Bulletin nº 180 Septembre 1971

U. R. S. I.

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LEIV HARANG
1902-1970

With deep regret we announce the demise of Professor Dr. Leiv Harang who passed away on 21 September 1970 at the age of 68. Professor Harang was born in 1902 in Trondheim, Norway. In 1926 he received his Master of Science degree from the University of Oslo and in 1937 was awarded the degree of Doctor of Philosophy from the same University.

After a short period as research associate in Göttingen, he was appointed Superintendent at the Auroral Observatory in Tromsö. During his 18-year period in Tromsö, he conducted numerous explorations contributing to a number of problems concerning the polar ionosphere. Apart from the more general auroral research related to auroral intensity, emission spectra and the altitude distribution of the various spectral components, his main field of work was concerned with the more irregular phenomena such as radio wave propagation during auroral disturbances, variations in the electron density during geomagnetic storms and associated phenomena.

The stay of Sir Edward Appleton in Tromsö during the Second Polar Year 1932-33 served to deepen and broaden his spectrum of scientific inte-

rests. During the subsequent years he adopted the radio echo technique to study the electron density distribution in the ionosphere and the production and loss coefficients during quiet conditions as well as during geomagnetic and auroral disturbances.

In 1946, the Norwegian Defence Research Establishment was founded and Dr. Harang was appointed as Superintendent of the Division of Telecommunications. The novel techniques developed during the World War were now incorporated in the equipment used for further exploration of the ionosphere. In addition to the more routine work, with regular recording and prediction of the ionospheric conditions for purely practical purposes, various scientific aspects were dealt with, such as polarization of reflected radio waves, absorption measurements, scattered reflection from irregularities, absorption of extra-terrestrial emission in the ionosphere and photoelectric measurements of the auroral phenomena. Dr. Harang served as Superintendent of the Division for six years and his work during this period, together with his creative personality, formed a research environment which still continues to stimulate a high degree of activity in the field of ionospheric research.

In 1952, Dr. Harang was awarded a professor's chair at the University of Oslo. This appointment gave him more time for pure scientific research. As Professor, he conducted a series of projects concerning radio echo measurements in auroral conditions, drift measurements of the ionosphere, and the relations between VLF radio waves and auroral and geomagnetic storms.

Professor Harang contributed greatly to the augmentation, development and work of the Norwegian National Committee of URSI, and he was also well known in URSI circles as Official Member of Commission III. He served as member of various national executive committees of which can be mentioned the Norwegian Research Council for Science and the Humanities. He was also a member of the Norwegian Academy of Sciences from 1940.

Professor Harang will be remembered for his enthusiasm, his creative and practical way of handling scientific problems, and his radiant personality during the daily execution of his work. He will be greatly missed by his colleagues and friends all around the world.

XVII[e] ASSEMBLÉE GÉNÉRALE DE L'URSI

Varsovie, 21-29 août 1972

La Première Annonce concernant la XVII[e] Assemblée générale a été diffusée le 22 juin 1971 à tous les Comités Membres de l'URSI par le Comité organisateur polonais.

Les Secrétaires des Comités Membres ont été priés d'en adresser des exemplaires aux personnes susceptibles de faire partie des délégations. Il serait souhaitable que le Bulletin de renseignements provisoire, joint à la Première Annonce, soit renvoyé à Varsovie dans le courant de septembre 1971.

Il est conseillé aux personnes désirant être incluses à la délégation de leur pays de se mettre en rapport avec le Comité Membre de l'URSI dans ce pays.

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XVII GENERAL ASSEMBLY OF URSI

Warsaw, 21-29 August 1972

The First Announcement concerning the next Assembly was circulated to all Member Committee of URSI on 22 June 1971 by the Organising Committee in Warsaw.

Secretaries of Member Committees were requested to send copies to the individuals whom they expect to invite to join their delegations. It would be appreciated if the Advance Information Forms enclosed with the Announcement could be returned to Warsaw during September 1971.

Individuals who wish to be considered as members of a delegation should make contact with the Member Committees of URSI in their respective countries.

ANTARCTIC TELECOMMUNICATIONS

The following circular letter (SCAR Circular No. 265 dated 12 March 1971) has been sent to National Committees of SCAR and also to URSI and WMO.

SCAR Symposium on Scientific and Technical Problems affecting Antarctic Telecommunications

During the Eleventh Meeting of SCAR, Oslo, 17-22 August 1970, the SCAR Group of Specialists on Technical and Scientific Problems affecting Communications proposed that a symposium on "Technical and Scientific Problems of Antarctic Telecommunications" be held. In *Recommendation XI-COM 6*, SCAR supported this proposal.

In its report to the SCAR Plenary Session, the Group pointed out that there was a need for scientists and telecommunicators to meet to discuss Antarctic telecommunications and telecommunication requirements. There exists a considerable amount of knowledge about the scientific aspects of the problems that is not being applied, and by bringing together scientists, engineers and operators not only can the scientific knowledge be discussed, but the engineers may be able to propose practical solutions to some of the difficulties.

The Sixth Antarctic Treaty Consultative Meeting agreed to recommend that their governments accept as guide lines the proposals contained in the report of the 1969 Antarctic Treaty Meeting on Telecommunications which includes, in Proposal 4., encouragement for SCAR to take the initiative in matters concerning the scientific and technical problems of Antarctic telecommunications.

The objectives of the Symposium would be to discuss telecommunication problems, compare possible alternative solutions when these exist and make recommendations. The Symposium should review available scientific results and developments applicable to Antarctic communications. It is important that adequate representation of all the groups, engineers, operators and scientists be obtained.

It is suggested that a number of review papers be invited on major communication and navigational aid problems, and that the number of supporting papers be strictly limited so as to allow time for detailed discussions. The attendance will be limited to about 60 to 80 for the same reason.

The Norwegian National Committee of SCAR invites attendance at the Symposium to be held in Norway. Tentative dates are 10-16 May 1972. The local arrangements will be made by Dr. F. Lied and Dr. E. V. Thrane. A small Programme Committee will be formed under the Chairmanship of W. R. Piggott (UK) with perhaps 3 or 4 other members.

The small Programme Committee will require the assistance of an individual consultant in each country to offer proposals, discuss the tentative plans by correspondence and help organise participation from his country. We have pleasure in inviting each National Committee to nominate such a consultant.

A summary of proposed topics is being prepared by the Programme Committee and will be circulated shortly with an invitation for the submission of titles and abstracts of papers for consideration for presentation at the Symposium.

In accordance with *Recommendation XI-COM.6*, I would request you to propose to your government that it assists participants in the Symposium because of the potential technical interest and benefit to those responsible for telecommunications needs in the Antarctic. The Chairman of the Programme Committee is seeking the collaboration of URSI and WMO.

