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

U.R.S.I.

## INFORMATION BULLETIN D'INFORMATION

nº 182 - Mars 1972

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Publié avec l'aide financière de l'UNESCO par le Secrétaire Général de l'URSI
Place Émile Danco, 7 - 1180 Bruxelles
(Belgique)
UNESCO Subvention - 1972 - No DG/2-1/414/34

## List of Abbreviations

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| BIH | Bureau International de l'Heure. |
| CCIR | International Radio Consultative Committee. |
| CCITT | International Telegraph and Telephone Consultative Committee. |
| CIG | Comité International de Géophysique (terminated 1967). |
| CODATA | Committee on Data for Science and Technology. |
| COSPAR | Committee on Space Research. |
| COSTED | Committee on Science and Technology in Developing Countries. |
| CPEM | Conference on Precision Electromagnetic Measurements. |
| CSAGI | Comité Spécial de l'Année Géophysique Internationale (terminated 1959). |
| CTS | Committee on the Teaching of Science. |
| FAGS | Federation of Astronomical and Geophysical Services. |
| GARP | Global Atmospheric Research Programme. |
| ICSU AB | ICSU Abstracting Board. |
| IAF | International Astronautical Federation. |
| IAGA | International Association of Geomagnetism and Aeronomy. |
| IAMAP | International Association of Meteorology and Atmospheric Physics. |
| IASY | International Active Sun Years (1968-1970). |
| IAU | International Astronomical Union. |
| ICSU | International Council of Scientific Unions. |
| IEEE | Institute of Electrical and Electronics Engineers. |
| IFRB | International Frequency Registration Board. |
| IGY | International Geophysical Year (1957-1958). |
| IQSY | International Years of the Quiet Sun (1964-1965). |
| ISO | International Organization for Standardisation. |
| ITU | International Telecommunication Union. |
| IUCAF | Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science. |
| IUCRM | Inter-Union Commission on Radio Meteorology. |
| IUCSTP | Inter-Union Commission on Solar-Terrestrial Physics. |
| IUGG | International Union of Geodesy and Geophysics. |
| IUPAP | International Union of Pure and Applied Physics. |
| IUWDS | International Ursigram and World Days Service. |
| SCAR | Scientific Committee on Antarctic Research. |
| SCOPE | Special Committee on Problems of the Environment. |
| UAI | Union of International Associations. |
| UNESCO | United Nations Education, Scientific and Cultural Organization. |
| UNISIST | ICSU-UNESCO Joint Project to Study the Feasibility of a World Information System. |
| WDC | World Data Centre. |
| WFEO | World Federation of Engineering Organizations. |
| WMO | World Meteorological Organization. |

# U. R. S. I.

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## JÜRGEN GROSSKOPF
## 1905-1971

Many radio scientists associated with URSI, and especially those interested in the activities of the Commission on Radio and Non-Ionized Media, will deeply regret the death of Professor Jürgen Grosskopf in August 1971.

Professor Grosskopf was a well-known figure at URSI Assemblies and his work on different aspects of radio wave propagation was internationally recognised. Until his retirement in 1970, he had been in charge of research on propagation in the Fernmeldetechnisches Zentralanstalt der Deutschen Bundespost at Darmstadt. His most recent contribution to an URSI Assembly was a paper, written jointly with Dr. Fehlhaber and presented at Munich in 1966, on the turbulence and structure of the troposphere as derived from radio propagation measurements : a subject which is still of great interest to both URSI and IUGG (IAMAP) and which will be discussed this year at a Symposium being organised by the Inter-Union Commission on Radio Meteorology.

For many years, Professor Grosskopf had been the Official Member for Commission II in the German URSI Committee. His death represents a grave loss not only to this Committee but also to the international community of radio scientists.

## THE FUTURE STRUCTURE OF URSI

The Working Group on the Reorganisation of URSI (1969-1970) submitted a Report and Recommendations which were reproduced in *URSI Inf. Bull.*, No. 178, together with an interim statement by the Board of Officers. The same issue contains also the Report issued by the IUGG Group on the future structure of IUGG.

During the past year, several new aspects of the question of reorganisation have been brought to the attention of the Board and these were communicated to the Member Committees, for consideration, in January 1972. The text of this document (URSI-M201) is reproduced below.

At the forthcoming General Assembly, the Council will review the various possible ways in which URSI could be reorganised. In the meantime, scientists interested in any aspect of the propagation of electromagnetic waves and associated topics are invited to make their views known to their Member Committees; the names of the Presidents and Secretaries are listed elsewhere in this issue.

*Doc. URSI-M201*

## Reorganisation of URSI

SUMMARY

At first sight the scientific interests of the eight URSI Commissions differ considerably from each other. However, all the Commissions have a common interest in research relating to the propagation of electromagnetic radiation and associated questions; it is generally agreed also that this community of interests acts as a binding or cohesive force which, at present, has the effect of holding together the different groups of radio scientists in URSI.

The URSI Working Group on Reorganisation (1969-1970) recognised this cohesive force and the desirability of maintaining, within ICSU, a single forum for the discussion of all aspects or radio science and its applications. This was one of the reasons underlying the recommendation that URSI should remain in being as a Union concerned primarily with radio science.

On the other hand, it can not be denied that similar cohesive forces tend to hold together all geophysicists, even though the different aspects of the subjects in which they are interested are divided between several Unions. The same can be said also for astronomers.

Because of historical reasons, associated with the development of science, the pioneers in ionospheric and magnetospheric research were radio scientists and not geophysicists. Also, for obvious reasons, radio astronomy

was pioneered by radio scientists before being incorporated later into the main field of astronomical research. In consequence, several of the present URSI Commissions are concerned with these branches of science and, indeed, many of the radio scientists associated with URSI can equally well regard themselves as geophysicists or astronomers. Hence, in addition to the internal cohesion of the radio scientists within URSI, there is an analogous cohesion among the geophysicists in URSI and IUGG and among the astronomers in URSI and IAU.

IUGG and IAU deal respectively with geophysics and astronomy in the broadest sense of these terms; they are concerned not only with the fundamental problems in these branches of science, but also with the interpretation of observational data acquired by all possible types of experiment, including those depending on the use of radio waves. In URSI, on the other hand, attention is concentrated mainly on, for example, the ionospheric or the magnetospheric plasma as a medium in which electromagnetic radiation can be generated or propagated. Hence radio scientists whose interest extends beyond this limited aspect of the upper atmospheric plasma are increasingly likely to regard IUGG, rather than URSI, as the natural forum for the discussion of ionospheric and magnetospheric physics in general.

If this view is correct, then there will be a gradual dispersion of the radio scientists associated with Commissions III, IV, V and parts of II and VIII and a corresponding decrease in the importance of these Commissions.

It is believed that the development of such a situation could be avoided by the creation of a Union on Electromagnetism and Aeronomy; it is suggested that such a Union should cover not only all the branches of radio science of interest to URSI at the present time, but also aeronomy and the geomagnetic field.

Such a Union would have two important advantages : it would preserve the cohesion of all the radio scientists in URSI and, in addition, it would ensure much easier and closer cooperation between the groups of geophysicists at present divided between URSI and IUGG.

On the other hand, if it is considered preferable, for any reason, to retain URSI as a separate Union, then it would be necessary to transform it in a radical way so that, in future, the activities of Commissions I, VI and VII would form the scientific basis of the reoriented Union.

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## 1. — Introduction.

A Working Group on the Reorganisation of URSI was formed at the XVI General Assembly in 1969. In accordance with its terms of reference, the Group presented its Report and Recommendations to the URSI Board of Officers in November 1970. The Board agreed to circulate these documents to the Member Committees of URSI, with an accompanying Statement, but considered that it would not be appropriate for it to express an opinion on the Recommendations (*URSI Inf. Bull.*, No. 178, pp. 7-18).

