

U.R.S.I.

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ROBERT HARRY BARFIELD

1895-1977

Half a century ago, the study of radio direction-finding systems, and especially the identification of the sources of errors and their elimination, represented an important branch in radio science. The development of accurate systems owed much to the work carried out under Watson-Watt at the Radio Research Station, near Slough in England (now the Appleton Laboratory). For many years Dr. R.H. Barfield, who died in July 1977, was a leading member of Watson-Watt's group at Slough. In a Report of the Radio Research Board (1950), the Chairman of the Board referred to Barfield's work at Slough from 1921 to 1946 and remarked:-

"During this period of 25 years, Dr. Barfield's principal contributions were to the science of radio direction-finding in which subject he became universally acknowledged as a leading expert. His work was largely responsible for the lead achieved in this country in radio direction-finding at the outbreak of the Second World War".

Dr. Barfield was one of the Reporters at the URSI General Assembly in London in 1934 and a paper describing his work on the lateral deviation of radio waves was presented to the Wave Propagation Commission at the Venice Assembly in 1938.

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QU'EST-CE QU'UNE ASSEMBLEE GENERALE DE L'URSI?

Prof. M.-Y. Bernard

Président du Comité National Français

(for English translation see p.6)

Le Dr. Minnis a posé cette question dans le No 202 du Bulletin d'Information de l'URSI et donné des éléments de réponse fort pertinents. Il a montré notamment que l'Assemblée générale administrative devait obligatoirement être accompagnée d'un programme scientifique, si l'on voulait intéresser les membres et donc obtenir leur participation. Les voyages sont chers et il faut justifier le déplacement à la fois par des motifs scientifiques et des motifs administratifs. Le Bureau du Comité National Français fait siennes toutes les propositions du Secrétaire général de l'URSI, mais il souhaite les compléter en radicalisant le problème.

Le rite de l'Assemblée générale est une condition nécessaire à l'existence d'une association, mais il ne saurait être une condition suffisante. L'Assemblée générale, réunie une fois tous les trois ans, doit permettre de dresser un bilan d'activité, de le faire connaître au monde, et de mettre au point un nouveau programme d'activité, dont l'exécution est confiée au Bureau élu à cette occasion. Si l'association n'a pas agi pendant 3 ans et ne dresse pas un nouveau programme d'action, à quoi bon une Assemblée générale. Une Assemblée générale sera vivante si l'URSI est vivante, donc si elle agit pendant les trois ans qui séparent les réunions.

L'unité opérationnelle de l'URSI est la Commission. La liste de ses membres constitue un répertoire international efficace permettant de contacter rapidement tous ceux qui travaillent sur un sujet scientifique donné, dès lors que l'on admet que les membres officiels de la Commission sont les mandants des spécialistes de leur pays. Ce rôle de fichier international, tout important qu'il soit, ne saurait cependant justifier l'existence d'une Commission; il faut qu'il soit utilisé. Quels sont les motifs d'utilisation?

- une réunion internationale pour discuter des résultats scientifiques récents et pour examiner

l'état de la discipline (colloque, symposium),

- la création d'une structure internationale pour effectuer en commun un travail scientifique qui n'est possible que dans le cadre d'une collaboration internationale (comparaison d'étalons, étude de propagation...).

Certaines Commissions, notamment A, B, C ou F, conduisent fort efficacement de telles actions. Il semble par contre que certaines Commissions aient très rarement l'occasion de mener à bien de telles opérations, pour une raison évidente; des groupes extérieurs à l'URSI font déjà le travail et le font bien. C'est tout spécialement le cas de la Commission D dont l'activité se heurterait à une techno-structure de colloques, parfaitement efficace, sur l'électronique quantique, les semi-conducteurs, l'opto-électronique, les systèmes hyperfréquences...

Ceci nous conduit au premier point à inscrire à l'ordre du jour d'une Assemblée générale: l'examen public de l'activité de chaque Commission, aboutissant à la prolongation du mandat, à sa modification ou à sa suppression. La suppression d'une Commission n'a aucun caractère infamant, dès lors que l'on constate que l'activité potentielle est déjà prise en charge par un autre organisme. L'URSI doit être capable de "se trouver du travail" en agissant dans les créneaux libres; dans chaque créneau, elle doit avoir une Commission qui travaille... Mais, si la place est prise et le travail bien organisé par d'autres, à quoi bon faire double emploi si ce n'est pour que la liste des Commissions apparaisse comme un programme complet de la science des télécommunications radioélectriques? L'URSI ne survivra que si elle stoppe les actions non productives et initie des actions originales dans des voies nouvelles.