On behalf of SCAR,

(signed) Tore Gjelsvik.

WAVES AND TURBULENCE IN STRATIFIED LAYERS AND THEIR EFFECTS ON ELECTROMAGNETIC PROPAGATION

A Colloquium on the above subject will take place from 6-15 June 1972 at San Diego, California, USA. The Colloquium is being organised by the Inter-Union Commission on Radio Meteorology (IUCRM); President : Prof. D. Atlas, University of Chicago, USA; Secretary : Dr. J. A. Lane Radio and Space Research Station, Slough, England. The Chairman of the Colloquium is Dr. Bradford Bean, National Oceanic and Atmospheric Administration, Boulder, Colorado 80302, USA.

The IUCRM is jointly sponsored by IUGG and URSI and is concerned with interdisciplinary problems related to the effects of the non-ionized

atmosphere on the propagation of electromagnetic waves and the use of remote probing techniques to study the atmosphere. Of particular interest to atmospheric scientists and fluid dynamicists on the one hand and to radio scientists on the other is the fine-scale structure of stratified layers marked by strongly sheared flow. Such strata are the seat of both stable gravity waves and unstable Kelvin-Helmholtz waves; the breaking of the latter is responsible for clear air turbulence among other things. The resulting refractively turbulent stratum is also responsible for the scatter of EM waves in tropospheric propagation and for back-scatter in the case of microwave or acoustic radars. Recent studies with high resolution radars have cast new light on the mechanisms of waves and turbulence in hydrostatically stable layers, while fluid dynamicists have advanced this knowledge through theoretical and experimental research on the stability of such flows. Simultaneously, meteorologists have been making strides on the structure and prediction of clear air turbulence.

The purpose of this Colloquium is to bring together specialists from all these disciplines so as to synthesize a picture of the state of our knowledge of the subject and to focus on the crucial problems in need of further research.

The proposed topics are to be treated in depth by review sessions, contributed papers, and working groups, the aim being to delineate progress, problems and recommended future effort.

The major topics to be treated are : (1) Origin of turbulence in stable layers, (2) Remote probing of turbulence in stable layers, (3) Interactions of waves and turbulence, (4) The nature of clear air turbulence and its prediction, (5) Laboratory experiments, (6) Theoretical and experimental analyses of stability criteria, (7) Transport processes and spectral characteristics (anisotropy, spectral saturation), and (8) Effects of turbulence on electromagnetic propagation.

Attendance will be international in scope but limited to approximately 50 scientists. Participation will be by invitation only. Participants will be selected on the basis of preliminary abstracts, of at least 100 words in length, submitted to the Colloquium Chairman, Dr. Bradford Bean, *not later than 30 November 1971.*

Authors will be required to submit full copies of their papers approximately six weeks in advance of the Colloquium for distribution to all participants. The edited conference proceedings will be published with minimum delay following the conference in a special issue of an appropriate scientific journal.

NETWORK THEORY

The Second International Symposium on Network Theory will be held from 5-7 July 1972 in Herceg Novi, Yugoslavia. The Symposium is organised by the Yugoslav Committee for Electronics and Automation (ETAN), in cooperation with the IEEE Group on Circuit Theory.

Papers will be welcomed on all aspects of network theory involving the use of computers, and its extensions to system theory. The following topics are suggested :

— network analysis programmes;
— network optimisation methods;
— filters : passive, active, distributed, time-varying, and digital;
— modelling and approximation methods in micro-electronics;
— load flow problems in power networks.

The papers to be presented will be selected by an international committee.

Enquiries for further information should be addressed to :

Yugoslav Committee for Electronics and Automation
P. O. Box 356
11001 Beograd, Yugoslavia.

ATMOSPHERIC ELECTRICITY

The V International Conference on Atmospheric Electricity will be held at Garmisch-Partenkirchen (SW from Munich) F.R. Germany in September in either 1973 or 1974 at the invitation of the Frauenhofer-Gesellschaft, Munich. The Conference is to be sponsored by the IUGG Joint Committee on Atmospheric Electricity.

The provisional topics are thunderstorms and showers, lightning, ions, atmosphere-space coupling, atmospheres of other planets, the global circuit, meteorology and instrumentation. The programme and the year were to be discussed at the recent IUGG Assembly in Moscow.

Further information is obtainable from :

Conference on Atmospheric Electricity,
Physikalisch-Bioklimatische Forschungsstelle,
D - 8100 Garmisch-Partenkirchen,
Fed. Rep. of Germany.

COOPERATION IN INTERDISCIPLINARY STUDIES IN ICSU

Editor's Note. — The division of science into separate disciplines with sharply-defined boundaries has become more and more inappropriate over the past 15-20 years. A consequence of this trend is the increasing tendency for some overlap in the interests and responsibilities of the Unions and other ICSU bodies. In March 1971 the Secretary General of ICSU submitted to the Unions a number of questions relating to the difficulties arising from such overlaps. In the opinion of the URSI Board of Officers, it was not possible to give simple answers to the questions and it seemed more appropriate to discuss the fundamental problems. The basic ideas agreed by the URSI Board at its meeting in April 1971 are reproduced below.

1. — Overlapping Disciplines

In at least some of the interdisciplinary areas of science, it must be admitted that the degree of cooperation between the interested ICSU bodies is not as effective as it ought to be. However, inadequate cooperation is merely a symptom of a more fundamental problem related to the attribution of responsibilities in branches of science where several disciplines overlap. Superficial discussion of the symptom without regard to the underlying cause is unlikely to lead to soundly based proposals for ensuring better cooperation.

When the first Unions were formed over 50 years ago, each was concerned with a compact and apparently almost self-contained branch of science. There were no serious difficulties attributable to lack of inter-Union cooperation, because interdisciplinary studies had hardly begun to be recognised. Since then, the development of science as a whole, and the expansion of the areas of scientific investigation of interest to the individual Unions, has led inevitably to the existence of what are now referred to as "overlap areas" : a term which implies that two or more Unions have a common interest in a given branch of science. It seems probable that this trend will continue and that new overlap areas will develop as the boundaries between hitherto unrelated disciplines are seen to be much less well-defined than had been suspected. Proposals for dealing with present problems of inter-Union cooperation should, therefore, be sufficiently flexible to enable the same principles to be applied, in the future, to a continually changing situation.

2. — Responsibility for Scientific Activities

If a Union has an interest in a certain branch of science, it will be assumed that this implies certain responsibilities for various types of scientific acti-

vity relating to the discipline in question. Such interests are not exclusive to any one Union, and it is obviously possible for two or more Unions to regard themselves as responsible for the same activities. Thus the problem to be solved is not how to improve inter-Union cooperation, but rather how to deal with the situation where there is some doubt as to the appropriate distribution of responsibilities between two or more Unions in the same branch of science. Where such a situation exists, at least three possible courses of action may be considered :

(1) the allocation of the overlapping responsibilities exclusively to one of the Unions;

(2) the creation of a new Union which would be exclusively responsible for activities in the overlap area;

(3) the creation, by the interested Unions, of one or more bodies which would be responsible to these Unions for these activities.

