for the observed clock behaviour;

*states* that the work of the BIH on TAI and UTC is of greatest importance to science and technology, and

*recommends* that all necessary support, including financial means, be given to the BIH for enabling it to continue its important and growing work in the field of international time-keeping.

#### U.21 - Sunspot Index Data Centre (SIDC)

The URSI Council,

*considering* the importance and utility of the sunspot index in such fields of research as climate, stellar convection, stellar activity cycles, solar radio astronomy;

*being aware* that the production of the Zurich Relative Sunspot Number has been discontinued;

*commends* the Sunspot Index Data Centre (SIDC) at Uccle, Belgium for its willingness to provide a sunspot index;

*recommends*

1. that the SIDC be encouraged to continue its work in computing an index of sunspot activity;
2. that this index be prepared in a manner that makes it consistent with the earlier Zurich series.

#### U.22 - Solar-Terrestrial Physics World Data Centre (WDC-A) at Boulder

The URSI Council,

*being aware* of the recent difficulties in continuing the full programme of the Solar-Terrestrial Physics Data Centre (WDC-A) at Boulder;

*recognizing* the very great importance of the services of this Data Centre for the world-wide scientific activities within several of the URSI Commissions;

*resolves*

1. to reaffirm the scientific value of maintaining the World Data Centre at Boulder, and the other World Data Centres in an adequate operating condition;
2. to urge the US authorities to confirm and develop the WDC-A services through the 1980's.

#### U.23 - Southern Hemisphere Incoherent Scatter Facility

The URSI Council,

*having considered* the report of the Commission G Panel on a Southern Hemisphere Incoherent Scatter Facility;

*endorses* the proposal that a feasibility study of a transportable incoherent scatter facility be undertaken;

*requests* the Panel to investigate possible arrangements for the financing of the study, and to proceed with the study, as soon as possible.

#### U.24 - Satellite Beacons

The URSI Council,

*recognizing* the value of long-term trans-ionospheric and atmospheric propagation studies for modelling and application purposes;

*recommends* that governmental and intergovernmental agencies be urged to provide satellite beacons in the HF-UHF range.

#### U.25 - Multi-Technique Campaigns

The URSI Council,

*considering*

- (a) the importance of multi-technique campaigns for investigations of the ionized environment of the Earth;
- (b) the fact that, in some cases, the different equipments available have not been fully exploited;

*recommends* that the organizations planning multi-technique campaigns distribute information about the goals of the campaigns and the facilities or techniques required or desired to make possible a full use of available equipment on an international basis.

#### U.26 - Maintenance of Stations

The URSI Council,

*recognizing*

- (a) that there is strong evidence for long-term variations in the Earth's magnetic field which affect the ionosphere, and in the relations between solar activity and ionospheric phenomena;
- (b) that monitoring of these changes is essential;
- (c) that the value of data for these purposes increases rapidly with the length and homogeneity of the sequence available;

*stresses* the need to maintain ionospheric and geomagnetic stations with long segments of data or, where this is not possible, to provide sufficient overlap with replacement stations.

#### U.27 - Monitoring of the Ionosphere

The URSI Council,

*recognizing* that the monitoring of the ionosphere on a global scale using ionosondes continues to be of major interest, and involves a large number of institutions around the world;

*draws attention* to the desirability to maintain an effective research effort, in parallel with the monitoring activities, aimed at improving the value and availability of the data bases so obtained, and at developing new methods to meet these ends.

#### U.28 - International Institute of Space Sciences and Electronics, and Giant Equatorial Radio Telescope

The URSI Council,

*considering*

- (a) that the establishment of the proposed International Institute of Space Sciences and Electronics (INISSE) as a collaborative effort among the developing countries would provide an excellent opportunity for the participating countries to make significant

advances in radio science;

- (b) that the construction of the proposed Giant Equatorial Radio Telescope (GERT), as one of the important projects to be undertaken by INISSE, would provide an excellent facility for research in radio astronomy at metre wavelengths;
  - (c) that the INISSE/GERT projects are well conceived and realizable;
- resolves* to strongly support the INISSE/GERT projects.

#### U.29 - UNESCO

The URSI Council,

*considering*

- (a) that the annual subvention received from UNESCO, via ICSU, represents a valuable support of the scientific activities of URSI, in particular for the organisation of international scientific symposia and other meetings of scientists, and the issue of publications;
- (b) that the funds received from UNESCO, via ICSU, represented a valuable addition to the support provided by the US URSI Committee and URSI itself for the development of the Young Scientists Scheme;

*resolves* to convey to UNESCO the thanks and appreciation of the Union for this support.

#### U.30 - Vote of Thanks to US URSI Committee

The URSI Council,

*noting*

- (a) the excellent facilities provided in Washington, D.C. for the scientific and administrative sessions of the XX URSI General Assembly, and the Open Symposia associated with it;
- (b) the full programme of scientific tours and social events arranged by the US Organizing Committee;
- (c) the hospitality shown to the participants and their families during the Assembly;

*resolves* to offer its warmest thanks

1. to the URSI Committee in the United States for the invitation to hold the Assembly in Washington, D.C.;
2. to the Organizing Committee for its detailed preparatory work which ensured the success of the Assembly;
3. to the members of the Accompanying Persons' Committee whose welcome was greatly appreciated by those who accompanied the participants in the Assembly.

## RESOLUTIONS AND RECOMMENDATIONS OF COMMISSIONS

### COMMISSION A - ELECTROMAGNETIC METROLOGY

#### A.1 - URSI Register of National Standards Laboratories

Commission A,

*considering*

- (a) that the first draft of the Register of National Standards Laboratories was produced by the Working Party (of Commission A) for the XVIII General Assembly (Lima, 1975), and that a revised version was available for the XIX General Assembly (Helsinki, 1978);
- (b) that the Register constitutes a unique compilation of the standards facilities available for a wide range of electromagnetic quantities;
- (c) that, in consequence, it has a valuable rôle to play, especially in those developing countries seeking to establish traceability to accepted standards in the developed nations;

*recommends*

- 1. that the Working Party be asked to continue its efforts (under the present Chairman, Mr. A.E. Bailey);
- 2. that sufficient funds be made available to ensure the continued production of the Register in an acceptable format (e.g., good quality print and graphics from computer file store);
- 3. that renewed efforts be made to publicize the existence of the Register, both in URSI literature and also in that of other international bodies (e.g. ITU, UNESCO, etc.).

#### A.2 - Working Group on Time Domain Waveform Measurements

Commission A,

*considering* that there exist needs in waveform measurements, especially in relation to fast pulses, which are important to: a) radio science in transient electromagnetic fields, in scattering and geophysical studies; b) radar, telecommunications and computers, e.g., in remote sensing; data acquisition, transmission and processing; high speed electronic devices and circuits; c) measurement and instrumentation in relation to measurement methods, oscilloscopes/optical streak cameras, detectors, sensors;

*considering further* that these needs impinge heavily on the interests of URSI Commissions, and that there exist unique capabilities in URSI to meet many of these needs;

*resolves* that a Commission A Working Group on Time Domain Waveform Measurements be established to

1. encourage and assist in meetings to provide a forum for Time Domain Electromagnetic Measurements;
2. foster agreement in the measurement of waveforms;
3. identify and then publicize critical areas needing research effort;
4. invite the other URSI Commissions to cooperate with Commission A in accomplishing the above objectives.

*Note: By decision of the Coordinating Committee of URSI, this Working Group was given the status of an Inter-Commission Working Group.*

### A.3 - Interactions of Electromagnetic Waves with Biological Systems

Commission A

*recommends*

1. that the existing Working Group on "Interactions of Electromagnetic Waves with Biological Systems" be continued under the chairmanship of Prof. S.W. Rosenthal;
2. that the Working Group hold several international symposia between General Assemblies and during the XXI General Assembly of URSI.

## COMMISSION B - FIELDS AND WAVES

### B.1 - Symposium on Electromagnetic Theory

Commission B,

*considering*

- (a) that URSI Symposia on Electromagnetic Theory have been held at intervals of three years in a series beginning in 1953;
- (b) that these Symposia are major events which represent the main effort of Commission B between Assemblies;
- (c) that offers to host the next Symposium have been received from Australia, Israel and Spain;

*resolves*

1. that the next Symposium in this series be held in 1983;
2. that the final decision regarding the location be made by postal ballot of Official Members of the Commission.

### B.2 - Cosponsorship of International Conferences

Commission B,

*considering* that various forthcoming international conferences are of direct interest to the Commission;

*recommends* that URSI cosponsor the following Conferences:

- 1) 7th Colloquium on Microwave Communication, Budapest (Hungary), 6-10 September 1982;
- 2) 8th European Conference on Optical Communication, Cannes (France), 21-24 September 1982;
- 3) European Microwave Conference, Helsinki (Finland), 13-17 September 1982.

#### B.3 - Optical Waveguide Problems

Commission B,

*considering* that it has a sustained interest in optical waveguide problems;

*expresses* the wish to interact with other URSI Commissions having similar interests.