Le devoir de chaque Président de Commission, lors de l'Assemblée générale, n'est pas seulement d'organiser une réunion scientifique de sa Commission si une telle réunion n'a pas eu lieu auparavant (ce qui semblerait souhaitable, et ce qu'ont fait les Commissions B et F). Son rôle est d'expliquer à l'Assemblée générale ce qui se passe dans le domaine scientifique couvert par la Commission, ce que celle-ci a fait au nom de l'URSI, ce qu'elle compte faire et ce qui est fait par d'autres... Ces exposés scientifiques de haut niveau devront être conçus pour intéresser tous les membres de l'Assemblée générale (et pas seulement les spécialistes d'une Commission). Une telle série

d'exposés constituera l'armature du programme du bilan scientifique (ou programme A) de l'Assemblée générale. Il concernera les membres de l'Assemblée générale puisqu'il leur fournira des éléments de jugement pour les décisions futures. Mais, il doit intéresser un public plus large et justifier que l'URSI invite à son Assemblée générale un grand nombre de scientifiques; cela lui permettra par ailleurs de faire sa propagande.

Un second point est tout aussi indispensable dans l'ordre du jour de l'Assemblée générale. C'est un programme scientifique qui doit permettre aux membres de l'Assemblée générale de prendre position sur l'opportunité de créer une nouvelle Commission. L'organisation de cette partie prospective (ou programme B) est une tâche délicate puisqu'il s'agit d'inviter les scientifiques "qui ont quelque chose de nouveau à dire" et dont le message pourra avoir une importance telle qu'une action internationale pourra être jugée nécessaire. Chaque membre de l'URSI devrait se sentir concerné et émettre des idées; mais un tel programme scientifique ne peut être mis au point que si un membre du Bureau en prend la responsabilité. Ce n'est pas l'affaire des Commissions en exercice, c'est l'affaire de tous, donc la responsabilité du Bureau. Un tel programme peut se concevoir sous la forme d'un ou deux colloques de trois jours, conçus de façon à intéresser le plus grand nombre de membres, appartenant à des Commissions différentes.

Un programme scientifique réussi doit aboutir, de temps à autre, à la création d'une nouvelle Commission (ou simplement à la constatation que, dans le domaine, les contacts internationaux sont suffisants). Créer une nouvelle Commission, c'est désigner un responsable, qui doit être choisi en fonction de ses qualités scientifiques, mais aussi en fonction de son dynamisme et de ses qualités d'organisateur. Il faut établir la liste des membres, puis laisser la Commission travailler en attendant le premier bilan, trois ans plus tard.

Qu'est-ce qu'une Commission? Si l'on examine l'évolution historique, on a tendance à assimiler Commission avec domaine de la connaissance scientifique. Mais une Commission peut aussi étudier un mode d'action de la connaissance regroupant plusieurs domaines autour d'un critère d'utilité. C'est ainsi que l'on pourrait imaginer

des nouvelles Commissions du type:

- électromagnétisme et milieu vivant]
- informatique et radio-télécommunication

comparables aux actuelles Commissions A à J, et des nouvelles Commissions du type:

- impact socio-économique des communications radioélectriques
- histoire de la radioélectricité

comparables à l'actuelle Commission de l'enseignement et de la formation. Tout dépend de la densité des idées de la base, de la volonté du Bureau de parvenir à un programme B intéressant, et enfin de la volonté de l'Assemblée générale d'aller de l'avant, si l'affaire en vaut la peine.

L'intérêt de ces deux types de Commissions est de renforcer l'unité de l'URSI. Tant que l'on se borne à des Commissions du premier modèle, l'URSI est une fédération d'unités opérationnelles en parallèle les unes sur les autres; les Commissions n'ont pas de liaisons directes, ayant, par définition, des sujets d'études séparés. Si, par contre, on tente de créer à la fois des Commissions des deux types, on obtient pour l'URSI une structure "matricielle", chaque membre pouvant appartenir à une Commission horizontale et à une ou plusieurs Commissions verticales (on peut imaginer un spécialiste des télécommunications spatiales, intéressé par l'impact socio-économique des télécommunications ou bien un spécialiste des circuits hyperfréquences intéressé par l'histoire de la radioélectricité...). Avec une telle structure, l'Union sera assurée de façon plus réaliste.