The first of these possible solutions is hardly worth consideration because the Unions concerned usually have a comparable level of interest in the overlap area; it would be difficult or impossible for them to agree, or for ICSU to make an arbitrary decision, on which one should carry all the responsibility.

The creation of a new independent Union, which would take over the responsibilities, seems at first sight to be an attractive proposal since it avoids the need for making a decision of the kind just mentioned. Unfortunately, the new Union would necessarily have frontier areas with the two Unions concerned with the original situation. It is difficult to believe that these areas would not, in the future, give rise to similar problems of overlapping interests.

In both the solutions referred to above, the inherent difficulty is the impossibility of defining clearly the boundaries between different branches of science, and hence the impracticability, in general, of assigning responsibilities for activities in each of the branches to an appropriate Union. If this conclusion is correct, the continued existence of overlap areas must be recognised and accepted, and a greater effort should be devoted to finding ways of minimising the difficulties which arise when several Unions simultaneously wish to influence the trend of scientific activity in an overlap area.

It is often forgotten that this is not a new problem and that the first attempt to solve it was made by the International Research Council (later ICSU) in 1925 when it formed the Joint Commission on Solar and Terres-

trial Relations. This Commission was the forerunner of the Inter-Union Commissions.

3. — Inter-Union Commissions

The Inter-Union Commissions correspond closely, in fact, to the bodies referred to in the third of the possible courses of action listed above; they have the following characteristics :

(*a*) they are small bodies consisting of one or two representatives appointed by each of the Unions wishing to cooperate in a given field;

(*b*) they are supported financially by these Unions, one of which is responsible for the administration of the Commission;

(*c*) their scientific activities are jointly controlled by the Unions, both directly through the Union representatives, and indirectly through the amount of financial support given by the Unions;

(*d*) the Unions can dissolve a Commission when, in their opinion, it no longer has a useful function to perform.

The characteristics of an Inter-Union Commission are such that two or more Unions can successfully cooperate in a given field of scientific activity. Moreover, the Unions remain in control of the work of the Commission and hence they can vary their support for it in the light of the changing priorities of their numerous other responsibilities.

4. — Committees of ICSU

The preceding discussion refers only to the Unions, and to the Inter-Union Commissions created on their initiative and subsequently controlled by them. During the past 20 years, the creation of Special and Scientific Committees of ICSU has introduced a new element which has had important repercussions on the activities of the Unions, especially in the overlap areas. The main features of these Committees are summarised below.

4.1. — Special Committees.

In 1951, the Unions that agreed to recommend the IGY programme established an Inter-Union Commission to make the initial plans. Later it was decided that the Union representatives alone could not deal with all

the aspects of the programme and it was agreed to enlarge the Commission by the addition of scientific reporters, each responsible for a particular part of the programme. Since the resulting structure no longer corresponded to that of an Inter-Union Commission, ICSU changed its status to that of a Special Committee of ICSU in order to achieve greater flexibility and freedom of action for the Committee.

As the responsibilities and the size of the Committee expanded, a full-time secretariat was established; there was a rapid increase in the financial requirements of the Committee and these could no longer be met by ICSU or by the cooperating Unions. In consequence, the Committee was permitted to appeal for financial support to the national academies, or their counterparts, in the countries that had agreed to participate in the observational programme of the IGY.

The structure of the IGY Committee and its financial arrangements set precedents which were followed when the IQSY and IBP Committees were formed in the 1960's. All these Special Committees of ICSU were responsible for well-defined scientific programmes requiring international collaboration for their success. The duration of these programmes and also the lifetimes of the Committees were limited.

During its existence a Special Committee acts, in practice, almost independently of the Unions and ICSU; this is possible because it has its own financial resources and its membership is sufficiently large and diversified to enable it to make decisions on almost all scientific and organisational questions without referring to the Unions or to ICSU.

It is important to point out that the national academies which adhere to ICSU and to the Unions also adhere, if they wish, to the Special Committees; in consequence, the academies make financial contributions to all these ICSU organisations. Hence it is clearly necessary for ICSU to restrict the number of Special Committees by limiting the frequency of major programmes which can not be organised by the Unions themselves and their own secretariats.

4.2. — Scientific Committees.

For the purposes of this document, it can be assumed that a Scientific Committee has the same type of structure and the same financial arrangements as a Special Committee. The essential difference is that the scientific programme for which a Special Committee is responsible is always well defined and is limited in duration. The programme for which a Scientific Committee is responsible is stated in very general terms and continues for an

indefinite period. The details of the programme are decided by the Scientific Committee itself.

5. — Creation and Termination of ICSU Bodies

Table 1 summarises the information given in the preceding paragraphs and shows the different bodies, within ICSU, which deal with interdisciplinary programmes : Inter-Union Commissions for programmes that can be organised and maintained by the Unions using their own resources, and Special and Scientific Committees set up by ICSU and supported financially by the academies in the adhering countries. For the sake of completeness, the Table shows also the Commissions which have traditionally formed an integral part of the Unions themselves and which are, in fact, responsible for many types of study in which only a single discipline is concerned.

The demand for the creation of interdisciplinary bodies of the types indicated in Table 1 has arisen because of the recognition of the interdependence of scientific studies formerly regarded as having little relation with each other. As science continues to increase in complexity, ICSU and the Unions must keep abreast of the need to initiate new interdisciplinary investigations when the occasion seems appropriate. This implies not only the creation of new bodies to deal with new investigations and programmes, but also the critical assessment, from time to time, of the need for the bodies already in existence.

The very limited resources at the disposal of the Unions should act as a natural restraint on the creation of Inter-Union Commissions and should ensure also that their utility is kept under review. Since each Special Committee of ICSU is formed to organise a specific programme and has a predetermined limited life, the need for a reassessment of its current and future activities hardly arises unless, for some unforeseen reason, it becomes necessary to consider extending the life of the Committee.

The critical evaluation of the usefulness of Scientific Committees presents difficulties; the Committees are largely dependent on contributions from the academies and, in consequence, neither ICSU nor the Unions make objective assessments of the need for their continued existence. In practice, the continuation of a Scientific Committee depends on the willingness of the adhering countries to maintain their contributions to it. In this respect, the Scientific Committees are very similar to the Unions; the essential difference between them lies in their respective origins. A Union is formed, outside ICSU, on the initiative of a sufficient number of national

academies; afterwards it may or may not be admitted to ICSU. On the other hand, a Scientific Committee is created by ICSU and the financial support of the academies is sought afterwards.