The purpose of the present document is to summarise some points of view, relating to the future of URSI, which differ from those on which Recommendation No. 1 was based. These views have been brought to the attention of the URSI Board of Officers by Prof. H. G. Booker who has suggested additional possible courses of action for consideration by the Member Committees of URSI.

## 2. — The Basis for Recommendation No. 1.

2.1. — In Recommendation No. 1, the Working Group recommended that URSI should remain in being as a Union concerned primarily with radio science. In addition, the Group expressed the opinion that the responsibility for the stimulation and coordination of studies in radio science could not be satisfactorily discharged by a Union dealing with the Earth's environment.

The principal assumptions which underlie this recommendation and the related opinion are :

(*a*) that there exists a cohesive force which binds together all those scientists who make use of radio methods in their research, irrespective of the particular branches of science to which they apply these methods;

(*b*) that radio scientists, considered as a single group, should continue to have a single forum where, when necessary, they can discuss questions of common interest relating to the exploitation of radio methods;

(*c*) that if radio science (as defined by the fields covered by the present URSI Commissions) were to be included in the terms of reference of a Union concerned with the Earth's environment, radio scientists would lose their freedom to study the applications of radio methods in other branches of science.

2.2. — The basic concepts to which Recommendation No. 1 of the Working Group owes its origin are clearly :

(*a*) that the scientists at present associated with URSI should be permitted to continue their activities within URSI without interruption;

(*b*) that, in view of its long traditions and its achievements, URSI should be allowed to retain its identity as a separate Union.

Although, at first sight, these concepts appear to be reasonable, doubts have been raised from time to time as to their validity and Professor Booker has submitted, to the Board of Officers, a document in which the probable future trends in URSI are examined. Before referring further to Professor Booker's views, it is necessary to review briefly the main features of the development of radio science since the formation of URSI.

## 3. — Development of Radio Science.

3.1. — It has often been pointed out that URSI owed its origin, in 1919, to the need for serious scientific studies of the propagation of electromagnetic waves at a time when communication engineers were becoming interested in the development of radio communication systems as a substitute for networks of cables. It was obvious that international cooperation in such studies would be necessary, and the recognition of this need led to the formation of the Eccles Commission in 1913 and of the Union itself in 1919.

3.2. — It is well known that research on radio wave propagation inevitably led to the investigation of the various media through which the waves had to pass. A direct outcome of this research was the discovery of the ionosphere in the 1920's and of the magnetosphere 30 years later. At the time of their discovery, information about these regions could be obtained only by using radio waves as remote probes. It was for this reason that URSI remained, for many years, the principal international forum for discussions on the ionosphere (in the Commission on Radio Wave Propagation) and the magnetosphere (in the Commission on Atmospheric Disturbances).

The development, over the past 20 years, of our knowledge of the microstructure of the neutral atmosphere was also due, in considerable measure, to investigations of the propagation of radio waves at metric and, later, shorter wavelengths.

Studies of radio waves emitted by extra-terrestrial sources were first discussed at a General Assembly of URSI in 1934. However, the remarkable development of radioastronomy began with the introduction of the new radio techniques that became available after the Second World War.

branches of geophysical and astronomical research referred to above could be pursued only by scientists who had the experimental facilities for using radio waves as probes. However, these scientists were often closely associated with theoreticians who assisted in the interpretation of the experimental data. Hence, until about 20 years ago, radio astronomy and many aspects of research on the upper atmosphere, including phenomena due to the influence of the geomagnetic field, were subjects for discussion, at the international level, almost exclusively in URSI.

3.4. — During recent years, rapid progress has been made in the techniques for the exploitation of space vehicles for acquiring many new types of information about the Earth's environment in interplanetary space and, in particular, about the ionosphere and the magnetosphere. In astronomy also, space vehicles are increasingly being used as platforms for making observations of celestial objects, for example, in X- and gamma-radiation, and at radio frequencies that can not be used at ground stations because of absorption of the energy in the terrestrial atmosphere or the ionosphere. The many new types of astronomical observations that are now being made constitute an important source of information which complements that obtainable at ground stations using either classical optical instruments or radio waves capable of penetrating the ionosphere and the atmosphere.

As a result of the developments outlined above, research on the upper atmosphere and the magnetosphere can no longer be regarded, as in the past, as being of interest only to radio scientists. Geophysicists regard all types of experimental data, including those obtained using radio methods, as forming the necessary basis for their research.

Similarly, the observations made by radioastronomers are, to an increasing extent, being incorporated into general astronomical research. Astronomers are ceasing to distinguish between the observations made using radio, optical, X-ray and other devices; instead, they tend to regard all of these as valid contributions to their research.

## 4. — Alternatives to Recommendation No. 1.

4.1. — Professor Booker has pointed out that, in ionospheric research (including aeronomy, the basic characteristics of the plasma, etc.), the relative importance of radio observations is decreasing. Hence it is not

unexpected to find that IUGG, rather than URSI, is being increasingly regarded as the natural forum for discussions on ionospheric research in general.

The same trend is found in magnetospheric studies because the plasma can no longer be regarded as merely a medium for radio wave propagation. Increasing importance is being attached, for example, to the origin of the particles in the magnetosphere, to the physical phenomena caused by their behaviour in the geomagnetic field, and to the interactions between the magnetic fields of the Earth and of interplanetary space.

In radioastronomy, the continued development of new techniques still appears to play an important rôle. For this reason, radio-astronomers, whether they are interested in the Sun, the interplanetary gas, pulsars or some other field, still find it useful to meet at URSI Assemblies and to discuss new ways of exploiting radio techniques in their researches. However, as these techniques and their applications become more highly developed over the coming years, the present sense of cohesion with other Commissions in URSI will tend to disappear and radioastronomers will cease to distinguish themselves from their colleagues who use optical devices, space vehicles, etc. for acquiring observational data.

4.2. — From the above discussion, Professor Booker draws several conclusions which are outlined below.

(*a*) In the URSI Commissions concerned with the neutral and ionized atmospheres, the magnetosphere and radioastronomy, radio science is concerned primarily with investigations of the different media by studying the way in which they affect radio waves propagated through them.

(*b*) So long as radio probing techniques remained the principal or the only means of studying the various media, it has been logical to regard URSI as the natural international forum for discussions of the relevant geophysical and astronomical problems. However, as the relative importance of radio methods decreases and as the volume of information obtained by other methods increases, there will be an increasing trend towards the acceptance of IUGG and IAU as the appropriate Unions for discussions on geophysical and astronomical research respectively.

(*c*) As a result of (*b*), the importance of both geophysics and radioastronomy within URSI will decrease and ultimately the principal responsibilities of the Union will be those aspects of radio science at present covered by Commissions I, VI and VII.

Professor Booker points out that the trends referred to in (*b*) and (*c*) above will have important consequences for URSI, even if the General

Assembly in 1972 decides that there is no need to make any changes. The Union can not continue to exist as it is at present; instead there will be a continued decrease in the importance of the Commissions dealing with geophysics and radioastronomy, and the radio scientists who are interested in these fields will tend to prefer the more broadly based Unions : IUGG and IAU.

Thus the inevitable consequence of taking no action would be the ultimate division of radio scientists into separate groups in several Unions.

4.3. — In these circumstances, the groups remaining within URSI would consist of those concerned with the more fundamental aspects of radio science, rather than with its applications to research on the environment.

There is some doubt as to whether a Union dealing only with the branches of radio science covered by the present Commissions I, VI and VII would be sufficiently broadly based to be viable. Professor Booker believes that it would be necessary to find a much wider group of scientific activities for a Union based on the activities of these Commissions. In this connection, he suggests that "information and communication science" is worth consideration since this field seems likely to retain its importance and to require international cooperation. A Union concerned with this science would not restrict itself to radio techniques alone, but would cover also optical and acoustical communications. It would retain an interest in wave propagation in various media and in such practical questions as communications systems depending on ionospheric and tropospheric propagation.