Note: See Council Resolution U.16.

#### B.4 - Activities in Inverse Scattering

Commission B

*expresses*

1. its continued interest in remote sensing,
2. its support of the resolution proposed by the ad hoc Committee on Remote Sensing,
3. the opinion that activities in inverse scattering should be accounted for within this framework.

Note: See Council Resolution U.14.

### COMMISSION C - SIGNALS AND SYSTEMS

#### C.1 - Cosponsorship of Symposia

Commission C

*recommends* that URSI sponsorship should be granted, possibly with financial help, to the following symposia:

- 1) IEEE International Symposium on Information Theory, Les Arcs, France, 21-25 June 1982,
- 2) 6th Summer Symposium on Circuit Theory, Prague, Czechoslovakia, 12-16 July 1982.



COMMISSION D. - PHYSICAL ELECTRONICS

D.1 - Symposia for the XXI General Assembly

Commission D

*recommends* that the following symposia be held during the XXI General Assembly in 1984:

- 1) Techniques for data and signal processing for communication and radio science;
- 2) Optical techniques for communication, sensing and processing.

Note: *Referred to Steering Group for Coordination of URSI Scientific Programme.*

COMMISSION E - ELECTROMAGNETIC NOISE AND INTERFERENCE

E.1 - Assistance to Developing Countries

Commission E,

*considering*

- (a) that many developing countries, especially in tropical areas are particularly vulnerable to radio interference and equipment damage by lightning discharges;
- (b) that these countries are geographically well placed for the study of the phenomena involved;
- (c) that much more information is needed on both natural and man-made noise from these countries;
- (d) that relevant programmes of measurement and data analysis can benefit from guidance and cooperation from countries where the techniques are well developed;

*recommends*

1. that URSI explore the various ways in which scientists in developing countries might be assisted in studies of natural and man-made noise, for example by holding seminars and by encouraging financial aid or the provision of equipment;
2. that, in consultation with the Committee on Developing Countries, Commission E carry out detailed planning of such assistance;
3. that CCIR be invited to collaborate in this programme;
4. that a workshop or seminar be organized by the Chairman of Commission E to initiate the programme.

Note: *Referred to the URSI Committee on Developing Countries.*

## E.2 - Terms of Reference 1982-1984

Commission E

*resolves* that its terms of reference for the period 1982-1984 cover the following:

- a) natural and man-made sources of noise;
- b) the composite noise environment;
- c) the effects of noise on systems performance;
- d) the lasting effects of transients on equipment performance;
- e) the scientific basis of noise and interference control;
- f) spectrum utilization.

## E.3 - Working Groups

Commission E

*resolves*

1. to retain the two following Working Groups:
  - Man-made Noise (established in Warsaw, 1972),  
Chairman: A.D. Spaulding (USA);
  - Natural Noise (established in Helsinki, 1978),  
Chairman: S. Lundquist (Sweden);
2. to establish two new Working Groups as follows:
  - Effects of Transients, the Chairman to be designated by the  
Chairman of Commission E;
  - Scientific Basis of Noise and Interference Control,  
Chairman: C.E. Baum (USA).

## E.4 - Participation in International Meetings

Commission E

*agrees* to participate in the following international meetings:

- 1) 6th International Wroclaw Symposium on Electromagnetic Compatibility (Wroclaw, Poland), June 1982;
- 2) IEEE EMC Society Symposium (San Francisco, USA), September 1982;
- 3) 5th Symposium and Technical Exhibition on Electromagnetic Compatibility (Zurich, Switzerland), March 1983;
- 4) IEEE EMC Society Symposium (Washington, USA), October 1983;
- 5) 7th International Wroclaw Symposium on Electromagnetic Compatibility (Wroclaw, Poland), June 1984;
- 6) 1984 International Conference on Electromagnetic Compatibility (Tokyo, Japan), October 1984.

#### E.5 - Remote Sensing

Commission E

*noting*

- (a) that remote sensing is basic to many of the Commissions of URSI, including Commission E;
- (b) that an Inter-Commission Working Group has worked since the 1978 Assembly to consider this matter, and has organised an open symposium at the current Assembly;
- (c) that it was not desirable to continue this Inter-Commission Working Group;
- (d) that the primary options are:
  - 1) to expand Commission F and modify its title to reflect the emphasis on remote sensing;
  - 2) to form an Inter-Union Commission on Remote Sensing, possibly building on IUCRM;
  - 3) to form a new Commission of URSI on Remote Sensing;

*recommends* the formation of a new Commission focused on remote sensing of the neutral atmosphere and the Earth's surface, pending the outcome of the current open symposium and the recommendations of the other affected Commissions (particularly Commission F).

Note: Superseded by Council Resolution U.14.

#### E.6 - Support to CCIR

Commission E,

*considering* the importance of the work of the International Radio Consultative Committee (CCIR) regarding international telecommunications;

*resolves* to continue to support the CCIR through the activities of its Working Groups.

Note: Referred to the URSI-CCIR-CCITT Liaison Committee.

### COMMISSION F - WAVE PHENOMENA IN NON-IONIZED MEDIA

#### F.1 - Symposia

Commission F

*recommends* that four symposia be held before the XXI General Assembly on the following topics:

- 1) Two-parameter radar measurements of precipitation for radio propagation modelling;
- 2) Signature problems in remote sensing of the Earth's surface;
- 3) Global scale forecasting using satellite data;
- 4) Mesoscale observations and forecasting using all sensors.

## F.2 - Working Groups

### Commission F

*resolves* to set up two Working Groups as follows:

- Beacon Satellites; Chairman: G. Hyde (USA);
- The terms of reference of Commission F; membership: P. Delogne (Belgium) and R.K. Crane (USA) (co-chairmen), F. Fedi (Italy) and D.L. Croom (UK).

## F.3 - Remote Sensing

### Commission F

*having considered* the report of the Inter-Commission Working Group on Remote Sensing;

*recommends*

1. that proposals to form a new Commission on Remote Sensing be rejected, specifically any Commission with a title such as "Remote Sensing and Radio Waves", "Remote Sensing of Land and Sea", or "Terrestrial and Planetary Remote Sensing";
2. that Commission F widen its terms of reference to cover all aspects of remote sensing, as well as propagation, in non-ionized media, and that its title include the words "Remote Sensing";
3. that a new Inter-Commission Working Group be formed to coordinate future URSI work on remote sensing, particularly symposia and other conferences;
4. that an Inter-Union Commission (or Scientific Committee) on Remote Sensing be formed with the mission of
  - a) promoting the development and use of remote sensing techniques for the study of the terrestrial atmosphere, oceans, and land and ice surfaces;
  - b) organizing jointly sponsored symposia in this area;
  - c) coordinating international programmes in this area.

Note: Superseded by Council Resolution U.14.

## F.4 - Inter-Union Commission on Radio Meteorology (IUCRM)

### Commission F

*recommends*

1. that the Inter-Union Commission on Radio Meteorology be transformed into an "Interdisciplinary Commission on Remote Measurements (IDCRM)" with appropriate terms of reference;
2. that the following be designated as URSI representatives on this new Commission:
  - A. Shutko (USSR)
  - P. Broche (France)
  - D. Barrick (USA)

R. Crane (USA)  
H. Ottersten (Sweden)  
G. Valenzuela (USA).

Note: Superseded by Council Resolution U.15.

## COMMISSION G - IONOSPHERIC RADIO AND PROPAGATION

### G.1 - Symposia and Workshops 1982-1984

#### Commission G

*recommends* that URSI should sponsor or cosponsor the following symposia and workshops:

- 1) Radio probing of the high-latitude ionosphere and atmosphere; new techniques and new results. Fairbanks, Alaska (USA), August 1982. Convener: R.D. Hunsucker (USA).
- 2) Beacon satellite studies of the Earth's environment. New Delhi (India), November 1982. Convener: R. Leitinger (Austria).
- 3) Symposium on Equatorial Aeronomy. Kenya, probably 1983.
- 4) Workshop on ionospheric modelling for propagation problems. Africa 1982 or 1983. Convener: C.A. Reddy (India).
- 5) Workshop on the use of beacon satellite transmissions. New Delhi (India), 1982 (in connection with the Symposium under Item 2)). Conveners: R. Leitinger (Austria) and T.R. Tyagi (India).
- 6) International Symposium on Solar-Terrestrial Physics. Ottawa (Canada), May 1982.
- 7) Symposium on ionospheric modification. Hamburg (FRG), August 1983 (at IUGG General Assembly).
- 8) Symposium on the electrodynamics of the polar ionosphere and magnetosphere. Hamburg (FRG), August 1983 (at IUGG General Assembly).

### G.2 - INAG Bulletin

#### Commission G,

*recognizing*

- (a) that there is a continuing interest in the maintenance of a vertical incidence ionospheric network;
- (b) that a considerable number of new ionosondes have recently been produced and deployed, some in developing countries;
- (c) that INAG has made adequate arrangements for the future production of this Bulletin;

*appreciating* that significant financial support will continue to be provided by WDC-A and some national administrations;

*recommends* that URSI continue to support the publication of the INAG

Bulletin for the next three years.