Scientific Committees appear to be anomalous in the ICSU family because although they are created by ICSU, they are subsequently maintained, in effect, by the academies. In contrast, the Unions are both created and terminated by the Academies, the Inter-Union Commissions by the Unions, and Special Committees by ICSU.

TABLE 1. The Control, Organisation and Financing of Scientific Programmes requiring International Cooperation.

Type of Programme	Controlling Body	Organising Body		Principal Source of Funds
		Short-term Programme	Long-term Programme	
Inter-disciplinary	Several Unions	Inter-Union Commission	Inter-Union Commission	Several Unions
	ICSU	ICSU Special Committee	ICSU Scientific Committee	Adhering
Single Discipline	One Union	Commissions of a Union	Commissions of a Union	Countries

BRIEF REPORT OF THE XIVth MEETING OF COSPAR

I. — GENERAL ORGANIZATION

The XIVth Meeting of COSPAR, and specialized Symposia organized jointly with the International Scientific Unions, were held on the invitation of the U.S. National Academy of Sciences in the North Court Rooms of the Seattle Center, Seattle, Washington, USA, during the period 18 June-2 July, 1971.

Meetings of various COSPAR bodies were held as follows :

— The Bureau : 19, 28, and 30 June;

— The Executive Council : 21, 30 June, and 1 July;

— The Plenary : 22 June and 2 July;

— The Working Groups, their Panels, Panel on Planetary Quarantine (Business and Open Meetings), Advisory Committee on Data Problems and Publications : between 21 June and 1 July.

I.1. — Open Meetings of COSPAR Working Groups and Panels.

The papers on the following topics were presented during the Open Meetings :

Working Group 1 : Lunar Laser; Other Topics; Tropospheric and Ionospheric Refraction Errors in Satellite Tracking and Relevant Collection Methods.

Working Group 2 : Experiments in Interplanetary Space and in the Magnetosphere.

Working Group 3 :

Panel 3A Galactic and Extragalactic Astronomical Measurements.

Panel 3B Solar Radiation; Flare Forecasting.

Panel 3C Cosmic Dust Data from Artificial Satellites and Space Probes; Collection and Detection by Rockets and Balloons; Cosmic Dust Data from Lunar Sources; Optical Data on Upper Atmospheric Dust; Data concerned with Zodiacal Light.

Working Group 4 :

Panel 4A The Structure of the Upper Atmosphere.

Panel 4B Interactions of the Neutral and Ionized Atmosphere - Latest Results; International Reference Ionosphere.

Panel 4C Polar Ionosphere - Latest Results.

Panel on Planetary Quarantine jointly with Working Group 5 : Planetary Quarantine and Sterilization.

Working Group 5 : Effects of Weightlessness Reactions of Primates; Results of other Flight Experiments; Effects of Chronic Irradiation; Preparations for Exploration of Mars; Effects of Space on Living Matter.

Working Group 6 : Reports on National Activities in Earth Surveys; Latest

Results in Satellite and Rocket Meteorology; Scientific Investigations in Meteorology and Earth Surveys from Manned Platforms.

Working Group 7 : Latest Investigations of Venus and Mars; Chemical and Biological Investigations of Lunar Soil; Physical and Mechanical Investigations of Lunar Soil; Atmosphere, Geology and Figure of the Moon; Investigations of Fra Mauro Moon Site.

In addition, two Sessions of Annual Reviews, featuring the progress in some chosen fields covered by Working Groups, were organized.

I.2. — SPECIALIZED SYMPOSIA.

Symposium on Total Solar Eclipse of 7 March 1970, jointly sponsored by COSPAR, IAGA(IUGG), IAU and URSI. 18, 19 and 21 June.

Topics : Astronomy and Solar Physics; Meteorology; Plans for Future Eclipses; Ionospheric Physics; Aeronomy; General.

Symposium on Dynamics of the Thermosphere and Ionosphere above 120 km, jointly sponsored by URSI and COSPAR. 24, 25, and 26 June.

Topics : Thermosphere Structure and Motion; Measurements of Ionospheric Motions above 120 km; Energetics and Dynamics of the Thermosphere; Thermosphere-Ionosphere Interactions; Large-Scale Effects in the Ionosphere; Thermospheric Tides; Waves and Traveling Disturbances.

Symposium on High Angular Resolution Astronomical Observations from Space, jointly sponsored by COSPAR and IAU. 28, 29 and 30 June, and 1 July.

Topics : Ground-Based Observations, Results, Limitations; Astrophysical Expectations from Increased Angular Resolution; High Angular Resolution Observations from Balloon-borne Instruments; High Angular Resolution Solar Observations from Rockets; High Resolution Astrophysical Space Research; New Pathways in High Resolution Astrophysical Space Research; The Large Space Telescope Project.

Colloquium on the Technology and Utilization of Stratrospheric Balloons, organized by SPARMO (Solar Particle and Radiation Monitoring Organization). 26 and 28 July.

In general, during the COSPAR Meetings and Specialized Symposia in Seattle, approximately 425 papers were presented.

Two specialized COSPAR Symposia were also held immediately before and after the COSPAR Meeting in Seattle in different locations : Symposium on November 1969 Solar Particle Event, at Boston College, Chestnut Hill, Mass., USA : 16-18 June; Symposium on D- and E-Region Ion Chemistry, University of Illinois : 6-8 July.

II. — Publication of Proceedings

The Proceedings of the XIVth Meeting of COSPAR and the specialized Symposia will be as follows :

Space Research XII comprising of the papers from the Open Meetings of COSPAR Working Groups on Physical Sciences and part of the papers presented at the Symposia. The Scientific Editors for this volume will be Prof. S. A. Bowhill, Drs L. D. Jaffe and M. J. Rycroft.

Life Sciences and Space Research X including the papers presented during joint Open Meeting of the Panel on Planetary Quarantine and Working Group 5, and at the Open Meetings of Working Group 5. The Scientific Editor will be Prof. W. Vishniac.

The Executive Editor for the above two volumes will be Dr. A. C. Stickland and they will be published by the Akademie-Verlag, Berlin, G.D.R., before the 1972 COSPAR Meeting.

III. — Activities of COSPAR Working Groups and Panels

In addition to the program of Open Meetings organized and conducted by the Working Groups and Panels as shown in Part I of this report, numerous Business Meetings of these bodies were held. The results of their deliberations will be published in the General Report from the XIVth Meeting of COSPAR. The Resolutions and Recommendations, many of which were adopted by the Plenary on the proposal of Working Groups, are given at the end of this Report.