It is recognised, on the other hand, that the existence of such a Union in ICSU would probably create difficulties because of potential overlapping interests with the World Federation of Engineering Organisations, and with IEEE which has already considerably developed its international activities.

Furthermore, even if such a Union could be formed, this action would not prevent the division of the radio scientists in URSI Commissions II, III, IV and VIII into two groups : one, in the new Union, concerned with communications and wave propagation and the other, in IUGG, concerned with the physics of the troposphere, the ionosphere and the magnetosphere. If it is considered desirable to avoid such divisions, it will be necessary to create a single Union having responsibilities not only for all aspects of geophysical research, but also for the important branches of radio science in URSI that have no applications to geophysics.

4.4 — Professor Booker has drawn attention to the Report of the IUGG Working Group; this was completed in 1970 and includes the suggestion that URSI and IUGG should together discuss the formation of a Union on Electromagnetism and Aeronomy (*URSI Inf. Bull.*, No. 178, pp. 18-21). This Union would be concerned with the geomagnetic field and aeronomy, with the branches of radio science concerned with electromagnetic waves and devices, including their applications in other fields such as radioastronomy and the troposphere, and with all aspects of ionospheric and magnetospheric research, at present divided between URSI and IUGG. A Union covering these fields would have two principal advantages : it would preserve the present cohesion between all the radio scientists in URSI and, in addition, it would ensure that there was a single Union in ICSU for the discussion of all questions relating to the ionosphere and the magnetosphere.

It has been suggested that the "engineering" aspects of electromagnetism and wave propagation would not receive sufficient recognition in a Union concerned with the environment. On the other hand, it must be pointed out that, although IUGG is primarily concerned with the scientific aspects of geophysics, it has successfully maintained active groups dealing with certain aspects of geophysics that are very close to civil engineering; for example, hydrology, or the damage caused by earthquakes. Moreover, within URSI, Commissions I, VI and VII have only very marginal interests in geophysics, but they have not been submerged or neglected even though URSI has been very active in branches of geophysical research that often extend well beyond the strict limits of radio research.

Thus, taking all these considerations into account, there appear to be valid reasons for URSI to explore further, in joints discussions with IUGG, the formation of a Union on Electromagnetism and Aeronomy.

## 5. — Conclusion.

The various courses of action open to URSI will affect, in different ways, the cohesion of radio scientists and the long-term prospects either of URSI, or of some possible successor to URSI. The consequences of the three main possibilities are outlined below.

Action 1. — To leave URSI more or less as it is at present.

*Effect on Radio Science.* — The present cohesion of radio scientists would be only temporarily preserved.

*Long-term Prospects.* — Scientists whose research interests extend outside radio science would be increasingly attracted to Unions other than URSI (IUGG for geophysics; IAU for astronomy).

ACTION 2. — To transform URSI into a Union on Information and Communication Science. This could be done deliberately, or it could be an end-product of Action 1.

*Effect on Radio Science.* — Radio scientists having an interest in geophysics or astronomy would be separated from those concerned with information and communication science.

*Long-term Prospects.* — The reoriented URSI would cover all aspects of information and communication science (radio, acoustical and optical). Relations with international engineering organisations would require consideration.

ACTION 3. — To create, following agreement between URSI and IUGG, a Union on Electromagnetism and Aeronomy, incorporating radio science (as in URSI) plus geomagnetism and aeronomy (as in IUGG).

*Effect on Radio Science.* — The present cohesion of radio scientists in URSI would be preserved. Also it would be possible to achieve at once, and not as a long-term result of Action 1, the desirable cohesion between all the scientists in URSI and IUGG who are concerned in some way with geophysics.

*Long-term Prospects.* — All the present activities of URSI, without exception, would be preserved in the new Union.

## STRUCTURE ET AVENIR DE L'URSI

Le Rapport et les Recommandations du Groupe de travail pour les questions de réorganisation de l'URSI (1969-1970), ainsi que la Déclaration du Bureau y relative ont été reproduits dans le *Bulletin d'Information de l'URSI*, nº 178; ce numéro contient également le Rapport du Groupe de l'UGGI chargé des problèmes de structure.

Certains aspects nouveaux de la question ont été mis en lumière et portés l'attention du Bureau au cours de l'année écoulée. Le document RSI-M201 (reproduit ci-dessous) a été soumis à l'examen des Comités lembres en janvier 1972.

Lors de la prochaine Assemblée générale, le Conseil étudiera les différentes voies que l'URSI pourrait suivre dans sa réorganisation. D'ici là, us les scientifiques concernés par la propagation des ondes électromagnéques sont invités à communiquer leurs opinions et commentaires au omité Membre de l'Union dans leur pays; une liste des Présidents et crétaires de ces Comités est publiée dans le présent numéro.

*Doc. URSI-M201*

## Réorganisation de l'URSI

RÉSUMÉ

l y a à première vue des différences sensibles dans les intérêts scientiues des huit Commissions de l'URSI. Elles portent cependant toutes intérêt commun à l'étude de la propagation des ondes électromagnétiques des questions s'y rapportant, et il est généralement admis que cette nmunauté d'intérêts assure la cohésion qui, à présent, unit au sein de RSI les différents groupes de radio-scientifiques.

Ayant reconnu l'existence de cette force de cohésion, le Groupe de vail pour les questions de réorganisation a exprimé l'opinion qu'il serait haitable de conserver, dans le cadre du CIUS (Conseil International Unions Scientifiques), une tribune unique pour traiter tous les aspects la radioélectricité scientifique et de ses applications. C'est là une des ons qui ont inspiré la recommandation que l'URSI devrait continuer ister en tant qu'Union se consacrant essentiellement à la radioélectricité ntifique.

ar ailleurs on ne pourrait nier le fait qu'une force cohésive semblable l à unir tous les géophysiciens, bien que les différents aspects des sujets intéressant soient traités dans plusieurs Unions. La même chose peut dite des astronomes.

our des raisons inhérentes à l'évolution de la science, les recherches sur iosphère et sur la magnétosphère eurent comme pionniers des radio-

scientifiques, et non pas des géophysiciens. De même les débuts de la radioastronomie (avant son rattachement au domaine général de l'astronomie) furent assurés par des radio-scientifiques. Par conséquent, plusieurs Commissions de l'URSI sont à présent concernées par ces sujets et nombreux parmi les radio-scientifiques peuvent se considérer tout à la fois comme géophysiciens ou comme astronomes. Il existe donc, en plus de la cohésion qui unit les radio-scientifiques au sein de l'URSI, une force analogue qui lie les géophysiciens de l'URSI et ceux de l'UGGI, ainsi que les astronomes de l'URSI et ceux de l'UAI.

L'UGGI se consacre à la géophysique et l'UAI à l'astronomie dans la plus large acception de ces termes; elles s'occupent non seulement des problèmes scientifiques fondamentaux, mais aussi de l'interprétation des données obtenues par toutes les catégories d'expériences, y compris les expériences liées à l'utilisation des ondes radioélectriques. Dans l'URSI, par contre, l'attention se concentre sur des aspects plus particuliers de ces branches de la science comme, par exemple, le plasma ionosphérique ou le plasma magnétosphérique en tant que milieux où naissent ou se propagent les ondes électromagnétiques. De ce fait les radio-scientifiques dont l'intérêt porte au-delà de cet aspect limité du plasma de la haute atmosphère tendent de plus en plus à voir en l'UGGI, plutôt qu'en l'URSI, le forum naturel où discuter de l'ensemble des questions se rattachant à la physique de l'ionosphère et de la magnétosphère.

Si cette vue est exacte, on assistera alors à la dispersion graduelle des radio-scientifiques associés aux Commissions III, IV et V et, en partie, aux Commissions II et VIII, et au déclin des activités de ces Commissions.