### G.3 - Multi-purpose Geophysical Observatories

Commission G,

*recognizing*

- (a) the increasing interest in systematic radio measurements of the terrestrial environment, including those of the sea surface, the lower neutral atmosphere, the mesosphere, and the ionosphere;
- (b) that the utility of these measurements is increased where they are co-located;
- (c) that these diverse measurements may share similar resources, such as radio transmitters, receivers, antennas, data processing facilities, and observing staff;

*recommends* that national administrations should attempt to develop multi-purpose geophysical observatories, including appropriate portions of the existing ionosonde network.

### G.4 - Ionospheric Channel Probing by Oblique Sounding

Commission G,

*considering* the increasing use of ionospheric channel probing by oblique sounding for the purpose of improving HF communications;

*encourages* the exchange of oblique sounding data and ionospheric properties derived therefrom, and

*urges* that an evaluation be made at many geographical locations of the potential for ionospheric assessment on a global and synoptic basis by this technique.

### G.5 - Vertical Incidence Ionosonde on Gough Island

Commission G,

*noting* the potential importance of a vertical incidence ionosonde on Gough Island (UK) for URSI and CCIR programmes;

*recommends* strongly that a vertical incidence sounding station be established at this site.

### G.6 - International Reference Ionosphere

Commission G,

*recognizing* that high accuracy N(h) profiles are required for tests of the International Reference Ionosphere;

*noting* that adequate techniques exist;

*recommends* that agencies with suitable facilities produce accurate profiles and carry out such tests.

#### G.7 - Training Handbook of Ionogram Interpretation and Reduction

##### Commission G

*expresses* its appreciation of the preparation in Japan of a simplified training handbook based on the *URSI Handbook of Ionogram Interpretation and Reduction*, and

*recommends* that an English version be produced for international use.

#### G.8 - Working Groups

##### Commission G

*resolves* to constitute or reconstitute, as appropriate, the following Working Groups:

- G.1 Ionospheric Network Advisory Group (INAG)  
Chairman: W.R. Piggott (UK)  
Vice-Chairman: D.G. Cole (Australia)
- G.3 Southern Hemisphere Atmospheric Studies Group (SHAGS)  
Co-chairmen: J.A. Gledhill (South Africa) and S. Radicella (Argentina)
- G.4 International Reference Ionosphere (IRI) (with COSPAR)  
Chairman: K. Rawer (FRG)  
Vice-Chairman: A.D. Danilov (USSR)
- G.6 Ionospheric Knowledge Needed to Improve Radiocommunication  
Chairman: C.M. Rush (USA)  
Vice-Chairmen: B.M. Reddy (USA) and E. Thrane (Norway)
- G.8 Incoherent Scatter  
Chairman: M.J. Baron (USA)  
Vice-Chairman: M.M. Blanc (France)
- G.10 International Digital Ionosonde Group (IDIG)  
Chairman: J.R. Dudeney (UK)  
Vice-Chairmen: K. Bibl (USA) and J.W. Wright (USA)
- G.11 Panel on Southern Hemisphere Incoherent Scatter Facility (SHISCAT)  
Chairman: J.A. Gledhill (South Africa)
- G.12 Use of Beacon Satellite Transmissions  
Chairman: R. Leitinger (Austria)  
Vice-Chairmen: L. Kersley (UK) and J.A. Klobuchar (USA).

#### COMMISSION H - WAVES IN PLASMAS

#### H.1 - Working Groups

##### Commission H

*resolves*

- 1. to maintain its Working Groups on
  - Wave Analysis (H.1),
  - Active Experiments (H.2);

2. to maintain the URSI-IAGA Working Groups on
  - Passive Electromagnetic Probing of the Magnetosphere (URSI-IAGA.1),
  - Wave Instabilities in Plasmas (URSI-IAGA.2);
3. to set up a new Working Group on Computer-Aided Wave Analysis (H.3).

## H.2 - Cosponsorship of Conferences

Commission H

*recommends* that URSI should cosponsor the following Conferences:

- 1) International Conference on Plasma Physics, Göteborg (Sweden), June 1982,
- 2) XVI International Conference on Phenomena in Ionized Gases, Düsseldorf (FRG), August 1983.

## H.3 - Coordination of International Meetings

Commission H,

*noting* the overlap between the current URSI meeting in Washington, D.C. and the IAGA Meeting in Edinburgh, UK;

*registers* its strong objection to scheduling such meetings simultaneously.

Note: See also Council Resolution U.1.

## H.4 - Programme for the XXI General Assembly of URSI

Commission H

*recommends* the following topics for inclusion in its programme at the XXI General Assembly in Florence, Italy, in 1984:

- 1) Symposium on Wave Analysis (with Commission C),
- 2) Symposium on Planetary Radio Waves (URSI-IAGA.2),
- 3) Symposium on Wave Experiments on the Space Shuttle;

*recommends further* that time should be allocated formally in the Commission H programme for general discussion of topics of current interest.

Note: Referred to the Steering Group for the Coordination of URSI Scientific Programme.

## H.5 - General Lectures

Commission H

*noting* the success of the three General Lectures given during the present General Assembly in Washington, D.C.;



*encourages* the provision of a greater number of such lectures, perhaps one per Commission, to be held during the XXI General Assembly in 1984.

Note: *Referred to the Steering Group for the Coordination of URSI Scientific Programme.*

## COMMISSION J - RADIO ASTRONOMY

### J.1 - Organization of Symposia

Commission J

*recommends*

1. that, between 1982 and 1984, a Symposium on Measurement and Processing for Indirect Imaging be organized by it preferably in collaboration with other Commissions and/or scientific bodies;
2. that a Symposium on Millimetre and Sub-millimetre Radio Astronomy be held in Europe in 1984 in connection with the XXI General Assembly of URSI.

Note: *Point 2 referred to the Steering Group for the Coordination of URSI Scientific Programme.*

### J.2 - URSI Membership

Commission J,

*considering*

- (a) that there is considerable interest in the subject of radio astronomy within the People's Republic of China, with major instruments being planned or constructed by at least three observatories;
- (b) that close international cooperation is required to carry out many astronomical programmes, especially those involving very long baseline interferometry;

*recommends* that URSI should again invite the People's Republic of China to become a member of URSI before the XXI General Assembly in 1984.

Note: *Referred to URSI Standing Committee on Membership.*

## RESOLUTIONS ET RECOMMANDATIONS DU CONSEIL

### U.1 - Relations avec d'autres Unions Scientifiques

Le Conseil de l'URSI,

*considérant*

- (a) qu'il est regrettable que la XXe Assemblée générale de l'URSI et l'Assemblée scientifique de l'Association Internationale de Géomagnétisme et d'Aéronomie (IAGA) aient été prévues à des dates aussi rapprochées;
- (b) qu'une telle coïncidence pourrait se reproduire à l'avenir dans l'organisation de réunions de l'URSI et d'autres organismes du Conseil International des Unions Scientifiques (ICSU) ayant des intérêts apparentés à ceux de l'URSI,

*décide* de réaffirmer la Section 9 de la Résolution C.1 (1975), à savoir:

- "9.a) d'inviter les organisations intéressées par la tenue de colloques internationaux sur les différents aspects des télécommunications à collaborer à la mise en place d'un arrangement qui permettrait d'échelonner les colloques à des dates convenues et d'éviter les doubles emplois, ce qui assurerait une programmation internationale véritable;
- " b) de rechercher les voies pour établir un organe de coordination permanent permettant la réalisation de ce projet, et d'assurer la publication régulière et fréquente de la liste des colloques dont l'organisation aura été convenue, et cela pour plusieurs années à l'avance".

### U.2 - Admission de nouveaux Comités Membres

Le Conseil de l'URSI,

*considérant*

- (a) qu'une demande d'admission en Catégorie 1 a été soumise par le Conseil de la Recherche scientifique de la République d'Iraq;
- (b) qu'une demande d'admission en Catégorie 1 a été soumise par l'Académie d'Athènes, Grèce;
- (c) que les conditions spécifiées aux Articles 2, 3 et 4 des Statuts de l'URSI sont satisfaites,

*décide* d'admettre comme Membres de l'Union en Catégorie 1:

1. le Comité qui sera formé sous les auspices du Conseil de la Recherche scientifique de la République d'Iraq;
2. le Comité qui sera formé sous les auspices de l'Académie d'Athènes, Grèce.

### U.3 - Finances de l'URSI

Le Conseil de l'URSI,

*notant* les recommandations du Comité permanent des Finances,

*décide*

1. d'approuver les comptes de l'Union apurés pour les années 1978, 1979 et 1980;
2. d'approuver les prévisions budgétaires figurant dans les tableaux 2 et 3 du Rapport du Comité permanent des Finances;
3. d'adopter, pour l'unité de contribution annuelle, les montants figurant dans le tableau 2 du Rapport précité sous la rubrique "Plan A", à savoir:

1982 \$520

1983 \$560

1984 \$610;

4. de publier le Rapport du Comité permanent des Finances dans le Volume XIX des Comptes Rendus des Assemblées générales de l'URSI;
5. étant donné les fluctuations liées à la situation économique mondiale, d'autoriser le Bureau à apporter des modifications annuelles aux prévisions budgétaires, s'il le juge approprié.