IV. — The COSPAR Bureau and Finance Committee

Three members of the COSPAR Bureau, replacing deceased and retiring

members, were elected during the COSPAR Meeting in Seattle. The composition of the COSPAR Bureau for the remaining term of office, i.e. until the regular election of full Bureau which will take place during the 1972 COSPAR Meeting is as follows :

Prof. M. Roy (IUTAM), *President.*
Acad. A. A. Blagonrarov (USSR), *Vice-President.*
Dr. H. Friedman (USA), *Vice-President.*
Acad. G. Barta (Hungary), *Member.*
Prof. Dr. E. A. Lauter (GDR), *Member.*
Prof. K. Maeda (Japan), *Member.*
Sir Harrie Massey (UK), *Member.*

In view of the retirement of Dr. R. S. Rettie from the activities in COSPAR, Dr. R. E. Barrington, new Representative of the National Research Council of Canada in COSPAR, has been appointed the Chairman of the COSPAR Finance Committee.

V. — Participation

The XIVth Plenary Meeting of COSPAR and the Specialized Symposia were attended by 711 participants from 35 countries, including 420 participants from the USA. In addition, there were 104 accompanying persons.

VI. — Location and Scientific Program for XVth COSPAR Meeting

The COSPAR Plenary in Seattle unanimously and with gratitude accepted the invitation of the Comision Nacional de Investigacion del Espacio of Spain, to hold the next COSPAR Meeting in Madrid, Spain. The tentatives dates for this Meeting are 26 May-9 June, 1972.

As usual, the XVth Meeting of COSPAR, in addition to the Business Meetings of COSPAR Bodies, will include :

(1) Joint Open Meetings of Working Groups devoted to Annual Reviews in Space Research.

(2) Open Meetings of Working Groups and Panels on Latest Significant Results in Space Research.

(3) Specialized Symposia. COSPAR accepted the following proposals for

symposia to be held in conjunction with the XVth Meeting of COSPAR in Madrid :

— URSI/IAU/COSPAR Symposium on Planetary Atmospheres and Surfaces;

— Symposium on Critical Problems of Magnetospheric Physics. This Symposium was initiated by COSPAR and invitations will be issued to IAGA (IUGG) and URSI for their cosponsorship;

— Symposium on Application of Space Techniques in Earth Surveys (matter of sponsorship still to be considered).

The Executive Council of COSPAR proposed also that the

— IAU/COSPAR Symposium on High-Energy Astrophysics, initiated by IAU Commission No. 48 and initially planned to take place in Cambridge, Mass., USA,

be held, if possible, in conjunction with the COSPAR Meeting in Madrid.

VII. — Resolutions and Recommendations

The Resolutions and Recommendations which follow were adopted at the Plenary Meeting of COSPAR on 2 July 1971. They were proposed by the Executive Council on the proposal of WG 1 (Decisions 1-4), WG 2 (Decision 5), WG 4 (Decisions 6 and 7), WG 6 (Decisions 8-10), WG 7 (Decision 11) and the Advisory Group on Data Problems and Publications (Decision 12).

Decision No. 1. COSPAR,

recognizing the great value of the Central Bureau for Satellite Geodesy for the collection and dissemination of information on all aspects of satellite geodesy; and

noting the serious financial state of the Bureau,

supports all efforts to secure financial aid, in particular from ICSU, for the continuation of the Central Bureau's activities.

Decision No. 2. COSPAR,

noting that the present World List of Tracking Stations has a number of revisions dispersed through the *COSPAR Information Bulletins*,

recommends that a new edition of the List be prepared with the assistance of the Central Bureau for Satellite Geodesy and that the new list be published by COSPAR.

Decision No. 3. COSPAR,

recognizing :

(*a*) The continuing benefit of cooperative satellite tracking campaigns,

(*b*) The scientific necessity for continuous acquisition of satellite tracking data; and

noting :

(*a*) The success of previous campaigns, most notably the ISAGEX,

(*b*) The proposal of the Smithsonian Astrophysical Observatory to coordinate their Earth Physics Satellite Observing Campaign (EPSOC) with all interested groups,

endorses the Earth Physics Satellite Observing Campaign, and

encourages all possible participants to join the program.

Decision No. 4. COSPAR,

recognizing the initiative of the Soviet Union organizing an international cooperative project aiming at measuring a large terrestrial chord, linking the areas of Arctic with the Antarctic by methods of satellite geodesy,

draws the attention of all national institutions possessing satellite tracking stations situated in Europe, Africa and Antarctica to this work, and

invites their participation.

Decision No. 5. COSPAR,

taking into account the results of the discussion of the widely distributed IMS Special Study Group First Report;

strongly *supports* and approves the first report of International Magnetospheric Study Special Study Group as the first step to the necessary organization of IMS (1975-1977);

endorses the activity of the Special Study Group to proceed with the preparation of the Second Report (rocket, balloon and ground-based measurements);

recommends that subsequent to the completion of its task, the present IMS

Special Study Group, composed of both IUCSTP and COSPAR representatives, be dissolved and replaced by a joint IUCSTP/COSPAR organization to oversee and guide the implementation of the IMS.

At the same time,

expressing the general feeling of maintaining close contacts between W.G.2 and Panel C of W.G.4 of COSPAR with those Working Groups of IUCSTP dealing with magnetospheric studies,

taking into account the anticipated reorganization of IUCSTP W.G. structure,

COSPAR,

recommends that the IMS Committee include Chairmen of the Working Groups concerned.

Decision No. 6. COSPAR,

noting the uncertainties in our knowledge of atmospheric composition and, in particular, of the atomic oxygen density and its seasonal-latitudinal variation in the mesosphere and lower thermosphere;

and noting also the importance of knowing these quantities for an understanding of atmospheric structure and for the development of future COSPAR International Reference Atmospheres;

recommends to agencies supporting atmospheric research, the planning of coordinated rocket, satellite and incoherent radar backscatter programs to make simultaneous composition measurements with all available techniques for the purposes of cross-calibration and the provision of systematic data.

Decision No. 7. COSPAR,

noting the unusually high wind velocities, reported at the XIV Plenary Meeting, in the lower thermosphere in the auroral and polar regions under disturbed conditions;

and further noting the importance of information on such winds to an understanding of atmospheric and ionospheric dynamics and to the development of COSPAR International Reference Atmospheres and URSI-COSPAR International Reference Ionospheres;

draws the attention of agencies supporting and planning atmospheric and

ionospheric research to the importance of planning coordinated wind measurements at high latitudes using rocket, satellite and ground-based techniques.

Decision No. 8. COSPAR,

noting that the United Nations has recognized the potential contribution of space techniques to practical applications, as witnessed by Secretary General U Thant's Message to COSPAR XIV,

reaffirms to the United Nations, and international scientific committees, associations and organizations, the willingness of COSPAR bodies to respond to requests for collaboration in the matter of utilization of space techniques for the good of mankind, and in particular to assist the developing nations to avail themselves of such technology for application to their own particular problems,

and instructs its Working Groups that they pay particular attention to the possibilities of application to human problems of the techniques under their cognizance.