Il est considéré qu'une telle situation pourrait être évitée par la formation d'une Union d'Electromagnétisme et d'Aéronomie, qui couvrirait non seulement toutes les branches de la radioélectricité scientifique intéressant actuellement l'URSI, mais aussi le géomagnétisme et l'aéronomie. Pareille Union aurait le double avantage de préserver la cohésion des radio-scientifiques de l'URSI et d'assurer une coopération plus aisée et plus étroite de tous les groupes de géophysiciens à présent divisés entre l'URSI et l'UGGI.

D'autre part si, pour quelque raison que ce soit, il est considéré préférable de maintenir l'URSI comme Union distincte, il faudra alors envisager des changements radicaux qui lui donneront comme base scientifique principale les activités des Commissions I, VI et VII.

* * *

— INTRODUCTION.

:onformément au mandat qui lui avait été confié par la XVIe Assemblée érale en 1969, le Groupe de travail pour les questions de réorganisation l'URSI a présenté son Rapport et ses Recommandations au Bureau de nion, lors de sa session de novembre 1970. Celui-ci, jugeant inopportun prendre position sur ces Recommandations, a décidé de diffuser aux nités Membres l'ensemble des documents en les accompagnant d'une :laration (*Bull. d'Inf. de l'URSI*, nº 178, pp. 22-34).

.e but du présent document est d'exposer de façon succincte certaines :s sur l'avenir de l'URSI, qui diffèrent sensiblement du point de vue se ıvant à la base de la Recommandation nº 1. Ces idées sur les diffé- :es voies qui s'ouvrent à l'URSI dans l'avenir ont été formulées et tées à l'attention du Bureau par le Professeur H. G. Booker; elles sont mises pour considération aux Comités Membres.

— PRINCIPE DE LA RECOMMANDATION Nº 1.

.1. — Dans sa Recommandation nº 1, le Groupe de travail exprime ›inion que l'URSI devrait continuer d'exister en tant qu'Union se sacrant essentiellement à la radioélectricité scientifique. De plus, il me que la tâche actuelle de l'URSI, qui est de stimuler et de coordonner études dans le domaine de la radioélectricité scientifique, ne saurait remplie de façon satisfaisante par une Union de l'Environnement estre.

.es attendus de cette Recommandation sont les suivants :

) il existe une force de cohésion qui unit tous les scientifiques utilisant méthodes radioélectriques dans leurs recherches, quelles que soient les nches de la science où s'appliquent ces méthodes;

) les radio-scientifiques constituant un groupe cohérent, ils doivent ıvoir disposer d'une propre tribune pour examiner les questions d'intérêt ımun concernant l'exploitation des méthodes radioélectriques;

) si la radioélectricité scientifique (prise ici comme le domaine couvert les activités actuelles des Commissions de l'URSI) venait à être incor- ée à une Union de l'Environnement terrestre, les radio-scientifiques ırraient y perdre la possibilité d'étudier les applications des méthodes ioélectriques à d'autres branches de la science.

.2. — Il apparaît donc clairement que la Recommandation nº 1 a été ›irée par les idées fondamentales suivantes :

*a*) les scientifiques actuellement associés à l'URSI doivent pouvoir poursuivre sans interruption leurs activités au sein de l'Union;

*b*) eu égard à sa longue tradition et à ses réalisations, l'URSI se doit de conserver son identité en demeurant une Union distincte.

Bien que ces idées paraissent parfaitement admissibles à première vue, certains doutes ont été émis à plusieurs reprises quant à leur bien-fondé. C'est pourquoi le Professeur Booker a jugé utile de soumettre au Bureau un document où il analyse les possibilités d'évolution de l'URSI dans l'avenir. Mais avant d'exposer ces possibilités, il semble utile de retracer brièvement les étapes essentielles du développement de la radioélectricité scientifique depuis la création de l'URSI.

3. — Développement de la radioélectricité scientifique.

3.1. — Il a été dit souvent que l'URSI avait été formée en 1919 pour répondre au besoin d'organiser l'étude scientifique de la propagation des ondes électromagnétiques, à un moment où les ingénieurs commençaient d'envisager la possibilité de remplacer les réseaux de câbles par des systèmes de communications radioélectriques. Il était évident que cette étude exigerait la collaboration internationale et c'est pourquoi fut formée en 1913 la Commission Eccles et, en 1919, l'Union même.

3.2. — Pour comprendre les phénomènes de la propagation des ondes radioélectriques, il fallait nécessairement étudier les différents milieux que ces ondes traversaient : la découverte de l'ionosphère dans les années 1920, et celle de la magnétosphère 30 ans plus tard, sont le fruit de ces recherches. A l'époque où furent découvertes ces régions, seules les ondes radioélectriques en permettaient le sondage à distance et pouvaient fournir des renseignements sur leur structure, etc. C'est ainsi que, pendant des années, l'URSI a été le forum international principal où se sont déroulées les discussions sur l'ionosphère (Commission de la propagation des ondes radioélectriques) et sur la magnétosphère (Commission des perturbations atmosphériques).

De même, le développement, au cours des 20 dernières années, de notre connaissance de la microstructure de l'atmosphère neutre est dû dans une grande mesure aux recherches sur la propagation des ondes radioélectriques aux longueurs métriques et, plus tard, aux longueurs décimétriques et millimétriques.

C'est à l'Assemblée générale de l'URSI, en 1934, que furent examinés pour la première fois les résultats d'études sur les émissions en provenance

)urces extra-terrestres. Ce n'est cependant qu'avec l'introduction de
iiques radioélectriques nouvelles, après la Deuxième guerre mondiale,
;'amorça le prestigieux essor de la radioastronomie.

. — Il importe de souligner qu'avant la mise au point des fusées,
ites et sondes spatiales pouvant transporter à leur bord des instruments
tifiques, seuls les chercheurs à même d'employer les ondes radio-
:iques comme sondes dans leurs expériences pouvaient poursuivre les
:s géophysiques et astronomiques dont il vient d'être question. Ces
:heurs travaillaient fréquemment en liaison étroite avec les théoriciens
ıpportaient leur concours à l'interprétation des données expérimen-
Jusqu'à il y a une vingtaine d'années environ, l'URSI a ainsi été
ule organisation internationale où étaient inscrits à l'ordre du jour
dioastronomie ainsi que de nombreux aspects de l'étude de la haute
'sphère, y compris les phénomènes dus à l'influence du champ
ıagnétique.

. — Au cours de ces dernières années, les rapides progrès enregistrés
la mise au point des techniques ont permis d'acquérir par les véhicules
aux de nombreux types nouveaux de données sur l'espace environnant
:rre et, plus spécialement, sur l'ionosphère et la magnétosphère. Dans
'maine de l'astronomie également, les véhicules spatiaux sont de plus
ius employés comme plate-formes pour l'observation d'objets célestes
ıoyen, par exemple, des émissions de rayons X et gamma et des
ıences radio inutilisables pour les stations terriennes en raison de
orption de l'énergie dans l'atmosphère terrestre et l'ionosphère. Les
rvations astronomiques de types nouveaux apportent actuellement une
ısion de données qui viennent compléter les données obtenues par les
)ns terriennes avec les instruments optiques classiques ou les ondes radio
:ptibles de pénétrer dans l'atmosphère neutre et dans l'ionosphère.
s développements retracés ci-dessus font que l'étude de la haute
'sphère et de la magnétosphère ne peut plus être considérée comme
essant les seuls radio-scientifiques. Dans leurs recherches, les géo-
iciens ont également recours à toutes les catégories de données
rimentales, y compris les données fournies par les méthodes radio-
riques.
: même la radioastronomie s'intègre de plus en plus dans le domaine
astronomie générale et les astronomes font de moins en moins la
ıction entre les moyens d'observation (ondes radioélectriques,
uments optiques, rayons X, ou autres) qui, tous, leur apportent des
:ibutions valables.

4. — POSSIBILITÉS AUTRES QUE CELLE ENVISAGÉE PAR LA RECOMMANDATION N° 1.