### U.3 - Comité permanent des Finances

Le Conseil de l'URSI,

*considérant* l'importance de la tâche dévolue au Comité permanent des Finances,

*décide* de maintenir ce Comité et de désigner les personnalités suivantes comme membres:

Dr. H.J. Albrecht (Allemagne, R.F.) Président

Dr. A.P. Mitra (Inde)

Dr. M. Petit (France)

Dr. S. Radicella (Argentine)

Prof. V. Zima (Tchécoslovaquie).

### U.5 - Rapport du Comité des Publications

Le Conseil de l'URSI

*décide*

1. d'accepter le Rapport présenté par le Comité des Publications et d'adopter les recommandations qui y sont formulées,
2. de publier le Rapport du Comité des Publications dans le Volume XIX des Comptes Rendus des Assemblées générales de l'URSI.

U.6 -Comité permanent pour la participation à l'URSI

Le Conseil de l'URSI,

*considérant* qu'il est souhaitable de poursuivre les efforts en vue d'encourager l'adhésion de nouveaux Comités Membres à l'URSI,

*décide* de maintenir le Comité permanent pour la participation à l'URSI, et de désigner comme membres les personnalités suivantes:

Prof. S. Okamura (Japon) Président  
Prof. R.L. Dowden (Nouvelle Zélande)  
Prof. K. Géher (Hongrie)  
Dr. May Kaftan (Iraq)  
Prof. V.V. Migulin (URSS)  
Prof. J.O. Oyinloye (Nigeria)  
Prof. M. Rodriguez Vidal (Espagne).

U.7 - Comité pour les pays en développement

Le Conseil de l'URSI,

*considérant*

- (a) la recommandation faite en 1980 par le Bureau de l'Union de convoquer à la XXe Assemblée générale une réunion de représentants des Comités Membres des pays en développement pour rechercher les voies qui permettraient à l'URSI d'apporter une contribution valable au développement de la radioélectricité scientifique dans ces pays, et d'examiner la possibilité de former un Comité pour s'occuper de ce problème;
- (b) l'intérêt manifesté par les représentants des Comités Membres concernés pendant la réunion de Washington;
- (c) les recommandations et le plan d'action présentés par ce groupe de représentants,

*décide*

- 1. d'établir un Comité pour les pays en développement;
- 2. de désigner comme membre du Comité les personnalités suivantes:

Dr. A.P. Mitra (Inde) Président  
Dr. May Kaftan (Iraq)  
Prof. K.P. Liang (Taiwan)  
Dr. I. Mandour (Egypte)  
Prof. J.O. Oyinloye (Nigeria)  
Prof. S. Radicella (Argentine)  
M. J. Voge (France);

- 3. d'autoriser le Comité à coopter un membre qui représentera le Comité péruvien de l'URSI.

U.8 - Comité de liaison URSI-CCIR-CCITT

Le Conseil de l'URSI,

*considérant* qu'il est souhaitable de développer davantage et d'améliorer la collaboration entre l'URSI et les Comités consultatifs de l'Union Internationale des Télécommunications,

*décide*

1. de maintenir le Comité de liaison URSI-CCIR-CCITT,
2. de désigner comme membres du Comité les personnalités suivantes:

M. M. Thué (France) Président  
Dr. F. Fedi (Italie)  
Prof. W.E. Gordon (EUA)  
M. G. Hagn (EUA)  
Dr. C.M. Rush (EUA)  
Prof. F.L.H.M. Stumpers (Pays-Bas).

U.9 - Comité permanent pour les Assemblées générales de l'URSI

Le Conseil de l'URSI,

*considérant*

- (a) que des invitations pour la XXIIe Assemblée générale de l'URSI en 1987 ont été reçues des Comités de l'URSI en Inde, en Israël et en Nouvelle Zélande;
- (b) que des invitations provisoires pour la XXIIIe Assemblée générale de l'URSI en 1990 ont été reçues des Comités de l'URSI en France et en Suède,

*décide*

1. de maintenir le Comité permanent pour les Assemblées générales de l'URSI, composé des membres suivants:

Prof. A. Smolinski (Pologne) Président  
Dr. J.L. Locke (Canada)  
Prof. S. Lundquist (Suède)  
Prof. V. Padula-Pintos (Argentine);

2. de renvoyer au Comité les invitations ci-dessus mentionnées.

U.10 - XXe Assemblée générale de l'URSI, 1984

Le Conseil de l'URSI,

*considérant*

- (a) les invitations reçues des Comités Membres italien et suédois de l'URSI pour la XXe Assemblée générale en 1984;
- (b) le résultat du vote,

*décide*

1. d'accepter l'invitation du Comité italien de l'URSI de tenir la XXe Assemblée générale à Florence, Italie, en 1984;

2. d'exprimer à ces deux Comités ses remerciements pour leurs invitations.

#### U.11 - Désignation de Présidents d'honneur

Le Conseil de l'URSI,

*considérant* qu'il est autorisé à conférer le titre de Président d'honneur à d'anciens membres du Bureau ou à des Présidents de Commission qui ont contribué de façon exceptionnelle à la réalisation des buts de l'Union,

*décide* de conférer le titre de Président d'honneur

à Sir Granville Beynon (Président de l'URSI de 1972 à 1975),

au Prof. I. Koga (Président de l'URSI de 1963 à 1966)

en reconnaissance des services insignes qu'ils ont rendus à l'URSI.

#### U.12 - Désignation d'un Secrétaire général émérite

Le Conseil de l'URSI,

*considérant* les services exceptionnels rendus à l'URSI par le Secrétaire général sortant pendant son mandat, ainsi que l'aide généreuse qu'il a apportée à l'Union dans la période suivant l'expiration de son mandat,

*décide* de conférer le titre de Secrétaire général émérite

au Dr. C.M. Minnis (Secrétaire général de l'URSI de 1968 à 1978).

#### U.13 - Projet d'union des Commissions G et H

Le Conseil de l'URSI,

*notant* les recommandations du Comité ad hoc formé pour étudier la proposition du Comité français de l'URSI de fusionner les Commissions G et H,

*décide*

1. que le projet d'union des Commissions G et H soit accepté en principe;
2. que la décision finale concernant ce projet d'union soit prise à la XXIIe Assemblée générale, à la lumière de l'expérience des trois années à venir;
3. que, si la nouvelle Commission est formée, son titre soit défini à la XXIIe Assemblée générale;
4. qu'un Comité composé des Présidents et Vice-Présidents des Commissions G et H soit formé pour organiser le patronage commun des réunions, colloques et séances dans les trois années à venir, ainsi que la contribution commune des deux Commissions à la prochaine édition de "Review of Radio Science";

5. qu'au cours des trois années à venir, d'une manière analogue, les Membres officiels des Commissions G et H conjuguent leurs activités;
6. qu'aucune réduction ne soit apportée au montant des ressources ou à la durée des séances destinées aux Commissions G et H travaillant en commun, pendant la période d'essai et après leur union si elle est décidée.

#### U.14 - Télédéttection

Le Conseil de l'URSI,

*ayant considéré*

- (a) le rapport, daté de mars 1981, du Groupe de travail inter-Commissions sur la téléddéttection, présidé par le Dr. J.O. Thomas;
- (b) le rapport du Groupe consultatif ad hoc formé pendant l'Assemblée générale de Washington sous la présidence du Dr. C.G. Little,

*décide*

1. de modifier le titre de la Commission F comme suit: "Téléddéttection et propagation des ondes - atmosphère neutre, océans, terre, glace";
2. d'encourager la Commission C à inclure dans son mandat le traitement des images et la reconnaissance des formes;
3. de former un Groupe de coordination inter-Commissions sur la téléddéttection pour coordonner les activités à l'intérieur de l'URSI;
4. de renvoyer la question du mandat et de la composition du Groupe de coordination inter-Commissions au Comité de coordination de l'URSI;
5. d'accepter la recommandation de la Commission B d'inclure la "diffusion inverse" dans le mandat du Groupe de coordination inter-Commissions mentionné ci-dessus;
6. d'explorer, en consultation avec l'Union Internationale de Géodésie et de Géophysique en premier lieu, les possibilités d'établir un organisme inter-organisations pour stimuler la recherche, organiser et coordonner les colloques dans le domaine de la téléddéttection.

#### U.15 - Commission inter-Unions de radiométéorologie (IUCRM)

Le Conseil de l'URSI,

*considérant* le point 6 de la Résolution U.14 sur la coordination des activités dans le domaine de la téléddéttection,

*décide* de recommander la dissolution de la Commission inter-Unions de radiométéorologie.