Decision No. 9. COSPAR,

noting that early comparisons show differences among the results of different techniques for making temperature determinations in the middle and upper stratosphere,

recommends to its adhering national institutions to plan direct rocket atmospheric sounding comparisons with satellite observations, and

also recommends that the satellite launching organizations co-operate with such efforts by supplying information, well in advance, of appropriate satellite schedules, and information on satellite instrumentation for such comparison tests, and that they participate with the rocket launching groups in the analysis of the results.

Decision No. 10. COSPAR,

noting that rocket observations of the upper stratosphere and lower mesosphere will make possible the study of large-scale circulation patterns of the neutral atmosphere, and the meridional exchange of energy in relation to dynamical circulation effects,

endorses the USSR proposal to establish a coordinated program of rocket

firings at sites along two meridional chains (one in eastern longitudes passing through the Soviet Union, Pakistan, India and the Indian Ocean, and the second at western longitudes in North and South America), supported by regional rocket networks (e.g. in Europe); and,

recommends that, in order to assure the best results in such co-ordinated efforts, where rockets, sensors, tracking systems and data processing of many different types will be used, the WMO/CIMO activity of conducting a comprehensive rocket intercomparison be strongly supported by all countries engaged in observational programs with meteorological rockets.

Decision No. 11. COSPAR,

wishing to save the time of the scientists and the money of the Unions,

recommends that meetings of the proposed ICSU Inter-Union Commission for the study of the Moon (IUCM) be held in connection with the meetings of existing Unions and Committees, and that the facilities of existing scientific Unions be utilized to the greatest possible extent by the Commission, and

invites IUCM to utilize whenever possible the Union representatives to COSPAR W.G.7 and to hold meetings of the IUCM at the same place and time as meetings of COSPAR.

Decision No. 12. COSPAR,

wishing to extend the SPACEWARN service to those countries represented in the ICSU who are not members of COSPAR

recommends that COSPAR contact through ICSU the appropriate national members of the ICSU to offer this service and to obtain the names and addresses of their designated contacts if they desire such service.

INTERNATIONAL REFERENCE IONOSPHERE (IRI)

K. RAWER
Arbeitsgruppe für physikalische Weltraumforschung
Freiburg-im-Breisgau, F. R. Germany

Editor's Note. — The following Report was presented by Prof. Rawer to Panel 4B on 25 June 1971 during the XIV COSPAR Meeting in Seattle. It supplements the Report published in *URSI Information Bulletin*, No. 179, pp. 18-28.

Present Status of IRI

We tried, during the last half year, to assemble significant data to build up preliminary models of electron density and temperature. These will correspond to the locations of the three incoherent scatter stations at Jicamarca, Arecibo and St. Santin (to be combined possibly with Millstone Hill). While for the maximum electron densities of the different layers data are well at hand, and at least some data on profiles are available, there are still difficulties concerning :

1. the lower ionosphere (D- and lower E-regions), where different methods seem to give disagreement;
2. electron and ion temperatures, for the same reason, and also because of scarcity of data;
3. ion composition, because of inadequacy of data;
4. conditions at high latitudes (to be described for a possible fourth location).

With respect to Items 2 and 3, we hope to obtain provisional decisions in the open session on 1 July (reports by Pfister and by Taylor). As far as Item 1 is concerned, we may probably come out with concurring models provisionally. We are still looking for consistent data relating to Item 4.

It is intended to produce a very preliminary set of tables for 3 locations by the end of this year. This will, however, not be a first Reference Ionosphere, but only a report to be used as a starting point for obtaining criticism after circulation in the Working Group.

The notes of the session on 1 July are to be circulated afterwards to all participants of the group (almost 100 people) by the URSI Secretariat.

WAVES AND RESONANCES IN PLASMAS

St Johns, Newfoundland, Canada

At the invitation of the URSI Committee in Canada, a Symposium on Waves and Resonances in Plamas was held at the University of St Johns, Newfoundland from 5-9 July 1971. It was attended by 51 participants from Belgium, Canada, Denmark, France, Japan, UK, USA, USSR and West Germany.

The Symposium was proposed by URSI Commission III in 1969 and the main objective was to bring together representatives of groups interested in plasmas from different points of view : plasmas in space and in the upper atmosphere, theoreticians, and laboratory scientists mainly working on hot plasmas. One of the main aims was to stimulate contacts between these groups by discussing the plasma resonance phenomena discovered in recent years by space vehicles.

Even though final answers to the various open questions could not be found during the Symposium, the participants often gained a new insight into their own problems as well as worth-while information on current activities in related fields. It is hoped that the personal contacts established at the Symposium will be maintained and extended in the future.

It is intended to publish the invited papers, and summaries of the discussions and contributed papers, in one issue of *Radio Science*.

The invited speakers and the Chairmen of the sessions were as follows :

Chairman	*Speaker*	*Subject*
M. P. Bachynski	K. G. Balmain :	Frequency response (antennas in plasmas)
M. Petit	D. B. Muldrew :	Transient response ("spikes" in topside ionograms)
P. Vandenplas	K. W. Gentle :	Instabilities and turbulence in laboratory plasmas
T. Watanabe	—	Waves in laboratory plasmas
I. Kimura	M. J. Rycroft :	VLF emissions in the magnetosphere
A. A. Ruhadze	T. W. Johnston :	Excitation
L. B. Felsen	R. W. Larenz :	Coupling
K. Rawer	—	Summary, Discussion.

Grateful acknowledgment is made to the Canadian URSI Committee (Chairman : Dr. R. E. Barrington) and the National Research Council for the invitation to hold the Symposium in Canada and for joining URSI in making travel grants to some of the speakers. The Chairman of the International Programme Committee was Prof. K. Rawer, Chairman of URSI Commission III.

THE INTERNATIONAL URSIGRAM AND WORLD DAYS SERVICE REPORT OF ACTIVITY DURING 1970

The International Ursigram and World Days Service (IUWDS) is an interdisciplinary service created and administered by the International Union of Radio Science (URSI) in association with the International Astronomical Union (IAU) and the International Union for Geodesy and Geophysics (IUGG). Its scientific field concerns all solar-terrestrial physics, and other geophysical fields in appropriate instances.

According to its terms of reference, IUWDS is a permanent service which "aims to provide information rapidly to the world scientific community to assist in the planning, coordination and conduct of scientific work in relevant disciplines". In carrying out its work, it has contributed to the large international enterprises of interdisciplinary cooperation like IQSY, and to more limited coordinated programs like the 1966 Proton Flare Project. Thanks to voluntary cooperation among the scientitists of these various Unions and disciplines, it has the means and the flexibility to adapt itself to the changes of strategy of the scientists and thus to avoid the need to build a temporary organisation for each new project. At any time, the parent Unions can make use of IUWDS or improve its organisation for the better service of science.