4.1. — Le Professeur Booker souligne que dans l'étude de l'ionosphère (y compris l'aéronomie, les caractéristiques fondamentales du plasma, etc.), l'importance relative des observations radioélectriques tend à décroître. Il n'est donc guère surprenant de constater que, pour l'étude globale de l'ionosphère, on se tourne vers l'UGGI plutôt que vers l'URSI.

La même tendance se manifeste pour ce qui concerne l'étude de la magnétosphère puisque le plasma ne peut plus être considéré uniquement comme milieu de propagation des ondes radioélectriques. Par exemple, une signification toujours croissante est attachée à l'origine des particules dans la magnétosphère, aux phénomènes physiques causés par leur comportement dans le champ géomagnétique, ainsi qu'à l'interaction entre le champ magnétique de la Terre et celui de l'espace interplanétaire.

Dans le domaine de la radioastronomie, le développement continu de techniques nouvelles semble toujours occuper une place importante. Pour cette raison les radioastronomes, que leurs travaux soient consacrés au Soleil, au gaz interplanétaire, aux pulsars ou à tout autre sujet, trouvent utile de se réunir pendant les Assemblées générales de l'URSI pour examiner ensemble les possibilités d'exploitation des techniques radio dans leurs recherches. Il est considéré cependant qu'avec le perfectionnement de ces techniques et de leurs applications dans les années qui viennent, le sentiment de cohésion qu'ils éprouvent au sein de l'URSI tendra à disparaître et qu'ils se joindront à leurs collègues qui utilisent les instruments optiques, les véhicules spatiaux, etc. pour l'obtention des données.

4.2. — De ce qui vient d'être exposé, le Professeur Booker tire les conclusions suivantes :

*a*) Dans les Commissions de l'URSI concernées par l'atmosphère neutre et l'atmosphère ionisée, la magnétosphère et la radioastronomie, la radioélectricité scientifique étudie principalement les caractéristiques des différents milieux en examinant leurs effets sur les ondes qui les traversent.

*b*) Aussi longtemps que les techniques radioélectriques ont constitué le seul ou principal moyen disponible pour sonder ces différents milieux, la discussion internationale des problèmes géophysiques et astronomiques s'y rattachant a logiquement trouvé place à l'URSI. Mais au fur et à mesure que l'importance relative des méthodes radio diminuera, et que le volume des données obtenues par d'autres moyens augmentera, les chercheurs se tourneront de plus en plus vers l'UGGI et vers l'UAI en

tant que tribunes appropriées pour l'examen des problèmes géophysiques et astronomiques.

*c*) Comme conséquence de *b*), l'importance de la géophysique et de l'astronomie dans l'URSI ira décroissant et les principaux domaines d'intérêt de l'Union finiront par être les disciplines radio-scientifiques à présent couvertes par les Commissions I, VI et VII.

Le Professeur Booker souligne que même si l'Assemblée générale de 1972 devait décider de ne pas apporter de changements à l'Union, les tendances indiquées en *b*) et en *c*) ne manqueraient pas d'entraîner de sérieuses conséquences pour l'URSI. L'Union ne peut continuer d'exister telle qu'elle est à présent : les Commissions concernées par la géophysique et la radioastronomie perdront en importance et les radio-scientifiques intéressés par ces études préféreront s'associer aux Unions ayant de plus larges bases, l'UGGI et l'UAI.

Dès lors, si aucune mesure n'est prise, les radio-scientifiques se disperseront inévitablement pour se regrouper au sein de plusieurs Unions.

4.3. — Les groupes restant à l'URSI seront formés des chercheurs qui se consacrent aux aspects fondamentaux de la radioélectricité scientifique plutôt qu'à ses applications dans l'étude de l'environnement.

Quelques doutes peuvent être émis quant à la viabilité d'une Union dont les bases seraient restreintes aux branches radio-scientifiques actuellement couvertes par les Commissions I, VI et VII. Le Professeur Booker estime qu'il serait nécessaire de trouver des bases scientifiques bien plus larges. A ce propos, il estime approprié d'envisager « les sciences de l'information et des communications », car ce domaine semble devoir conserver son importance et exiger la collaboration internationale. Une Union consacrée à ce domaine de la science ne se limiterait pas aux seules techniques radioélectriques, mais s'occuperait aussi des communications optiques et acoustiques. Elle garderait son intérêt pour la propagation des ondes dans les différents milieux ainsi que pour des questions pratiques, telle que les systèmes de communication dépendant de la propagation ionosphérique et troposphérique.

Il est admis par ailleurs que l'existence d'une Union de cette nature dans le cadre du CIUS pourrait créer des difficultés étant donné la possibilité de recouvrements d'intérêts avec la Fédération Mondiale des Organisations d'Ingénieurs et avec l'IEEE, qui a déjà développé de sérieuses activités internationales.

Mais même si elle pouvait se former, cette Union n'empêcherait pas la division des radio-scientifiques des Commissions II, III, IV et VIII de

l'URSI en deux groupes distincts : l'un se formant au sein de la nouvelle Union et s'occupant des communications et de la propagation des ondes et l'autre au sein de l'UGGI et étudiant la physique de la troposphère de l'ionosphère et de la magnétosphère. Si l'on veut empêcher cette dispersion, il faut envisager la création d'une Union qui couvrirait non seulement tous les aspects des recherches géophysiques, mais aussi les branches de la radioélectricité scientifique actuellement représentées dans l'URSI et qui ne s'appliquent pas à la géophysique.

4.4. — Le Professeur Booker attire l'attention sur le Rapport du Groupe de travail de l'UGGI; celui-ci a été rédigé en 1970 et il suggère notamment que l'URSI et l'UGGI examinent ensemble les possibilités de former une Union d'Electromagnétisme et d'Aéronomie (*Bull. d'Inf. de l'URSI* n° 178, pp. 35-38). Cette Union serait concernée par le champ géomagnétique et l'aéronomie, par les branches de la radioélectricité scientifique relatives aux ondes et aux dispositifs électromagnétiques, y compris leurs applications dans des domaines tels que la radioastronomie et la troposphère, ainsi que par tous les aspects des études ionosphériques et magnétosphériques actuellement répartis entre l'URSI et l'UGGI. Cette Union aurait le double avantage de préserver la cohésion actuelle de tous les radio-scientifiques de l'URSI et de concentrer en une seule Union toutes les questions relatives à l'ionosphère et à la magnétosphère.

Il a été dit qu'une Union de l'Environnement n'accorderait pas toute l'importance qui leur revient aux aspects de l'électromagnétisme et de la propagation des ondes relevant des ingénieurs. Il convient de souligner à ce propos que, tout en étant concernée au premier chef par les aspects scientifiques de la géophysique, l'UGGI a réussi à maintenir des groupes actifs qui s'occupent de certains aspects apparentés au génie civil comme, par exemple, l'hydrologie ou l'étude des dommages causés par les tremblements de terre. On constate aussi qu'en dépit de l'intense activité déployée par l'URSI dans des branches de la recherche géophysique qui vont bien souvent au-delà des strictes limites de la recherche radioélectrique, les Commissions I, VI et VII de l'URSI, dont l'intérêt pour la géophysique n'est que très secondaire, n'ont été ni submergées ni négligées.

Tenant compte de toutes ces considérations, des raisons valables semblent exister pour l'URSI d'explorer avec l'UGGI la possibilité de la formation d'une Union d'Electromagnétisme et d'Aéronomie.

— CONCLUSION.

Chacune des voies qui s'offrent à l'URSI aurait, bien entendu, des ;percussions différentes sur la cohésion des radio-scientifiques et sur les ;rspectives d'avenir de l'Union ou de son éventuel successeur. Les ɔnséquences des trois principales solutions possibles sont exposées -dessous.

SOLUTION 1. — Laisser l'URSI plus ou moins telle quelle.