En conclusion, l'Assemblée générale de l'URSI pourrait être articulée en un programme A (deux jours) et un programme B (trois jours). On inclut, dans le programme A, la partie purement administrative (élection du Bureau, problèmes financiers). La durée de l'Assemblée générale ne dépassera pas une semaine, ce qui facilite beaucoup la participation.

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WHAT IS AN URSI GENERAL ASSEMBLY?

Prof. M.-Y. Bernard

President, French URSI Committee

Dr. Minnis posed this question in URSI Information Bulletin No 202 and referred to certain very pertinent aspects of a reply. In particular, he pointed out that the administrative sessions of the General Assembly must necessarily be accompanied by a scientific programme of sufficient interest to attract the participants. Travel costs are high, and the participants must be able to justify these in terms of both the scientific and the administrative aspects of the Assembly. The Bureau of the French National Committee of URSI supports the views of the Secretary General, but it would like to supplement them by a more radical approach to the problem.

The formal General Assembly is a necessary condition for the existence of an association but it is not a sufficient condition. The Assembly, convened every three years, must provide the occasion for reviewing and publishing recent activity, and for deciding on a new programme of activities, the execution of which will be the responsibility of the newly-elected Board of Officers. If the Union has been inactive during three years and if it proposes no new activities, what is the use of the Assembly? An Assembly will be a lively event if URSI is alive, that is if it takes action during the three years between Assemblies.

The operational unit in URSI is the Commission. The list of its Official Members is a useful international directory which facilitates rapid contacts between those who are working in a given scientific field, provided one assumes that the Official Members are representative of the specialists in their countries. However important it may be, the list of Members is not sufficient to justify the existence of a Commission; some use must be made of it. In what ways can it be used?

- for international meetings permitting the discussion of recent results, or the examination of the current situation in the field (colloquium, symposium);

- for the creation of an international structure designed to facilitate cooperative scientific work where this is possible only in an international context (comparison of standards, studies of propagation...).

Certain Commissions, in particular A, B, C and F, organise such activities very effectively. However, it seems that other Commissions rarely undertake such tasks for the obvious reason that groups outside URSI already deal with them in a competent way. This is especially true in the case of Commission D, in whose field there are perfectly effective organisations which arrange symposia on quantum electronics, semi-conductors, opto-electronics, microwave systems...

This leads us to the first item for inclusion in the programme for a General Assembly: an open review of the activity of each Commission, leading to a decision either to maintain it, perhaps with modified terms of reference, or to terminate it. The termination of a Commission does not imply a criticism of it, so long as it is clear that its potential activities are already in the hands of another organisation. URSI must be capable of identifying new fields of activity and taking action; in each new field it must have a Commission which works... However, if the work is already being well organised by other bodies, there is no point in duplicating the effort merely to ensure that the Commissions can be regarded as covering the whole field of the science of radiocommunications. URSI will survive only if it terminates non-productive activities and initiates actions in new directions.

The duty of each Chairman of Commission is not merely to arrange a scientific meeting of his Commission during the General Assembly, when such a meeting has not already taken place (the preferred procedure adopted by Commissions B and F). His rôle is to explain, to the Assembly, what is happening in the branch of science covered by his Commission, what his Commission has done on behalf of URSI, what it proposes to do and what is being done by other bodies. These high-quality scientific reviews must be designed to interest all the participants in the Assembly and not only the specialists in his Commission. A series of reviews of this kind would constitute the basis for the scientific review programme of the Assembly (Programme A). It would be important to the participants, since it would provide them with the basic

information needed for making judgements about future decisions. But it must also be interesting for a wider audience, so as to justify inviting larger numbers of scientists to URSI Assemblies, and thereby helping to publicise the activities of the Union.

A second item for the programme of the Assembly is equally indispensable. This is a scientific programme aimed at permitting the participants to make decisions concerning the creation of new Commissions. The organisation of this forward-looking part of the Assembly programme (Programme B) would require considerable care, since it would involve inviting the participation of scientists who have something new to say, and whose opinions would carry sufficient weight to justify international action. Everyone associated with URSI ought to feel concerned and to express his ideas, but Programme B could be organised only if a member of the Board were made responsible for it. It is not a matter for the existing Commissions - it is the responsibility of everyone and hence of the Board of Officers. Such a programme could take the form of one or two symposia lasting three days, conceived in such a way as to interest as many as possible of the people in the various Commissions.