Adhering to the Federation of Astronomical and Geophysical Services (FAGS), IUWDS receives a subvention from UNESCO for part of its publications activity and for the coordination of its Regional Warning Centers which are scattered around the world. But the Regional Centers and the World Warning Agency are entirely supported by national funds for their local activities and for their inter-regional exchanges of information.

As built up by the merger in 1962 of two previous services, the IUWDS follows two complementary policies. With the World Days Service, and according to the International Geophysical Year philosophy, it works for a better use of the systematic observation programs. With the International Ursigram Service, and according to the URSI philosophy, it acts as a bridge between pure research and the application of science to technology. As an inter-union permanent service, for several years it has distributed Astronomical Telegrams for IAU; on behalf of COSPAR it assigns international designations to satellite launchings and distributes a bi-weekly bulletin designed to aid a certain types of international cooperation in scientific work involving satellites. The general IUWDS organisation and program have

been fully described in the second (1969) edition of the IUWDS booklet *Synoptic Codes for Solar and Geophysical Data*, and in successive annual reports.

The general activity of the service was fully reviewed in 1970 in Leningrad at the Steering Committee meeting on 19 May, and at the meetings of Warning Center representatives on 16 and 19 May.

The GEOALERT system, as used throughout the IQSY, may have decreased in value. Observatories, rather than using GEOALERTS to change observing programs, now seem to make use of the various forecasts issued by some one of the RWCs instead, and no formal changes in station operations take place on the receipt of the GEOALERTS. The GEOALERTS can and do provide, however, as advisory information.

The International Geophysical Calendar, which is a yearly planning of coordination of geophysical observations, seems to be quite effective according to the numbers of copies which are requested and to the comments received concerning the programs in meteorology, ionosphere and several other disciplines. The Abbreviated Calendar Record contains, after the event, summaries of the observed solar activity and geophysical situation and events, and is now published monthly in the series *Solar-Geophysical Data* by the WDC-A, Boulder, USA.

The establishment of IUCSTP by IAU, IUGG, IUPAP, URSI and COSPAR in 1966 has emphasised the evolution of research in solar-terrestrial physics and the new policy of attacking scientific problems in this field by interdisciplinary cooperation in the carrying out of definite and limited projects. This evolution reacts on IUWDS because, besides the continuing daily assistance to the telecommunication services, support is given to isolated or coordinated temporary experiments in any part of the world which have definitely increased in number during recent years. We have gained some experience which could be very useful for the various kinds of experiments which are planned in the framework of the International Magnetospheric Study, 1975-1977. Others are worldwide interdisciplinary projects like the Proton Flare Project or the more limited Ionospheric Storm Project; isolated rocket firings and balloon launchings for recording the start of an event or for a rendez-vous with a satellite pass; coordinated balloon flights from large areas in the auroral zone or from conjugate point areas; etc.

The regional structure of IUWDS contributes to the efficiency of its assistance to the experimenters, but world-wide cooperation is the fundamental basis for its success. We must also point out that the links between IUWDS and the scientific community give the possibility of obtaining,

on a temporary basis, many complementary data with scientific advice and support, all of which definitely helps to solve the various scientific problems associated with giving assistance to those responsible for scientific experiments. In fact the action taken by IUWDS consolidates interdisciplinary cooperation between scientists of various countries and contributes to the success of their new experiments.

But the permanent elements of IUWDS, which are mainly concerned with the technical or practical implications of the observations, form the necessary basis for temporary action designed to assist any scientific experiment. They provide most of the rapid communication links, between distant countries, a permanent survey of the Sun and of geophysical conditions; the experience of those involved facilitates a quick reaction to events. In this field both sides are the gainers : the scientists for the success of their experiments and the technologists for the assistance provided by the scientists in helping to solve their problems.

We have reviewed our links with our parent Unions : URSI, IAU and IUGG, and the various bodies with which we are cooperating : FAGS, WMO, WDCs, COSPAR, IUCSTP, SPARMO, SCAR, etc. Following this review we hope that IUWDS will continue to evolve in accordance with the actual needs of scientists and within the limits of our technical resources and our knowledge of solar-terrestrial physics.

Meudon, 26 May 1971.

P. Simon,
Secretary, IUWDS.

INTERNATIONAL MAGNETOSPHERIC STUDY 1975-77

Copies of the *First Report* : *Spacecraft Missions* relating to this study were widely circulated with the following covering letter Ref. STP 18(71) in May 1971.

Dear Colleague,

. . . . .

In February 1971, our Joint Study Group met at the Royal Society of London with representatives of the national space programs of several countries (among them France, Germany, Italy, Japan, the UK, the USA,

and the USSR) and of ESRO and, after three days of information exchange and discussion, drafted this report. It is being sent to you in advance of formal adoption by COSPAR and IUCSTP.

We believe that the meeting constitutes an historic landmark in international scientific cooperation. While the IGY, COSPAR, and the IQSY set the stage for full exchange of plans and scientific results, the London meeting marks the first occasion on which representatives of national and multinational space research organizations have sat down together and drafted a concrete plan for designing and coordinating their respective space programs so as to optimize the results.

Space programs typically require long lead times for planning and execution, are costly, and relatively inflexible, once work has begun. For these reasons, the problem of coordinating space programs has been attacked first. Please note, however, that this report is only the first of a forth coming series : the important questions of coordinating rocket, balloon, airborne and, above all, the many related ground-based programs, which are only mentioned in this report, will also be thoroughly treated. The first outline plans for these will be developed within the coming year, with progressively more detailed and specific plans later, as necessary.

The fundamental principle underlying the enclosed report is the following : even a bare minimum of coordination of STP-related spacecraft missions operating during the same or overlapping time intervals will greatly enhance the scientific results, as compared with the same missions conducted independently. The report provides a basis whereby space scientists and program administrators can make decisions about coverage in space, time, and instrumentation for STP-related spacecraft that will be, or may be, operating in 1975-77 (and somewhat before) without materially affecting the cost. The report recommends only what is realistic and possible : it does not ask for any special new missions, but only reviews those that have already been decided or are being considered by national space administrations and scientific study groups, shows how each will contribute to the IMS, and takes note of the gaps if coverage is limited to only those spacecraft that have already been formally approved.

We take this opportunity to commend and thank the Joint Study Group for its excellent work. We request that, where appropriate, you bring their report to the attention of those in a position to act on it and benefit from it : scientific planners, administrators, and experimenters.

Yours sincerely,

(signed) M. Roy,
President of COSPAR.

(signed) H. Friedman,
President of IUCSTP.