U.16 - Titre de la Commission D

Le Conseil de l'URSI,

*considérant*

- (a) le souhait exprimé par la Commission D d'apporter, dans le cadre de l'URSI, une contribution majeure à l'étude des dispositifs et techniques utilisés dans les communications, la détection et le traitement des données dans la gamme optique;
- (b) l'intérêt de cette Commission pour les sources et les détecteurs dans les gammes hyperfréquences, en particulier millimétriques et submillimétriques, la microélectronique, la cryoélectronique et les autres dispositifs pour le traitement du signal,

*décide* que le terme "optique" soit inclus dans le titre de la Commission D, et que ce titre soit modifié comme suit: "Dispositifs électroniques et optiques et applications".

U.17 - Groupe de travail inter-Commissions pour la coordination des activités de l'URSI pour les communications, la détection et le traitement des données dans la gamme optique

Le Conseil de l'URSI,

*considérant*

- (a) que la portion optique du spectre revêt une importance croissante dans de nombreuses applications pour lesquelles les ondes radio-électriques ont été utilisées de façon prépondérante jusqu'à présent;
- (b) que l'URSI est logiquement l'Union appelée à traiter les applications des fréquences optiques,

*décide* d'établir un Groupe de travail inter-Commissions pour coordonner les activités des Commissions pour les communications, la détection et le traitement des données dans la gamme optique.

U.18 - Utilisation du Système International d'Unités

Le Conseil de l'URSI,

*considérant*

- (a) que des recommandations demandant instamment que les unités du Système International soient acceptées et utilisées le plus largement possible ont été adoptées par les XVe et XIXe Assemblées générales de l'URSI (Munich 1966 et Helsinki 1978);
- (b) que les communications à l'échelle internationale et interdisciplinaire seront grandement améliorées par l'usage général des unités du Système International,

*décide*

1. de demander instamment l'utilisation exclusive des unités du Système International dans les communications, les articles publiés dans les revues et les présentations orales aux réunions, conférences et colloques qui sont copatronnés par l'URSI;



2. d'exiger l'utilisation exclusive des unités du Système International dans les communications, les articles publiés dans les revues et les présentations orales aux réunions, conférences et colloques qui sont patronnés par l'URSI uniquement, en particulier aux Assemblées générales de l'Union.

U.19 - Service international des Ursigrammes et des jours mondiaux (IUWDS)

Le Conseil de l'URSI,

*considérant*

- (a) les services particulièrement remarquables que le Service international des Ursigrammes et des jours mondiaux (IUWDS) a rendus à la communauté scientifique internationale en assurant la transmission rapide des données sur les phénomènes intéressants les scientifiques radioélectriciens, les géophysiciens et les astronomes;
- (b) la contribution majeure qui est apportée par cet organisme à la mise en oeuvre des programmes de recherche internationaux, tels que l'Année du maximum solaire, l'Etude magnétosphérique internationale et le Programme de la moyenne atmosphère;

*exprime* sa gratitude à ce Service pour l'excellent travail fourni;

*considère* avec inquiétude les incertitudes concernant le financement futur du Service, et

*recommande* que les trois Unions intéressées - UAI, UGGI et URSI - s'adresse conjointement au Conseil International des Unions Scientifiques (ICSU) et à l'UNESCO pour leur demander de faire tout leur possible pour assurer l'appui financier nécessaire qui permettra de maintenir le fonctionnement de l'IUWDS à son niveau actuel.

U.20 - Bureau International de l'Heure (BIH)

Le Conseil de l'URSI,

*considérant*

- (a) que le Bureau International de l'Heure (BIH) a été chargé par la 14e Conférence Générale des Poids et Mesures de définir l'échelle du Temps atomique international (TAI) en se basant sur les horloges atomiques qui fonctionnent dans le monde entier, en accord avec la définition de la seconde dans le Système International des Unités;
- (b) que le Temps universel coordonné (UTC) est dérivé du TAI et que, selon la 15e Conférence Générale des Poids et Mesures, le Temps universel coordonné est devenu la base du temps civil;
- (c) que les échelles de temps TAI et UTC revêtent une importance croissante dans les domaines scientifique et technologique;
- (d) que le nombre des horloges qui participent à la définition du TAI n'a pas cessé de s'accroître pour atteindre actuellement la centaine, ce qui a pour conséquence d'augmenter le volume

de travail au BIH;

- (e) que le calcul du TAI avec les plus grandes précision et stabilité possibles exige des études scientifiques intenses, par exemple, pour déterminer les apports respectifs des horloges de qualités différentes et pour détecter les causes du comportement des horloges;

*déclare* que le travail du BIH pour la définition des échelles de temps TAI et UTC est de la plus grande importance pour la science et pour la technologie;

*recommande* que tout le soutien nécessaire, y compris les moyens financiers, soient mis à la disposition du BIH pour lui permettre de poursuivre son importante tâche, toujours croissante, dans le domaine de la conservation du temps à l'échelle internationale.

#### U.21 - Centre de données pour les indices des taches solaires (SIDC)

Le Conseil de l'URSI,

*considérant* l'importance et l'utilité de l'indice des taches solaires dans des domaines de recherche tels que la climatologie, la convection stellaire, les cycles d'activité des étoiles et la radioastronomie solaire;

*consient* du fait que la publication du nombre relatif de taches solaires de Zurich a été arrêtée;

*adresse* ses félicitations au Centre de données pour les indices des taches solaires à Uccle, Belgique, qui a accepté d'assurer la publication de l'indice des taches solaires,

*recommande*

1. que le Centre de données pour les indices des taches solaires soit encouragé à poursuivre son travail de calcul de l'indice des taches solaires;
2. que cet indice soit présenté de manière à former une suite cohérente avec l'ancienne série d'indices de Zurich.

#### U.22 - Centre mondial de données de physique solaire-terrestre (WDC-A) à Boulder

Le Conseil de l'URSI,

*consient* des difficultés récemment intervenues en ce qui concerne la poursuite de l'ensemble du programme du Centre mondial de données de physique solaire-terrestre (Centre mondial de données WDC-A);

*reconnaissant* la grande importance des services que ce Centre fournit, pour les activités scientifiques dans le monde entier, et cela dans des disciplines couvertes par plusieurs des Commissions de l'URSI,

*décide*

1. de réaffirmer la valeur scientifique des services rendus par le Centre mondial de données à Boulder et par les autres Centres

mondiaux, et de souligner l'importance qu'il y a à maintenir dans ces Centres des conditions convenables de fonctionnement;

2. d'inviter instamment les autorités des Etats-Unis d'Amérique à maintenir et à développer les services du Centre mondial de données (WDC-A) à Boulder pendant les années 1980-1990.

#### U.23 - Système à diffusion incohérente dans l'hémisphère austral

Le Conseil de l'URSI,

*ayant pris connaissance* du rapport du Groupe de travail de la Commission G concernant un système à diffusion incohérente dans l'hémisphère austral;

*approuve* la proposition d'entreprendre une étude de faisabilité d'un système transportable à diffusion incohérente,

*invite* le Groupe à rechercher des arrangements qui permettraient de financer cette étude et de l'entamer dès que possible.

#### U.24 - Balises sur satellites

Le Conseil de l'URSI,

*reconnaissant* la valeur des études à long terme sur la propagation transionosphérique et atmosphérique pour l'élaboration de modèles et pour les applications,

*recommande* que les agences gouvernementales et intergouvernementales soient instamment invitées à munir les satellites de balises dans la gamme des ondes décamétriques, métriques et décimétriques.

#### U.25 - Campagnes multi-techniques

Le Conseil de l'URSI,

*considérant*

- (a) l'importance des campagnes multi-techniques pour l'étude de l'environnement ionisé de la Terre;
- (b) le fait que, dans certains cas, les différents types d'équipements disponibles n'ont pas été pleinement utilisés,

*recommande* aux organismes projetant des campagnes multi-techniques de diffuser des informations sur les buts de ces campagnes ainsi que sur les équipements et techniques, requis ou souhaités, afin de permettre la pleine exploitation des équipements disponibles à l'échelle internationale.

#### U.26 - Maintenance des stations

Le Conseil de l'URSI,

*reconnaissant*

- (a) que l'existence de variations à long terme du champ magnétique terrestre influençant l'ionosphère, mais aussi de variations à long terme dans les relations entre l'activité solaire et les phénomènes ionosphériques, a été établie avec certitude;
- (b) qu'il est essentiel de surveiller ces variations;
- (c) que la valeur des données concernant ces variations s'accroît considérablement avec la longueur et l'homogénéité des séquences de données disponibles,

*souligne* la nécessité de maintenir les stations ionosphériques et géomagnétiques possédant de longues séquences de données ou bien, dans les cas où cela n'est pas possible, d'assurer un fonctionnement en parallèle avec les stations de remplacement pendant une période de temps suffisante.