A successful scientific programme must, from time to time, lead to the creation of a new Commission, or to the decision that, in the field concerned, the existing international contacts are adequate. The creation of a new Commission implies the designation of a responsible person who should be chosen for his qualities as a scientist, but also for his dynamic qualities and his ability as an organiser. He must establish the list of members and then allow the Commission to work pending the first review of its activities three years later.

What is a Commission? If one looks at their historical development, it seems that each tends to be identified with a branch of science. But a Commission can also study the initiation of action based on knowledge in several branches of science and aimed at a useful objective. Accordingly, it is possible to envisage new Commissions dealing with topics such as

- electromagnetism and the living world;
 - information science and radiocommunications
- which would be similar to the present Commissions A-J,

and new Commissions such as

- the social and economic impact of radiocommunications;
- the history of radio science

which would resemble the Commission on Science Teaching. Everything will depend on the value of the new ideas, on the willingness of the Board to plan an interesting Programme B, and finally on the readiness of the Assembly to go ahead if it considers the objectives to be worth while.

The advantage of having these two types of Commission would be to reinforce the cohesion in URSI. So long as the Union is restricted to the first type, URSI is nothing more than a federation of operational units which act in parallel with each other; these Commissions have no direct links since, by definition, they deal with separate subjects. On the other hand, if one attempted to establish both types of Commission, the result would be a matrix structure; each scientist could belong to a horizontal and to several vertical Commissions. One can envisage a specialist in space communications taking an interest in the social-economic problems of telecommunications, or a specialist in microwave circuits in the history of radio science. Such a structure would represent a more realistic basis for strengthening the unity of URSI.

In conclusion, the General Assembly of URSI could consist of Programme A (two days) and Programme B (three days). Programme A would include the purely administrative meetings (election of Board of Officers, financial questions). The length of the Assembly would not exceed one week and this would facilitate the participation of many people.

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URSI-CCIR-CCITT LIAISON COMMITTEE

The background to the formation of this Committee was outlined in URSI Information Bulletin No 199 (September 1976). The first meeting was held at ITU Headquarters in Geneva on 26 September 1977 and the following summary of the proceedings is based on the Minutes of the Meeting.

Present: Chairman: J.A. Saxton (URSI, CCIR)
F. Bigi (representing Director, CCITT)
W.E. Gordon (URSI)
J.P. Hagen (URSI, CCIR)
R.C. Kirby (Director, CCIR)
H. Pouliquen (representing Secretary General, ITU)
F.L. Stumpers (URSI)
J. Verrée (CCIR)
Secretary: C.M. Minnis (URSI).

1. The Chairman referred to the decision of the URSI Council in 1975, namely that, in future, URSI should focus its attention more sharply on those aspects of telecommunications science which provided support for operational activities. In 1976, the Chairman and M. Voge (President of URSI) had met the Directors of CCIR and CCITT and it was agreed to form a Liaison Committee to facilitate closer contacts between, on the one hand, the radio scientists and, on the other, the telecommunication engineers and others who were more intimately concerned with operational matters. It was appreciated that the Committee would not have any official status in ITU and that its activities would be of an informal character.

2. Messrs Kirby, Bigi and Pouliquen commented on the appropriate procedures for ensuring adequate contacts between URSI and ITU and it was agreed that cooperation with ITU should, as in the past, be effected mainly through the Study Groups of CCIR and CCITT. Documents have for many years been submitted by URSI to CCIR and the first documents have recently been submitted to CCITT.

3. Mr. Kirby pointed out that there were many problems associated with radiocommunications where assistance or advice from URSI would be useful, for example:

- spectrum utilisation and the scientific aspects of electromagnetic compatibility;
- the optimum utilisation of the radio spectrum above 40 GHz;

- the implications of information theory in spectrum utilisation;
- the scientific assessment of the advantages and disadvantages of digital transmission techniques for broadcasting.

In appropriate cases, symposia sponsored by URSI would provide an excellent forum for discussing such problems.