*Conséquences pour la radioélectricité scientifique.* — L'actuelle cohésion ;s radio-scientifiques ne serait préservée que provisoirement.

*Perspectives d'avenir.* — Les chercheurs dont les intérêts vont au-delà ;s limites strictes de la radioélectricité scientifique seraient attirés de plus ı plus par d'autres Unions (UGGI pour la géophysique, UAI pour astronomie).

SOLUTION 2. — Faire de l'URSI une Union des Sciences de l'Infor-ıation et des Communications, soit délibérément, soit comme résultat ltime de la Solution 1.

*Conséquences pour la radioélectricité scientifique.* — Les radio-scienti-ques s'intéressant à la géophysique et à l'astronomie seraient séparés ; ceux qui s'intéressent aux sciences de l'information et des communi-ıtions.

*Perspectives d'avenir.* — Après réorientation, l'URSI couvrirait tous les ;pects des sciences de l'information et des communications (radio, optique, ;oustique). Les relations de l'Union avec les organisations internationales 'ingénieurs devraient être étudiées.

SOLUTION 3. — Former, de commun accord avec l'UGGI, une Union 'Electromagnétisme et d'Aéronomie englobant la radioélectricité scienti-que (URSI) ainsi que le géomagnétisme et l'aéronomie (UGGI).

*Conséquences pour la radioélectricité scientifique.* — L'actuelle cohésion es radio-scientifiques dans l'URSI serait préservée. On arriverait aussi, ıais sur-le-champ, à l'ultime conséquence de la Solution 1 : la cohésion es chercheurs de l'URSI et de l'UGGI intéressés par l'un ou l'autre ;pect de la géophysique.

*Perspectives d'avenir.* — Toutes les activités actuelles de l'URSI, sans ‹ception, se poursuivraient au sein de la nouvelle Union.

# XVII GENERAL ASSEMBLY OF URSI

Warsaw, Poland, August 1972

The First Announcement was distributed through Member Committees in June 1971. The Second Announcement will be sent out from Warsaw in February 1972 and intending participants are urged to make their hotel reservations and other travel arrangements in good time on the forms provided. The Organising Committee has made block reservations for URSI delegates in several hotels near the Palace of Culture and Science where the Assembly will be held.

Member Committees have already been notified of the names of most of the speakers proposed by the Chairmen of Commissions, and the Board of Officers is confident that the Committees will cooperate by including the speakers in their delegations. Speakers are reminded that they should send their abstracts to Warsaw, on the sheets provided, *so as to arrive by 30 April 1972.*

As for the Ottawa Assembly, several Committees have already stated their intention of including younger scientists in their delegations. In addition, the Board of Officers has made $ 10,000 available for the support of about a dozen young scientists who could not otherwise be present. The selection will be made from the candidates already proposed by Member Committees.

Presidents and Secretaries of Member Committees are reminded that items for inclusion in the Agenda of the Council should reach the URSI Secretariat by *18 April 1972.*

Nominations for the incoming Board of Officers should arrive in Brussels by *15 March 1972.* The list of eligible candidates will be issued in June.

The devaluation of the dollar has made it necessary to modify the Registration Fees payable by those attending the Assembly.

The revised Registration Fees are :

US$ 28 for participants,
US$ 11 for accompanying persons.

# EUROPEAN IONOSPHERIC SCATTER OBSERVATORY (EISCAT)

At the XVI General Assembly of URSI in 1969, it was recommended that European research groups be urged to investigate the possibility of establishing an incoherent scatter observatory in the European auroral zone.

It is satisfactory to record that prompt action was taken jointly by Finland, France, Germany, Norway and Sweden whose representatives organised a feasibility study on such a project. The resulting proposal for *A European Incoherent Scatter Facility in the Auroral Zone* (*EISCAT*) is contained in a 79-page report, published in June 1971 by the Auroral Observatory, Tromsø, Norway, and presented by F. du Castel (France), O. Holt (Norway), B. Hultqvist (Sweden), H. Kohl (F. R. Germany), and M. Tiuri (Finland).

The project envisages a tristatic and a monostatic radar operating near 958 MHz and 240 MHz respectively. The tristatic system would enable three independent velocity components of the moving plasma to be measured and would be of great value in studies of the dynamics of the upper atmosphere. The sensitivity of the EISCAT system for making drift determinations will be significantly better than that of the only present operational multistatic system : St-Santin - Nançay.

It is intended to install the UHF transmitter and the complete VHF radar at Tromsø (Norway), Kiruna (Sweden) and Sodankylä (Finland). These stations are situated between the $L = 6$ and $L = 8$ contours at 1,000 km. The magnetic inclination at Tromsø varies from 78° at the ground to 75° at 2,000 km.

The principal technical features of the proposed system are as follows :

Frequency : 958 and 240 MHz.

Power

peak pulse : 5 MW
mean : 150 kW.

Pulse length : 10 μs - 10 ms.

Transmitting antennae :

Tromsø UHF : 50 m paraboloid
VHF : 100 m × 100 m steerable array.

Receiving antennae :

Kiruna : 25 m steerable paraboloid
Sodankylä : 30 m steerable paraboloid.

Northern Scandinavia appears to be a very appropriate location for an incoherent scatter system because of the already well-established observatories in Finland, Norway and Sweden which have long been very active in high-latitude ionospheric, auroral and geomagnetic research, and in radio wave propagation studies. The existence of the observatories at Sodankylä, Tromsø and Kiruna will help to minimise the cost and to simplify the operation of the EISCAT.

The proposal envisages that the five countries concerned should share the capital and running costs over a period of 10 years. The prospective member organisations would negotiate a formal agreement envisaging the commencement of operation in 1975.

Pending further information about recent progress, our colleagues in Finland, France, Germany, Norway and Sweden are to be congratulated on the initiative they have taken in making a thorough study of the EISCAT project and in presenting their proposal.

## BEACON SATELLITES

The Radio Tracking and Real Time Telemetry Panel of COSPAR Working Group 1 (Chairman : Prof. K. Rawer) is compiling a list of all active experimenters who are interested in studies of the ionosphere using radio beacon emissions from satellites.

Those who have not already responded to a questionnaire, circulated in late 1971, are invited to send the information indicated below to the Co-Chairman of the Group : Robert W. Kreplin, Code 7125, Naval Research Laboratory, Washington D.C. 20390, USA.

1. Are you at present active in ionospheric research employing beacon satellite transmissions ?

2. Name and address of chief scientist or principal investigator who is actively directing this work.
3. Name and location (latitude and longitude) of stations at present in operation. Also indicate the frequencies in use.
4. List of satellites from which transmissions are received.
5. Subject of the present scientific investigation; laboratories or institutions with which you cooperate in these investigations.

## UTC SYSTEM : MODIFICATIONS 1 JANUARY 1972

The BIH recommended the application to UTC of a negative time step of −107,757.7 μs on 1 January 1972 (*URSI Inf. Bull.*, No. 181, pp. 24-26).