#### U.27 - Surveillance de l'ionosphère

Le Conseil de l'URSI,

*reconnaissant* que la surveillance, à l'échelle mondiale, de l'ionosphère au moyen d'ionosondes continue de présenter un intérêt majeur et requiert la participation d'un grand nombre d'institutions de par le monde,

*attire l'attention* sur le fait qu'il est souhaitable de poursuivre, parallèlement au travail de surveillance, un véritable effort de recherche pour améliorer la valeur des données ainsi obtenues et les rendre plus accessibles, ainsi que pour développer des méthodes nouvelles propres à atteindre ce but.

#### U.28 - Institut international des sciences spatiales et de l'électronique et radiotélescope équatorial géant

Le Conseil de l'URSI,

*considérant*

- (a) que l'établissement d'un Institut international des sciences spatiales et de l'électronique (INISSE), projeté par les pays en développement en tant qu'entreprise commune fournirait aux pays participants une excellente occasion de progresser de façon significative dans le domaine de la radioélectricité scientifique;
- (b) que le Radiotélescope équatorial géant (GERT) dont le projet de construction figure parmi les projets les plus importants de l'INISSE, fournirait une excellente base pour la recherche radioastronomique en ondes métriques;
- (c) que les projets INISSE/GERT sont bien conçus et qu'ils sont réalisables,

décide d'apporter tout son appui aux projets INISSE/GERT.

U.29 - UNESCO

Le Conseil de l'URSI,

*considérant*

- (a) que, par la subvention annuelle qu'elle accorde à l'URSI par l'intermédiaire du Conseil International des Unions Scientifiques l'UNESCO fournit un appui précieux pour les activités scientifiques de l'Union, en particulier pour l'organisation de colloques scientifiques internationaux et d'autres conférences scientifiques, ainsi que pour la production de publications;
- (b) que les fonds reçus de l'UNESCO, par l'intermédiaire de l'ICSU, ont permis d'accroître sensiblement les ressources fournies par le Comité américain de l'URSI et par l'Union même en vue de la mise en oeuvre du Programme des jeunes scientifiques,

décide d'exprimer à l'UNESCO sa vive gratitude pour cette aide.

U.30 - Remerciements au Comité américain de l'URSI

Le Conseil de l'URSI,

*notant*

- (a) l'excellente organisation matérielle mise en place à Washington, D.C. pour les séances scientifiques et administratives de la XXe Assemblée générale de l'URSI et les colloques ouverts associés;
- (b) le programme des visites scientifiques et des réceptions organisé par le Comité d'organisation américain;
- (c) l'accueil cordial réservé aux participants et à leurs familles pendant l'Assemblée,

décide d'exprimer ses plus vifs remerciements

1. au Comité américain de l'URSI pour son invitation de tenir l'Assemblée générale à Washington, D.C.;
2. au Comité d'organisation pour ses méticuleux travaux préparatoires qui ont assuré le succès de l'Assemblée;
3. aux membres du Comité pour les personnes accompagnantes, dont le chaleureux accueil a été hautement apprécié par les personnes qui accompagnaient les participants à l'Assemblée.

## RESOLUTIONS ET RECOMMANDATIONS DES COMMISSIONS

### COMMISSION A - METROLOGIE ELECTROMAGNETIQUE

#### A.1 - Registre de l'URSI des Laboratoires nationaux d'étalons

La Commission A,

*considérant*

- (a) que le premier projet de Registre des Laboratoires nationaux d'étalons a été préparé par le Groupe de travail de la Commission pour la XVIIIe Assemblée générale (Lima 1975), et qu'une version révisée a été préparée pour la XIXe Assemblée générale (Helsinki 1978);
- (b) que ce Registre constitue la seule liste disponible des laboratoires responsables des mesures et des étalons pour une vaste gamme de grandeurs électromagnétiques;
- (c) qu'en conséquence, il représente un outil précieux, plus particulièrement dans les pays en développement souhaitant être tenus au courant des étalons agréés dans les pays développés,

*recommande*

- 1. que le Groupe de travail soit invité à poursuivre sa tâche, sous la présidence de son actuel Président, M. A.E. Bailey;
- 2. que des fonds suffisants soient mis à sa disposition pour assurer la publication continue du Registre sous une forme raisonnable (par exemple, impression de bonne qualité et graphiques provenant de fichiers informatisés);
- 3. que de nouveaux efforts soient faits pour faire connaître l'existence du Registre, aussi bien à travers les publications de l'URSI qu'à travers celles d'autres organismes internationaux (UIT, UNESCO, etc).

#### A.2 - Groupe de travail sur la spectroscopie dans le domaine temporel

La Commission A,

*considérant* les besoins existants en ce qui concerne les mesures de formes d'ondes, plus particulièrement en relation avec les impulsions rapides qui sont importantes pour a) la radioélectricité scientifique dans l'étude des champs électromagnétiques transitoires, de la diffusion ainsi que dans les recherches géophysiques, b) le radar, les télécommunications et les ordinateurs, par exemple dans la télédétection, l'acquisition, la transmission et le traitement des données, les dispositifs et les circuits électroniques à réponse très rapide, c) la mesure et les instruments concernant les méthodes de mesures, les oscilloscopes, les caméras optiques rapides, les détecteurs et les capteurs;

*considérant* en outre que ces besoins affectent les intérêts des Commissions de l'URSI, et que celle-ci dispose de moyens uniques pour satisfaire nombre de ces besoins,

*décide* d'établir un Groupe de travail sur la spectroscopie dans le domaine temporel pour

1. encourager et aider l'organisation de réunions favorisant la création d'un forum pour les mesures électromagnétiques dans le domaine temporel,
2. parvenir à un accord sur la mesure des formes d'ondes,
3. identifier et faire connaître les domaines critiques nécessitant un effort de recherche,
4. inviter les autres Commissions de l'URSI à collaborer avec la Commission A dans la mise en oeuvre de ces objectifs.

*Note:* Par décision du Comité de Coordination de l'URSI, ce Groupe de travail a reçu le statut de Groupe de travail inter-Commissions.

### A.3 - Interactions entre ondes électromagnétiques et systèmes biologiques

La Commission A

*recommande*

1. le maintien du Groupe de travail sur les interactions entre les ondes électromagnétiques et les systèmes biologiques, sous la présidence du Prof. S.W. Rosenthal;
2. l'organisation, par ce Groupe de travail, de plusieurs colloques internationaux entre les Assemblées générales et pendant la XXIIe Assemblée générale.

## COMMISSION B - ONDES ET CHAMPS

### B.1 - Colloque sur la Théorie électromagnétique

La Commission B,

*considérant*

- (a) que les colloques de l'URSI sur la théorie électromagnétique se sont succédés à intervalles de trois ans depuis 1953;
- (b) que ces colloques revêtent une importance majeure et représentent l'essentiel des activités de la Commission B entre les Assemblées;
- (c) que des invitations pour organiser le prochain colloque ont été reçues de l'Australie, d'Israël et de l'Espagne,

*décide*

1. que le prochain colloque de cette série aura lieu en 1983;

2. que la décision finale concernant le lieu sera prise au moyen d'un vote par correspondance des Membres officiels de la Commission.

#### 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 copatronage aux conférences suivantes:

- 1) 7e Colloque sur les communications en hyperfréquences, Budapest (Hongrie), 6-10 septembre 1982;
- 2) 8e Conférence européenne sur les communications optiques, Cannes (France), 21-24 septembre 1982;
- 3) Conférence européenne sur les hyperfréquences, Helsinki (Finlande) 13-17 septembre 1982.

#### B.3 - Problèmes concernant les guides d'ondes optiques

La Commission B,

*considérant* que les problèmes relatifs aux guides d'ondes optiques présentent un intérêt permanent pour elle,

*exprime* le souhait de collaborer avec les autres Commissions de l'URSI ayant des intérêts analogues.

Note: Voir Résolution du Conseil U. 14.

### COMMISSION C - SIGNAUX ET SYSTEMES

#### C.1 - Copatronage de colloques

La Commission C

*recommande* que l'URSI accorde son patronage, si possible avec aide financière, aux colloques suivants:

- 1) Colloque international de l'IEEE sur la théorie de l'information, Les Arcs (France), 21-25 juin 1982;
- 2) 6e Colloque d'été sur la théorie des circuits, Prague (Tchécoslovaquie), 12-16 juillet 1982.



COMMISSION D - PHYSIQUE ELECTRONIQUE

D.1 - Colloques à la XXIIe Assemblée générale

La Commission D

*recommande* que les colloques suivants soient organisés pendant la XXIIe Assemblée générale de l'URSI en 1984:

- 1) Techniques pour le traitement des données et du signal pour les communications et la radioélectricité scientifique,
- 2) Techniques optiques pour les communications, la détection et le traitement des données.