Dr. Hagen remarked that, in CCIR Study Group 2, the help of the radio scientist would be valuable in dealing with, for example:

- beam shaping for antennas in space-system technology, especially for broadcasting;
- the hazards to health of the large energy flux densities near high-power transmitters;
- the problems created by the broad-band techniques now being increasingly used: for example, how to filter out the wings of the emission while retaining adequate quality;
- the general problems of out-of-band emissions.

4. The Chairman referred to the Symposium on Wave Phenomena in Non-ionized Media recently organised by URSI Commission F. This had been very successful and a special effort had been made by URSI to bring together both the scientists in the physics of wave propagation and the engineers concerned with the influence, on communication systems, of the medium through which the waves pass.

5. Mr. Kirby referred to the responsibility of CCIR for undertaking the preparatory work for the World Administrative Radio Conference in 1979. The CCIR Study Groups would have to make recommendations on the criteria to be used when different Services share frequency allocations and on the optimum utilisation of the radio spectrum.

The Chairman recalled that scientific progress in certain relevant fields was rapid and that it would still be possible for URSI to submit new information to CCIR up to May 1978.

6. Prof. Gordon stressed the need to bring CCIR into closer contact with the scientific community as represented by URSI, especially by making use of symposia on

appropriate subjects. This could be achieved, for example, by the inclusion of a CCIR representative in the programme committees of URSI symposia and the preparation, after the Symposium, of a concise statement of the results likely to be of interest to CCIR.

Prof. Stumpers supported the views of Mr. Kirby and Prof. Gordon on the value of Symposia. He referred to the EMC Symposia in Montreux and Wroclaw where the participants included both communication engineers and scientists and recalled that URSI Commissions planned to deal with questions of interest to CCIR during the URSI General Assembly in 1978. The Chairman had already referred to the successful URSI Commission F Symposium (para 3).

7. It was agreed that the Secretary should keep CCIR informed about future URSI symposia likely to be of interest to CCIR. He should also invite the Programme Committees to provide, in the technical sessions, for the presentation and discussion of matters of immediate interest to those concerned with communications.

8. It was agreed also that it would be useful if CCIR could pinpoint a number of areas in which the Study Groups had particular problems on which the advice of URSI scientists might be helpful. The Secretary will try to find scientists willing to examine such problems and express opinions on them.

9. Prof. Stumpers and Dr. Hagen referred to the difficulty of presenting engineering problems and those concerned with the applications of science, in such a way as to excite the interest of the scientist. Suggestions designed to minimise this difficulty were discussed.

10. M. Verrée suggested that the CCIR representation on the Liaison Committee should be reviewed in the light of the different types of Study Group. It was agreed that the Chairman and Mr. Kirby should consider this matter and make proposals for the future membership of the Committee.

11. No date has yet been fixed for the next meeting of the Committee but, in the meantime, if any readers wish to make suggestions on how to strengthen the links between URSI and the Consultative Committees of ITU, the Secretary General would be glad to hear from them.

TELECOMMUNICATION JOURNAL: ARTICLES BY URSI SCIENTISTS

The Telecommunication Journal is published, in English, French and Spanish, monthly by the International Telecommunication Union and is widely read all over the world by those who are responsible for the planning of telecommunication systems and for their day-to-day operation.

At the recent meeting of the URSI-CCIR-CCITT Liaison Committee, it was emphasised that there was a need for closer contacts between telecommunication engineers and the scientists who are concerned with results of research that may have applications in telecommunications. Such results are, of course, published in the recognised specialist journals, but usually in a style which can be understood only by others working in the same field.

It has often been said that scientists have an additional responsibility for presenting the essential results of their work in such a way that they can be understood by a wider audience. In the context of the relations between URSI and ITU, suggestions have been made from time to time that radio scientists should be encouraged to prepare articles dealing with their work for publication in the Telecommunication Journal. Such articles should, however, present the results and information contained in them in a form that can be assimilated by those concerned with the practical problems discussed in CCIR Study Groups.

The October issue contains articles prepared by some of those who contributed to the discussions on the teaching of telecommunications science, which were held at the URSI Assembly in 1975:

- A model for teaching telecommunications science, by M.S. Assis and J.P. de A. Albuquerque;
- Teaching electromagnetics and telecommunications science in a developing country, by B.R. Nag;
- Development problems in the teaching of electromagnetics and telecommunications, by O. Awe.