BROADCASTS OF SOLAR AND GEOPHYSICAL INFORMATION

As from 1 July 1971, the NBS radio station WWVH will be relocated at Kauai, Hawaii, USA (21°59′31″ N; 159°46′04″ W) and will transmit at 2.5, 5, 10, 15 and 20 MHz. The station WWV remains at Fort Collins, Colorado, USA (40°40′49″ N; 105°02′27″ W) and transmits on 2.5, 5, 10, 15, 20 and 25 MHz.

The modified and expanded information broadcast by these stations is now given in English, and not by Morse Code as in the past. The times are 18 min past the hour for WWV, and 45 min past the hour for WWVH. Full details of the timing of the 400, 500 and 600 Hz tones, etc. and of the format of the voice messages containing solar and geophysical information are given in IUWDS Circular Letter RWC-123 dated 1 June 1971. Further information is available from the Secretary or the Deputy Secretary of IUWDS at the following addresses :

Dr. P. Simon,
Observatoire,
92 Meudon, France.

Miss J. V. Lincoln,
National Oceanic and Atmospheric Administration,
Boulder, Colorado 80302, USA.

TOTAL SOLAR ECLIPSE : 1973 JUNE 30

The National Science Foundation (NFS) intends to publish the first issue of *1973 Eclipse Bulletin* in October-November 1971. It will include material presented at an informal meeting on this eclipse held in Seattle on 19 June 1971 during the COSPAR Meeting. This material deals with the circumstances of the eclipse : meteorological conditions and site surveys in the Sahara, Mauritania, and Lake Chad regions; a proposed Japanese expedition to Mauritania; the plans of the NSF for coordinating programmes planned in the USA; etc.

Organisations or individuals who have additional material of the type mentioned above, or who wish to receive such information, are invited to communicate with either :

Mr. Ronald LaCount,
Eclipse Office,
National Science Foundation,
1800 G Street, N.W.,
Washington D. C., 20550, USA.

or

Dr. M. Rigutti,
Osservatorio Astronomico di Capodimonte,
Via Moiariello 16,
80131 Napoli, Italy.

GLOBAL ATMOSPHERIC RESEARCH PROGRAMME

The following publications have been received (see also *URSI Information Bulletin*, Nos 175, 177, 179) :

Report of the Fifth Session of the Joint Organizing Committee, Bombay, 1-5 February 1971.

GARP Special Report No. 3. Report of the First Session of the Tropical Experiment Council, Geneva, February 1971.

GARP Special Report No. 4. Report of the First Session of the Tropical Experiment Board. Geneva, February 1971.

Copies can be purchased from WMO, Case postale No. 1, CH - 1211 Geneva 20, Switzerland.

WESTERN PACIFIC REGIONAL COMMITTEE OF IUWDS

The following changes should be made in the list of members given in *URSI Information Bulletin*, No. 169, pp. 43-45.

Delete : Y. N. Huang; substitute : Jin-tuu Wang.

Add : Woo Hoang Kee (Korea, Republic of).

As already announced in *URSI Information Bulletin*, No. 171, Dr. I. Kasuya replaced Dr. H. Uyeda as Chairman in March 1969.

MEMBER COMMITTEES OF URSI URSI COMMISSIONS

Full lists of the membership of the URSI Commissions and of the Presidents and Secretaries of the URSI Member Committees were published in *URSI Information Bulletin*, No. 176. The first list of replacement entries was given in No. 178 and the second list appears below.

A full and completely revised list will appear in *URSI Information Bulletin*, No. 182 (March 1972) and it would be appreciated if information on more recent changes could be sent to the Secretary General in Brussels *not later than 31 January 1976*.

Member Committees

Canada :

President : Dr. R. E. Barrington, Communication Research Centre, Shirley Bay, P. O. Box 490, Station "A", Ottawa, Ontario KIN 8T5.

Secretary : Dr. J. L. Locke, Radio and Electrical Engineering Division, National Research Council of Canada, Ottawa 7, Ontario.

Ceylon :

President : Dr. M. L. T. Kannangara, Reader in Physics, University of Ceylon, Colombo 3.

China (Taiwan) :

President : Prof. H. C. Fang, Directorate General of Telecommunications, Ministry of Communications, Taipei, Taiwan.

Secretary : Prof. P. H. Kong, Telecommunication Laboratories, Ministry of Communications, P. O. Box 71, Chung-Li, Taiwan.

Commission I on Radio Measurements and Standards

Official Members :

Canada : Mr. R. F. Clark, Radio and Electrical Engineering Division, National Research Council of Canada, Ottawa 7, Ontario.

South Africa : Mr. G. V. Meij, SABS, Private Bag 191, Pretoria.

USA : Dr. H. M. Altschuler, National Bureau of Standards, 272.10, Room 4066, Boulder, Colorado 80302.

Commission II on Radio and Non-Ionized Media

Official Members :

Canada : Dr. H. E. Turner, Meteorological Branch, Department of Transport, 315 Bloor Street West, Toronto, Ontario.

China (Taiwan) : Prof. T. V. Miao, Directorate General of Telecommunications, Ministry of Communications, Taipei, Taiwan.

India : c/o Dr. A. P. Mitra, National Physical Laboratory, Hillside Road, New Delhi 12.

Commission III on the Ionosphere

Official Members :

Canada : Dr. A. G. MacNamara, Radio and Electrical Engineering Division, National Research Council of Canada, Ottawa 7, Ontario.

Finland : Prof. J. Oksman, University of Oulu, Oulu.

Commission IV on the Magnetosphere

Official Members :

China (Taiwan) : Prof. Y. K. Tai, Institute of Geophysics, National Central University, Chung-Li, Taiwan.

Commission V on Radio Astronomy

Official Members :

Canada : Dr. W. L. H. Shuter, Department of Physics, University of British Columbia, Vancouver, 8 B. C.

Commission VI on Radio Waves and Circuits

Official Members :

Canada : Prof. K. G. Balmain, Department of Electrical Engineering, University of Toronto, Toronto 5, Ontario.

China (Taiwan) : Prof. C. M. Huang, Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan.

South Africa : Mr. P. Meerholz, Fuchs Electronics, P. O. Box 75, Alberton, Transvaal.

Switzerland : c/o Dr. N. Schaetti, Laettenwiesenstrasse 8, CH - 8152 Glattbrugg.

Commission VII on Radio Electronics

Official Members :

South Africa : Mr. P. Meerholz, Fuchs Electronics, P. O. Box 75, Alberton, Transvaal.

Commission VIII on Radio Noise of Terrestrial Origin

Official Members :

Canada : Dr. R. C. Murty, Department of Physics, University of Western Ontario, London, Ontario.

South Africa : Mr. R. W. Vice, Director NITR, P. O. Box 3718, Johannesburg.

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