*Note: Renvoyé au Comité pour la coordination du programme scientifique de l'URSI.*

COMMISSION E - BRUITS ET BROUILLAGES ELECTROMAGNETIQUES

E.1 - Aide aux pays en développement

La Commission E,

*considérant*

- (a) que de nombreux pays en développement, plus spécialement dans les zones tropicales, sont particulièrement vulnérables aux brouillages radioélectriques et à la détérioration des équipements par la foudre;
- (b) que leur position géographique favorise l'étude des phénomènes concernés;
- (c) qu'il est nécessaire de disposer d'une plus grande quantité de données sur les bruits naturels et les bruits artificiels en provenance de ces pays;
- (d) que, par leur collaboration et leurs conseils, les pays disposant de techniques bien élaborées pourraient contribuer à la mise en oeuvre de programmes de mesures et d'analyse des données,

*recommande*

1. que l'URSI explore les différentes possibilités pour aider les scientifiques des pays en développement dans l'étude des bruits naturels et artificiels, par exemple en organisant des séminaires et en favorisant une aide financière ou une aide en équipements;
2. que la Commission E élabore un programme d'assistance détaillé, en consultation avec le Comité de l'URSI pour les pays en développement;
3. que le Comité Consultatif International des Radiocommunications (CCIR) soit invité à collaborer à ce programme;
4. que le Président de la Commission E organise une réunion de discussion ou un séminaire pour inaugurer ce programme.

Note: Renvoyé au Comité pour les pays en développement.

## E.2 - Mandat pour la période 1982-1984

La Commission E

*décide* d'inclure les points suivants dans son mandat pour la période 1982-1984:

- a) sources de bruits naturels et de 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 systèmes,
- e) base scientifique des bruits et de la maîtrise des brouillages,
- f) utilisation du spectre.

## E.3 - Groupes de travail

La Commission E

*décide*

1. de maintenir les deux Groupes de travail suivants:
  - Bruits artificiels (formé à Varsovie, 1972),  
Président: Dr. A.D. Spaulding (EUA);
  - Bruits naturels (formé à Helsinki, 1978),  
Président: Prof. S. Lundquist (Suède);
2. d'établir deux nouveaux Groupes de travail comme suit:
  - Effets des phénomènes transitoires (le Président sera désigné par le Président de la Commission E);
  - Base scientifique des bruits et de la maîtrise des brouillages,  
Président: Dr. C.E. Baum (EUA).

## E.4 - Participation à des réunions internationales

La Commission E

*accepte* de participer aux réunions internationales suivantes:

- 1) 6e Colloque international de Wrocław sur la compatibilité électromagnétique, Wrocław (Pologne), juin 1982;
- 2) Colloque de l'"IEEE EMC Society", San Francisco (EUA), septembre 1982;
- 3) 5e Colloque et exposition technique sur la compatibilité électromagnétique, Zurich (Suisse), mars 1983;
- 4) Colloque de l'"IEEE EMC Society", Washington (EUA), octobre 1983;
- 5) 7e Colloque international de Wrocław sur la compatibilité électromagnétique, Wrocław (Pologne), juin 1984;
- 6) Conférence internationale sur la compatibilité électromagnétique de 1984, Tokyo (Japon), octobre 1984.

#### E.5 - Télédétection

La Commission E,

*notant*

- (a) que la télédétection revêt une importance fondamentale pour la plupart des Commissions de l'URSI, y compris la Commission E;
- (b) qu'un Groupe de travail inter-Commissions a été établi à l'Assemblée générale de 1978 pour étudier cette question et a organisé un colloque ouvert pendant la présente Assemblée;
- (c) qu'il n'est pas souhaitable de reconduire le mandat de ce Groupe de travail inter-Commissions;
- (d) que les principales options se présentent comme suit:
  - 1) élargir la Commission F et modifier son titre de façon à mettre l'accent sur l'aspect télédétection,
  - 2) former une Commission inter-Unions de télédétection peut-être en réorientant les activités de la Commission inter-Unions de radiométéorologie (IUCRM),
  - 3) former une nouvelle Commission consacrée à la télédétection au sein de l'URSI,

*recommande*, en attendant l'issue du colloque ouvert actuellement en cours et les recommandations des autres Commissions intéressées, en particulier la Commission F, la formation d'une nouvelle Commission de l'URSI consacrée spécialement à la télédétection de l'atmosphère neutre et de la surface de la Terre.

Note: Cette Résolution est rendue caduque à la suite de l'adoption de la Résolution U.14 par le Conseil.

#### E.6 - Appui au CCIR

La Commission E,

*considérant* l'importance du travail du Comité Consultatif International des Radiocommunications (CCIR) pour les télécommunications internationales,

*décide* de continuer d'appuyer le CCIR à travers les activités de ses Groupes de travail.

Note: Renvoyé au Comité de Liaison URSI-CCIR-CCITT.

### COMMISSION F - PHENOMENES ONDULATOIRES DANS LES MILIEUX NON IONISES

#### F.1 - Colloques

La Commission F

*recommande* l'organisation, dans la période allant jusqu'à la XXIIe Assemblée générale de l'URSI, de quatre colloques sur les sujets

suivants:

- 1) Mesures radar à deux paramètres des précipitations pour l'établissement de modèles de propagation radioélectrique,
- 2) Problèmes de signature en télédétection de la surface de la Terre,
- 3) Prévisions à l'échelle globale au moyen de données en provenance de satellites,
- 4) Observations et prévisions à l'échelle moyenne au moyen de tous les capteurs.

## F.2 - Groupe de travail

La Commission F

*décide* de former

1. un Groupe de travail sur les satellites à balises, sous la présidence du Dr. G. Hyde (EUA),
2. un Groupe de travail chargé d'étudier le mandat de la Commission F et composé comme suit: P. Delogne (Belgique) et R.K. Crane (EUA), co-présidents, F. Fedi (Italie) et D.L. Croom (Royaume-Uni).

## F.3 - Télédétection

La Commission F,

*ayant pris connaissance* du rapport du Groupe de travail inter-Commissions sur la télédétection,

*recommande*

1. que les propositions tendant à former une nouvelle Commission sur la télédétection soient rejetées, plus précisément toute Commission qui porterait un titre tel que "Télédétection et ondes radioélectriques", "Télédétection du sol et de la mer" ou "Télédétection de la Terre et des planètes";
2. que la Commission F étende son mandat de façon à couvrir tous les aspects de la télédétection et de la propagation dans les milieux non ionisés, et que le terme "télédétection" soit inclus dans son titre;
3. qu'un nouveau Groupe de travail inter-Commissions soit formé avec comme mission de coordonner les activités futures de l'URSI dans le domaine de la télédétection, en particulier les colloques et autres conférences;
4. qu'une Commission inter-Unions (ou un Comité scientifique) sur la télédétection soit formé avec comme mission
  - a) de promouvoir le développement et l'utilisation des techniques de télédétection pour l'étude de l'atmosphère terrestre, des océans, de la terre et de la glace,
  - b) d'organiser des colloques sur le sujet, patronnés en commun avec les organisations appropriées,

c) de coordonner les programmes internationaux dans ce domaine.

*Note: Cette Résolution est rendue caduque à la suite de l'adoption de la Résolution U.14 par le Conseil.*

#### F.4 - Commission inter-Unions de radiométéorologie (IUCRM)

La Commission F

*recommande*

1. que la Commission inter-Unions de radiométéorologie soit transformée en "Commission interdisciplinaire sur les mesures à distance" (Interdisciplinary Commission on Remote Measurements (IDRCM)) avec un mandat approprié;
2. que les personnalités suivantes soient désignées comme représentants de l'URSI au sein de la nouvelle Commission:

A. Shutko (URSS)  
P. Broche (France)  
D. Barrick (EUA)  
R. Crane (EUA)  
H. Ottersten (Suède)  
G. Valenzuela (EUA).

*Note: Cette Résolution est rendue caduque à la suite de l'adoption des Résolutions U.14 et U.1b par le Conseil.*

#### COMMISSION G - RADIOELECTRICITE IONOSPHERIQUE ET PROPAGATION

##### G.1 - Colloques et cycles d'études 1982-1984

La Commission G

*recommande* que les colloques et cycles d'études suivants soient patronnés ou copatronnés par l'URSI:

- 1) Sondage radioélectrique de l'ionosphère et de l'atmosphère aux hautes latitudes: techniques et résultats nouveaux, Fairbanks, Alaska (EUA), août 1982. Organisateur: R.D. Hunsucker (EUA).
- 2) Etude de l'environnement terrestre au moyen des satellites à balises, New Delhi (Inde), novembre 1982. Organisateur: R. Leitinger (Autriche).
- 3) Colloque sur l'aéronomie équatoriale, Kenya, probablement en 1983.
- 4) Cycle d'études sur les modèles d'ionosphère pour les problèmes de propagation, Afrique, 1982 ou 1983. Organisateur: C.A. Reddy (Inde).

- 5) Cycle d'études sur l'utilisation des émissions des balises sur satellites, New Delhi (Inde), 1982 (en conjonction avec le colloque cité sous 2). Organismes: R. Leitinger (Autriche) et T.R. Tyagi (Inde).
- 6) Colloque international de physique solaire-terrestre, Ottawa (Canada), mai 1982.
- 7) Colloque sur les modifications de l'ionosphère, Hambourg (RFA), août 1983 (pendant l'Assemblée générale de l'UGGI).
- 8) Colloque sur l'électrodynamique de l'ionosphère et de la magnétosphère polaires, Hambourg (RFA), août 1983 (pendant l'Assemblée générale de l'UGGI).