The problem of balancing the cost of an ionospheric disturbance forecasting service against the actual value of the service to an operational radiocommunications system is one which can not be solved alone by the scientist, the engineer or the economist. An approach to

the solution of this problem was discussed in the July issue of the Telecommunication Journal:

Ionospheric disturbance forecasts: assessment of their economic value, by C.M. Minnis.

Readers of the URSI Bulletin who are interested in contributing to the Telecommunication Journal should first write to:

Editorial Office,
ITU,
Place des Nations,
CH - 1211 Geneva 20,
Switzerland.

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NEEDS FOR IONOSONDES IN THE 1980'S

1. In 1976, the URSI/IUGG(IAGA) Inter-Union Working Group on Structure and Dynamics of the Thermosphere, Ionosphere and Exosphere set up an ad hoc Working Group to study the needs for extensive routine sounding of the ionosphere in the 1980's.

The membership of the ad hoc Group was as follows:

H. Rishbeth (UK): Chairman	
N.P. Benkova (USSR)	E.L. Hagg (Canada)
A.S. Besprozvannaya (USSR)	J.S. Nisbet (USA)
L. Bossy (Belgium)	J. Oksman (Finland)
D.C. Cole (Australia)	J.O. Oyinloye (Nigeria)
J.R. Dudeney (UK)	R. Raghavarao (India)
A. Giraldez (Argentina)	R.S. Unwin (New Zealand)
J.A. Gledhill (S. Africa)	N. Wakai (Japan)

2. In August 1977 the Chairman edited a Report, entitled Needs for Ionosondes in the 1980's, which is based on the contributions submitted by the individual members. The Report will be reproduced in the INAG Bulletin and copies will be sent by URSI also to the Official Members of Commission G for their comments.

The Report was considered at the IAGA Meeting in Seattle in August 1977. A Resolution was adopted recommending the maintenance of a global network of ionosondes throughout the 1980's and urging national organisations to consult the Ionospheric Network Advisory Group before deciding to close an existing station. No doubt URSI

Commission G will consider the Report during the URSI General Assembly in 1978.

3. In introducing the Report, Dr. Rishbeth gives three reasons for its preparation:

"First, when the present intensive effort of the IMS "is over, upper atmosphere science will enter a new phase, "probably marked on the one hand by consolidation and on "the other hand by further large-scale environmental "studies of the whole upper atmosphere. Second, it is "likely that some ionospheric sounders have been kept "going to meet IMS needs, some with ageing instruments, "and could not continue thereafter without extensive (and "expensive) re-equipment. Third, the development of modern "computer-controlled sounders with sophisticated data "handling brings prospects of a new kind of ionospheric "sounding".

He points out also that the Report was necessarily compiled without detailed knowledge of what the major problems of upper atmosphere science will be in the 1980's. New studies of the situation ought to be made from time to time in the light of future developments.

4. The General Remarks and the Conclusions of the Report are reproduced below. The original paragraph numbers have been retained.

General Remarks on the Needs for Ionosondes

4. Ionosondes provide a cost-effective way of monitoring an important part of the Earth's environment. They produce a wealth of information from a substantial interval of height and on a global scale that hardly any other technique can match. The long sequences of data, extending over three or four solar cycles in some cases, are a permanently valuable scientific asset that should not be ended.

5. A network of ionosondes will be needed in the 1980's as part of the large-scale experimental programmes that will take place to improve man's knowledge of the whole interactive system of the upper atmosphere. Current ionosonde data will be needed to support these programmes. The existence of many years' past data at many sites, however valuable, is not a substitute for simultaneous data.

6. In particular a network of ionosondes is needed:

(a) To study the development and propagation of large-

scale disturbances of many types in the upper atmosphere. For this purpose north-south chains of stations covering substantial ranges of latitude are necessary.

- (b) To study smaller-scale and day-to-day variations.
- (c) To provide reference data at fixed locations for satellite, rocket and balloon experiments.

7. Bearing in mind that many users of the ionosphere for communications purposes have their own specialised sounding equipment, the needs for ionosondes to aid communications seem to be limited to:

- (a) Monitoring of solar-cycle and other long-term variations.
- (b) Real-time data from key sites to aid forecasting of short-term disturbances.

8. Reports from the World Data Centres show that the demand for ionospheric data continues unabated. Although this demand cannot be equated to the need for new data several years hence, it does provide evidence of a high level of activity in ionospheric science.