*BIH Circular* D63, dated 4 February 1972, announces that most laboratories improved the coordination of their UTC (i) with UTC. The time steps actually applied are listed below.

| | *Laboratory i* | *Step of UTC (i)* μs |
|---|---|---|
| APO | Postmaster-General's Department (Australian Post Office) Melbourne, Australia. | −107,580.0 |
| DHI | Deutsches Hydrographisches Institut, Hamburg, F. R. Germany. | −107,757.7 |
| FOA | Research Institute of National Defence, Stockholm, Sweden. | −107,662.0 |
| IEN | Istituto Elettrotecnico Nazionale, Torino, Italy. | −107,695.0 |
| NBS | National Bureau of Standards, Boulder, USA. | −107,600.0 (1) |
| NRC | National Research Council of Canada, Ottawa. | −107,440.0 (2) |
| ON | Observatoire de Neuchâtel, Neuchâtel, Suisse. | −107,757.7 |
| OP | Observatoire de Paris, Paris, France. | −107,744.7 (1) |
| PTB | Physikalische-Technische Bundesanstalt, Braunschweig, F. R. Germany. | −107,941.0 (1) (3) |

(1) Some of the UTC (i) are steered, in order to maintain approximate synchronism. This applies to :
UTC (NBS) and UTC (USNO) which are synchronized to ±5 μs,
UTC (OP) and UTC (PTB) which are maintained close to UTC.
(2) With respect to UTA (NRC), which was discontinued.
(3) With respect to TUA (PTB), which was discontinued.

| | | |
|---|---|---|
| RGO | Royal Greenwich Observatory, Herstmonceux, UK. | —107,582.7 |
| ROJ | Republic Observatory, Johannesburg, South Africa. | —107,884.0 |
| RRL | Radio Research Laboratories, Tokyo, Japan. | —107,620.0 |
| TAO | Tokyo Astronomical Observatory, Tokyo, Japan. | —107,757.7 |
| TCL | Telecommunication Laboratories, Taïwan, Republic of China. | —107,650.0 |
| USNO | US Naval Observatory, Washington, USA. | —107,600.0 (1) |
| ZIPE | Zentralinstitut Physik der Erde, Potsdam, GDR. | —107,790.0 |

## WARC-ST 1971
## DECISIONS AFFECTING RADIO ASTRONOMY

Document IUCAF/180 was reproduced in *URSI Information Bulletin*, No. 181, pp. 9-22. The following correction should be made at the top of p. 15 :

For "4900-5000 MHz", substitute "4990-5000 MHz".

The same correction is applicable to Appendix 1, p. 3 of IUCAF/180.

The following letter and the document entitled *Radio Astronomy and the Broadcasting Satellite Service* (printed below) have been circulated by the Chairman of IUCAF to many radio astronomers. Replies should be sent direct to Professor Smith at Jodrell Bank.

Nuffield Radio Astronomy Laboratories
Jodrell Bank
Macclesfield, Cheshire, U.K.
18 January 1972

Dear Colleague,

I wish to bring to your attention a very serious threat to observations using one of the most important frequency bands allocated to radio astronomy. In the agreements reached in June-July 1971, an allocation was

made to the broadcasting-satellite service in a band immediately below the band 2690-2700 MHz which is an exclusive allocation to radio astronomy. This action was taken despite strong objections by IUCAF and others representing the interests of radio astronomers. Furthermore, while the conference recognised, by a footnote, the desire by radio astronomers to use a wider band than the exclusive allocation, it will be difficult or impossible to share the additional frequencies with broadcasting satellites.

Although the decisions of the WARC are incompatible if implemented generally, it may be possible to avoid the most serious consequences to the radio astronomy service by careful planning of the broadcasting-satellite service, and discussions on the possibilities have already begun. If these discussions are to be effective, it is essential that all present and planned usage of the band shall be fully documented. I would be glad therefore if you could study the attached document, ans discuss it with your colleagues, with the interested scientific bodies in your country, and with your national telecommunications administration, who may become involved in the conflicts which are likely to arise between the two services. Your administration should be made fully aware of your views, both as to the effects on your own work and on radio astronomy in general. Please convey these views also to me directly, together with a note on what action you have taken, and with what result.

I should also point out that information is lacking on some of the factors which will determine how interference might be minimised by technical provisions. For example, we need to know more precisely what is the response of typical radio astronomy receivers to signals in adjacent bands. The technical factors will be studied by the CCIR; you could help by collaborating with your administration in these studies, and by making the relevant technical characteristics of your installation available to IUCAF.

I look forward to hearing from you.

Yours sincerely

F. G. Smith
*Chairman*, IUCAF.

## Radio Astronomy and the Broadcasting Satellite service

1. — INFORMATION.

At the Second World Administrative Radio Conference for Space Telecommunications (WARC-ST) held in Geneva in June and July 1971, the frequency band 2500-2690 MHz was allocated to a number of services including Broadcasting Satellites. In addition, two footnotes to the table were agreed upon that have a direct bearing on future planning for both the Broadcasting Satellite and the Radio Astronomy services. These two footnotes were 364G, in which administrations are asked to "bear in mind the needs of the Radio Astronomy service in their future planning" of the band 2670-2690 MHz and 364H in which administrations are "urged to take all necessary steps to protect the Radio Astronomy service in the band 2690-2700 MHz". The first footnote was intended to allow an extension of the radio astronomy band to a width of 30 MHz on a shared basis; the second was intended to draw attention to the problem of protecting the exclusive allocation within the 10 MHz bandwidth.

2. — POSSIBLE CONSIDERATIONS OF EFFECTS ON RADIO ASTRONOMY.

(*a*) The 10 MHz frequency band at 2690-2700 MHz which has for some years been exclusively allocated to the Radio Astronomy service on a worldwide basis is of great present and future importance to radio astronomers both here and abroad. It is heavily used.

(*b*) If a satellite were to broadcast in an assigned television channel near the top of the allocated range 2500-2690 MHz, it would certainly make it impossible to extend the bandwidth used by the Radio Astronomy service to 30 MHz, as envisaged in footnote 364G, unless the satellite were geostationary and invisible from any observatory using the wider bandwidth.

(*c*) If the satellite were to broadcast in an assigned television channel immediately adjacent to the Radio Astronomy band 2690-2700 MHz, it seems almost certain that the Radio Astronomy service would suffer interference from unavoidable out-of-band radiation from the satellite even if the radio astronomical observations were confined to the exclusive band. It would also be very difficult, perhaps impossible, to prevent the

powerful signals immediately adjacent to the Radio Astronomy band from interfering with observations through the formation of intermodulation products in low-noise receiver input amplifiers.

(*d*) These harmful effects of the broadcasting satellites would not be confined to the region of sky immediately around the satellite, and might be experienced in observations over the whole sky at any observatory from which there is a line-of-sight to the satellite, whether or not the observatory lies in the normal service area of the satellite broadcasting transmitter.

## STUDIES OF THE MOON

Four of the ICSU Unions, including URSI, agreed in 1971 to form the Inter-Union Commission for Studies of the Moon. The parent Union is IAU. COSPAR has also agreed to participate.

The aims of the Commission are to coordinate information about the Moon, especially where inter-disciplinary studies are concerned and to provide advice on such studies. The Commission will also coordinate international meetings relating to studies of the Moon.

The following provisional statement was submitted, on behalf of URSI, to the Commission for its Constitutive Meeting in Paris in May 1971.

(1) URSI has no Commission specifically concerned with the Moon. However, the Commissions which deal with radio astronomy (V) and with the propagation of electromagnetic waves in non-ionized media (II) have an interest in studies of the Moon.

(2) Laser ranging of the Moon has superseded the early measurements made at radio frequencies. In general, as a result of the increasing volume of directly-made observations, studies of the Moon as a radioastronomical object are probably less important than they were some years ago. As a matter of practical convenience, it will probably be best for IAU to undertake the responsibility of ensuring that the results of radioastronomical studies are made available to the IUCM. Adequate contacts between URSI Commission V and IAU Commission 40 outside the IUCM would ensure that the views of radioastronomers, whether they are interested primarily in the application of radio methods or in the study of the results obtained, are made known to IUCM.

(3) URSI Commission II is concerned with several aspects of radio wave propagation which have potential applications to studies of the Moon and to future communication problems on the Moon.

(3.1) By studying the diffuse reflexion and scattering of radio waves of different frequencies from the Moon's surface, information could be obtained on the surface roughness characteristics of the Moon. The validity of alternative models of surface roughness can now be tested for those areas on which direct observations have been made.

(3.2) The variation with depth of the dielectric constant of the Moon would provide information on the geological structure beneath the surface.

(3.3) At some stage it seems probable that radio communications between the hidden face of the Moon and the visible face will be desirable. Since the radius of curvature of the Moon is much smaller than that of the Earth, spherical diffraction may possibly be capable of providing adequate signals and should be investigated.