## G.2 - Bulletin de l'INAG

La Commission G,

*reconnaissant*

- (a) que le maintien d'un réseau de stations de sondage ionosphérique à incidence verticale continue de présenter un intérêt certain;
- (b) qu'un nombre considérable d'ionosondes ont été construites et installées récemment, notamment dans les pays en développement;
- (c) que le Groupe-conseil du réseau ionosphérique (INAG) a pris les mesures appropriées pour poursuivre la publication de son Bulletin;

*notant* que le Centre mondial de données A (WDC-A) et certaines administrations nationales continueront de fournir un appui financier substantiel à cet effet,

*recommande* qu'au cours des trois années à venir l'URSI continue d'apporter un soutien à la publication de ce Bulletin.

## G.3 - Observatoires géophysiques à programmes multidisciplinaires

La Commission G,

*reconnaissant*

- (a) que les mesures radioélectriques systématiques de l'environnement terrestre, y compris la surface des océans, la basse atmosphère neutre, la mésosphère et l'ionosphère, font l'objet d'un intérêt accru;
- (b) que, dans les cas où ces mesures sont effectuées en un même site, leur valeur s'en trouve augmentée;
- (c) que les différentes mesures en question peuvent être effectuées au moyen d'équipements similaires, tels qu'émetteurs, récepteurs, antennes, installations pour le traitement des données, et par le même personnel spécialisé,

*recommande* que les administrations nationales s'efforcent d'établir des observatoires géophysiques à programmes multi-disciplinaires, en y incorporant les éléments appropriés du réseau existant des ionosondes.

G.4 - Essai de canaux ionosphériques par sondage à incidence oblique

La Commission G,

*considérant* les applications toujours plus nombreuses de l'essai des canaux ionosphériques par sondage à incidence oblique pour l'amélioration des communications en ondes décamétriques;

*encourage* l'échange des données obtenues par sondage à incidence oblique ainsi que des informations sur les propriétés de l'ionosphère qui en sont déduites,

*demande instamment* qu'une évaluation des possibilités de surveiller l'ionosphère à l'échelle mondiale ou synoptique au moyen de cette technique soit faite en de nombreux points géographiques.

G.5 - Ionosonde à incidence verticale dans l'Ile de Gough

La Commission G,

*notant* l'importance que pourrait présenter pour les programmes de l'URSI et du CCIR l'installation d'une ionosonde à incidence verticale dans l'Ile de Gough (Royaume-Uni),

*recommande* instamment d'y installer une station de sondages à incidence verticale.

G.6 - Ionosphère de référence internationale (IRI)

La Commission G,

*reconnaissant* le besoin de disposer de profils d'ionisation,  $N(h)$ , très précis pour la vérification de l'Ionosphère de référence internationale;

*notant* l'existence des techniques appropriées,

*recommande* aux agences disposant des équipements adaptés de fournir des profils très précis et de procéder à cette vérification.

G.7 - Version simplifiée du Manuel d'interprétation et de dépouillement des ionogrammes

La Commission G,

*exprime* sa satisfaction du fait qu'une version simplifiée du Manuel d'interprétation et de dépouillement des ionogrammes a été préparée au Japon pour faciliter la formation du personnel,

*recommande* la publication d'une version anglaise analogue pour usage à l'échelle internationale.

G.8 - Groupes de travail

La Commission G

*décide* de constituer ou reconstituer, selon le cas, les Groupes de travail suivants:

- G.1 Groupe-conseil du réseau ionosphérique (INAG)  
Président: W.R. Piggott (Royaume-Uni)  
Vice-Président: D.G. Cole (Australie)
- G.3 Groupe d'études de l'atmosphère de l'hémisphère austral (SHAGS)  
Co-présidents: J.A. Gledhill (Afrique du Sud) et  
S. Radicella (Argentine)
- G.4 Ionosphère de référence internationale (IRI) (avec le COSPAR)  
Président: K. Rawer (RFA)  
Vice-président: A.D. Danilov (URSS)
- G.6 Connaissance des caractéristiques ionosphériques nécessaires  
pour l'amélioration des systèmes de propagation radioélectrique  
Président: C.M. Rush (EUA)  
Vice-présidents: B.M. Reddy (EUA) et E. Thrane (Norvège)
- G.8 Diffusion incohérente  
Président: M.J. Baron (EUA)  
Vice-président: M.M. Blanc (France)
- G.10 Groupe international pour les ionosondes numériques (IDIG)  
Président: J.R. Dudeney (Royaume-Uni)  
Vice-présidents: K. Bibl (EUA) et J.W. Wright (EUA)
- G.11 Système de diffusion incohérente dans l'hémisphère austral  
(SHISCAT)  
Président: J.A. Gledhill (Afrique du Sud)
- G.12 Utilisation des émissions des satellites à balises  
Président: R. Leitinger (Autriche)  
Vice-présidents: L. Kersley (Royaume-Uni) et J.A. Klobuchar (EUA).

#### COMMISSION H - ONDES DANS LES PLASMAS

##### H.1 - Groupes de travail

La Commission H

*décide*

1. de maintenir les Groupes de travail sur
  - l'Analyse des ondes (H.1),
  - les Expériences actives (H.2);
2. de maintenir les Groupes de travail inter-Unions URSI/IAGA sur
  - le Sondage électromagnétique passif de la magnétosphère (URSI/IAGA.1),
  - les Instabilités des ondes dans les plasmas (URSI/IAGA.2);
3. d'établir un nouveau Groupe de travail sur l'Analyse des ondes par ordinateurs (H.3).

##### H.2 - Copatronage de conférences

La Commission H

*recommande* que l'URSI accorde son copatronage aux conférences suivantes:



- 1) Conférence internationale de physique des plasmas, Göteborg (Suède), juin 1982;
- 2) XVIe Conférence internationale sur les phénomènes dans les gaz ionisés, Düsseldorf (RFA), août 1983.

### H.3 - Coordination des réunions internationales

La Commission H,

*notant* la coïncidence des dates de l'Assemblée générale de l'URSI à Washington, D.C. (EUA) et de l'Assemblée scientifique de l'IAGA à Edimbourg (Royaume-Uni),

*fait figurer dans ses actes* l'expression de sa vive désapprobation pour ce qui concerne la convocation simultanée de réunions de ce genre.

Note: Voir aussi la Résolution U.1 du Conseil.

### H.4 - Programme pour la XXIIe Assemblée générale de l'URSI

La Commission H

*recommande* l'inclusion des sujets suivants dans son programme pour la XXIIe Assemblée générale de l'URSI à Florence, Italie, en 1984:

- 1) Colloque sur l'analyse des ondes (avec la Commission G),
- 2) Colloque sur les ondes radioélectriques planétaires (Groupe de travail URSI/IAGA.2),
- 3) Colloque sur les expériences relatives aux phénomènes ondulatoires effectuées à partir de la navette spatiale;

*recommande également* que le programme officiel de la Commission H comporte des périodes consacrées à la discussion générale de sujets d'intérêt courant.

Note: Renvoyé au Comité pour la coordination du programme scientifique de l'URSI.

### H.5 - Conférences d'intérêt général

La Commission H,

*notant* le succès rencontré par les trois conférences d'intérêt général organisées pendant l'Assemblée générale de Washington, D.C.,

*recommande* que le nombre de ces conférences soit augmenté, à raison peut-être d'une conférence par Commission, pour la XXIIe Assemblée générale de l'URSI.

Note: Renvoyé au Comité pour la coordination du programme scientifique de l'URSI.

## COMMISSION J - RADIOASTRONOMIE

### J.1 - Organisation de colloques

La Commission J

*recommande*

1. qu'un Colloque sur les mesures et le traitement des données pour la production indirecte d'images soit organisé entre 1982 et 1984, de préférence en collaboration avec les autres Commissions de l'URSI et/ou avec d'autres organismes scientifiques;
2. qu'un Colloque sur la radioastronomie en ondes millimétriques et submillimétriques soit organisé en 1984 en Europe, en association avec la XXIIe Assemblée générale de l'URSI.

Note: Le Point 2 est renvoyé au Comité pour la coordination du programme scientifique de l'URSI.

### J.2 - Membres de l'URSI

La Commission J,

*considérant*

- (a) qu'un intérêt considérable pour la radioastronomie existe en République populaire de Chine où au moins trois observatoires envisagent la construction d'installations de grande envergure ou procèdent déjà à leur construction;
- (b) que la mise en oeuvre de nombreux programmes astronomiques, plus spécialement les programmes impliquant l'interférométrie à très longue base, exige une collaboration internationale étroite,

*recommande* que la République populaire de Chine soit à nouveau invitée à adhérer à l'URSI.

Note: Renvoyé au Comité permanent pour la participation à l'URSI.