Conclusion

70. It is concluded that a substantial network of ionospheric sounders will be needed in the 1980's to support the planned large-scale scientific investigations of the upper atmosphere, and also for communications via the ionosphere, as specified in paras. 5-7.

71. The needs will be for current data, and cannot entirely be met from past data.

72. The need for ionospheric data in the southern hemisphere and at low latitudes is such that existing stations should be retained.

73. With that proviso, the specifications given in paras. 11-12 could be met by the existing network, allowing for some anticipated reduction.

74. Before a national administration closes any station the scientific community should be invited to comment, through INAG, especially in relation to the following criteria for identifying stations that are especially valuable:

- (a) Those that have an unbroken run of good quality data extending over some decades, particularly in view

of their potential use for monitoring long-term and man-made changes.

- (b) Those forming part of 'chains', generally north-south, which can study the propagation and development of large-scale geophysical disturbances.
- (c) Those in geophysically interesting regions, such as the polar cap, auroral zone and the vicinity of the magnetic equator.
- (d) Those that are remote from other stations, magnetically conjugate to other stations, or in the southern hemisphere.
- (e) Those operated in conjunction with well-instrumented geophysical observatories and special research facilities.

75. When a station is closed, care should be taken to safeguard its data for the use of the international community.

76. Because of the wealth of data that ionosondes provide they should be operated, not in isolation, but in conjunction with other techniques to provide a broad picture of the ionosphere, as an integral part of man's study of the upper atmosphere.

5. Professor Bossy (a member of the Working Group) has drawn attention to the importance of studies of small-scale variations in the ionosphere, in relation to, for example, investigations of transport phenomena, the distribution of Es ionization, and the influence of local geomagnetic and geographic features. Relatively dense groups of ionosondes are needed for such studies and in Prof. Bossy's opinion, the Report does not give sufficient emphasis to the need to maintain the denser groups of stations which already exist in several parts of the world.

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INTERNATIONAL REFERENCE IONOSPHERE 1977
(Ed. Rawer, Bilitza and Ramakrishnan)

It was intended to publish the above volume in September 1977 but publication has been postponed for the reasons given below. (See URSI Bulletin No 202).

The profiles and other information in IRI 1977 will be based entirely on actual measurements. In recent months important new data have become available and other new information is expected in the near future. In view of this situation, it seemed preferable to defer publication of IRI 1977 so as to permit the new data to be incorporated. The alternative, which seemed to be undesirable, would be to publish the volume in 1977, as originally intended, and to issue a supplement or a list of corrections in 1978.

Prof. K. Rawer, Chairman of the IRI Steering Committee, has provided the following supplementary explanation of the decision to postpone publication:-

The original terms of reference for IRI asked for profiles at only a few characteristic locations (incoherent scatter sounding stations). However, larger sets of satellite data relating to electron density and temperature in the upper atmosphere have recently become available. These data, together with the empirical CCIR models for foF2 and M(3000), seemed to offer the possibility of establishing, to a first approximation, the dependence of the electron-density profiles on geographical coordinates, provided that a valid relation between M(3000) and the height of the peak could be found. As a result of work done by Bradley and Dudeney, and more recently by Eyfrig and Bilitza, this goal now seems to have been reached. It has, therefore, been decided to introduce these geographical variations into the plasma profiles and the temperatures, in so far as the available data make this possible.

Important new information relating to ion composition has also become available: namely, a new compilation by Danilov and his co-workers for the 100-200 km height range at mid-latitudes, new satellite data at greater heights, and data from the lowest levels of the ionosphere where in situ measurements are particularly difficult to make. Although these data are not numerous, it was felt that they ought to be incorporated into IRI now, so as to provide at least provisional information. For the same

reason, information on negative ions will be included also, in spite of the fact that the relevant profiles are few, and have been obtained by one group only.

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INTERNATIONAL GEOPHYSICAL CALENDAR 1978

The Operational Edition of the Calendar (see following pages) has been issued by the International Ursigram and World Days Service (IUWDS) and copies are available on request from

Dr. P. Simon,
Ursigrammes Observatoire,
F - 92190 Meudon,
France,

or

Miss J.V. Lincoln,
WDC-A for Solar-Terrestrial
Physics,
NOAA,
Boulder, Colorado 80302,
USA.

On the back of the Calendar, there is a summary (not reproduced here) of the recommended observational programmes in various branches of atmospheric physics and in studies of certain interplanetary phenomena.