(3.4) The absence of an atmosphere on the Moon opens up possibilities of verifying certain theories relating to wave propagation which can not be accurately checked on the Earth because of fluctuations in the refractive index of the atmosphere.

(4) The above very tentative review of possible experiments will require further elaboration in the light of the aims of IUCM and the various national research programmes relating to the Moon.

At the second meeting, held in November 1971, Professor A. Dollfus (IAU) was elected Chairman. The Secretary will be nominated by the Parent Union.

The URSI is represented on the Commission by M. P. Misme, CNET, 3, avenue de la République, F - 92 Issy-les-Moulineaux, France.

The Secretary General of URSI will act as alternate to M. Misme until the General Assembly.

The next meeting of the Commission will be held in May or September 1972 when M. Misme will present a document explaining the proposals of URSI Commission II in more detail. Persons who are interested in the Moon as a special type of laboratory for studies of radio propagation, or in the use of radio waves for studying the Moon, are invited to communicate their ideas to M. Misme.

# ASTROPHYSICAL DATA

The National Radio Astronomy Observatory plans to hold an inter-ional symposium on the collection and analysis of astrophysical data. vill be held at the NRAO in Charlottesville, Virginia, USA, Novem- 13-15, 1972. The symposium will be sponsored by the Institute of ctrical and Electronics Engineers (IEEE) Group on Aerospace and ctronic Systems, by the International Union of Radio Science (URSI) l the NRAO. Attendance will be by invitation only. Interested parties, vever, are encouraged to notify the Organizing Committee. Papers l be selected from abstracts submitted by participants. Invited papers l also be included. A majority of the selected papers will be published.

The Organizing Committee is composed of :

Burns, National Radio Astronomy Observatory, USA.
Hvatum, National Radio Astronomy Observatory, USA.
Spitzer, National Aeronautics and Space Administration, USA (IEEE representative).
Biraud, Observatoire de Paris, France.
Rydbeck, Chalmers University of Technology, Sweden (URSI representative).
Brouw, Leiden Observatory, The Netherlands (presently on leave at the University of Sydney, Australia).
Kenderdine, Mullard Radio Astronomy Observatory, Cambridge, UK.

The purpose of the symposium is to discuss and compare techniques d devices used in the collection and analysis of astrophysical data. ıphasis is on the techniques used rather than on the interpretation of : data themselves. Techniques used in radio, optical, solar, X-ray and mma-ray astronomy are of interest.

The following is a list of specific topics indicative of the desired subject ıtter :

ı-line and dedicated computers.
ıe fast Fourier transform.
ıe of special programming language.

Rôle of large general-purpose computers in astrophysical work.
Spectral line processing.
Mapping and image-forming problems.
Smoothing and restoration techniques.
Synthesis techniques.
Applications (existing and planned systems).
Output media (CRT, printer, microfilm, etc.).
Interactive devices.
Computer control of telescopes.
Coordinate transformation (precession, Doppler, correction, etc.).
Model fitting.
Pattern recognition problems.
Catalogs of sources.
Use of the computer in astrophysical theory.

The timetable for preparing the symposium is as follows :

| | |
|---|---|
| Letter of invitation and call for papers : | March 1, 1972 |
| Brief abstracts received : | June 1, 1972 |
| Program arranged; chairman and speakers notified : | August 15, 1972 |
| Symposium : | November 13-15, 1972. |

General inquiries and correspondence should be adressed to :
Dr. W. R. Burns, National Radio Astronomy Observatory, Edgemont Road, Charlottesville, Virginia 22901, USA.

## ANTENNAS AND PROPAGATION

The Chairman of the Organising Committee, Prof. H. Uchida, has kindly provided information about the International Symposium on Antennas and Propagation which was held in Tohoku University, Sendai, Japan in September 1971.

During the three days of the Symposium, there were 30 technical sessions at which 50 papers were presented by Japanese scientists and 85 by participants from other countries. Summaries of the papers were made available in a 276-page volume which will be useful for reference purposes pending publication of the full texts.

: the Opening Session, the participants were welcomed in addresses
ı by Prof. Uchida and by Prof. T. Osatake, Vice-President of the
tute of Electronics and Communication Engineers of Japan, the host
.nisation of the Symposium.

·of. Emeritus I. Koga, Past President of URSI, gave a Congratulary
ress in which he outlined the history of Sendai. The city dates back to
) when it was first developed by Masamune Date who was interested
eveloping communications and trade between Japan and Europe in
17th century.

:of. Koga recalled that the now universally known Yagi antenna had
ı invented in the Department of Electrical Engineering at Tohoku
versity. He conveyed to the meeting the greetings and best wishes of
. Yagi who is 85 years old and still in good health.

special evening session was arranged at which Prof. A. Kimpara
airman of the Japanese URSI Committee) reported on modern develop-
ts in the study of atmospherics, whistlers, VLF emissions and pro-
ation in Japan. At the same session, Prof. A. A. Oliner (USA) described
possible application of acoustic wave devices to electromagnetic
ems.

## BULLETIN SIGNALÉTIQUE

'ELECTRONIQUE fait l'objet en 1972 d'une nouvelle publication
iographique mensuelle du Centre de Documentation du CNRS (sec-
ı 145 du *Bulletin signalétique*).

ı travers la presse scientifique mondiale, les comptes rendus de congrès
ıçais et étrangers, les rapports et les thèses, sont étudiés notamment
ıhysique électronique, la physique des plasmas, l'électronique quantique
es télécommunications.

Chaque fascicule comprend des index auteurs et matières, cumulés
ıuellement. L'abonnement annuel est fixé à 250 Frs français.

Toutes les références sont entrées sur bande magnétique pour permettre,
re l'édition par ordinateur, d'offrir :

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The following publications have been announced :

1. Survey of the activities of the ICSU Scientific Unions, Special and Scientific Committees and Commissions of ICSU in the field of scientific information during the year 1970.
   396 pp. September 1971. Price $ 12.00.
2. Tentative list of publications of ICSU Scientific Unions, Special and Scientific Committees and Commissions of ICSU, Year 1970, and corrections and additions to the 1969 list.
   44 pp. September 1971. Price $ 5.00.
3. Proceedings of the Full (ICSU-AB) Board Meeting, July 1971, Orléans, France.
   219 pp. Price $ 15.00.

In all cases postage is extra. Orders should be sent to : ICSU Abstracting Board Secretariat, 17, rue Mirabeau, Paris 16e, France.

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(*a*) the members of the Board of Officers,
(*b*) the Presidents and Secretaries of the URSI Member Committees,
(*c*) the Chairmen, Vice-Chairmen and Official Members of URSI Commissions I-VIII.

The information is based on the records in the URSI Secretariat and on modifications to earlier lists received up to 10 February 1972. It would be appreciated if more recent changes or corrections could be sent to the Secretary General in Brussels before 1 November for inclusion in the December issue of the Bulletin.

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Le but de l'URSI est de stimuler et de coordonner, à l'échelle internationale, les études dans le domaine de la radioélectricité scientifique et, plus particulièrement :

*a*) de promouvoir et d'organiser les recherches exigeant une coopération internationale, ainsi que la discussion et la diffusion des résultats de ces recherches;

*b*) d'encourager l'adoption de méthodes de mesure communes, ainsi que la comparaison et l'étalonnage des instruments de mesure utilisés dans les travaux scientifiques.

## International Union of Radio Science (URSI).

The object of URSI is to stimulate and to coordinate, on an international basis, studies in the field of radio science and, within this field :

(*a*) to promote and organise research requiring international cooperation, and the discussion and dissemination of the results of this research;

(*b*) to encourage the adoption of common methods of measurement, and the intercomparison and standardization of the measuring instruments used in scientific work.

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Des presses de
VAILLANT-CARMANNE, S. A.
imprimeur-éditeur
4, Place Saint-Michel
Liège