International Geophysical Calendar for 1978

(See other side for information on the use of this Calendar)

JANUARY

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10*	11*	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

FEBRUARY

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8*	9*	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

MARCH

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8*	9*	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

APRIL

S	M	T	W	T	F	S
						1
2	3	4	5*	6*	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

MAY

S	M	T	W	T	F	S
		1	2	3	4	[5] [6]
7	8	9*	10*	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

JUNE

S	M	T	W	T	F	S
					1	2
4	5	6*	7*	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

JULY

S	M	T	W	T	F	S
						1
2	3	4	5*	6*	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

AUGUST

S	M	T	W	T	F	S
			1	2*	3*	4
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

SEPTEMBER

S	M	T	W	T	F	S
						1
3	4	5*	6*	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

S	M	T	W	T	F	S
1	2	3*	4*	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31*				

S	M	T	W	T	F	S
			1*	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29*	30*		

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27*	28*	29	30
31						

JANUARY 1979

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24*	25*	26	27
28	29	30	31			

17 Regular World Day (RWD)

18 Priority Regular World Day (PRWD)

8 Quarterly World Day (QWD)
also a PRWD and RWD

3 Regular Geophysical Day (RGD)

7 Day of Solar Eclipse

10* Dark Moon Geophysical Day (DMGD)

6,7 World Geophysical interval (WGI)

6,7 Airglow and Aurora Period

3,4 Day with unusual meteor shower activity,
Northern, [, or Southern,], Hemisphere

NOTES:

1. N-MAC (noon-midnight auroral correlations) periods are: Jan.2-16, Jan.30-Feb.13, Feb.27-Mar.13, Sep.27-Oct.11, Oct.26-Nov.9, Nov.24-Dec.8, 1978.
2. IAGA/URSI Working Group on Passive Electromagnetic Probing of the Magnetosphere international campaign Jun. 21-Jul. 20, 1978.
3. Build-up year FGGE continues to December 1, 1978 when operational year begins.
4. All radio meteor and incoherent scatter facilities will be operating continuously June 1-14 inclusive under the URSI/IAGA Cooperative Tidal Observations Program CTOP. Details from Dr. R. G. Roper, Georgia Tech, Atlanta, GA 30332, U.S.A.

OPERATIONAL EDITION, September 1977

see other side

ELECTROMAGNETIC WAVE THEORY

The latest in the traditional series of URSI Symposia on Electromagnetic Wave Theory was held in Palo Alto, California in June 1977. On this occasion it was organised jointly by the Antennas and Propagation Society of IEEE and URSI Commission B.

The Digest of the Symposium contains 351 pages and reproduces 122 abstracts (including figures) of the papers presented. The papers are grouped as follows:

- Electromagnetic theory I, II
- Waveguides
- Antennae and the environment
- Optics
- Inverse scattering
- Numerical techniques I, II
- Random media
- Antennae and arrays
- HF scattering
- Transients and singularities
- Scattering.

Some copies of the Digest are still available at a cost of US\$11 (including packing and postal charges). Orders for the Digest should be sent to:

Prof. K.K. Mei,
University of California,
Department of Electrical Engineering and
Computer Sciences,
Berkeley, Cal. 94619,
USA.

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OPTICAL FIBRE COMMUNICATION

Copies are available of the Technical Digest of the International Conference on Integrated Optics and Optical Fibre Communication held in Tokyo, Japan, 18-20 July 1977.

The 600-page Digest contains about 150 contributed and invited papers, and also papers presented at the Post-Conference Meeting. The price of the Digest is 8,000 Yen, plus postage (surface mail: 280 Yen for Japan; 1,200 Yen for all other addresses). Special postal rates for air mail are available.

Orders, together with a bank draft or a money order payable to the order of "IOOC '77", should be sent to

Professor H. Yanai,
Department of Electrical Engineering,
University of Tokyo,
Bunkyo-ku Tokyo,
113 Japan.

It is regretted that personal cheques can not be accepted.

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THE MAGNETOSPHERE AND ITS ENVIRONMENT

Dr. R.S. Unwin of the Geophysical Observatory in Christchurch, New Zealand has compiled a 24-page booklet containing the Summary Proceedings of the International Symposium on the Magnetosphere and its Environment, held in Christchurch from 24-28 January 1977. Some copies of the booklet are available from:

Royal Society of New Zealand,
Box 12249,
Wellington, New Zealand.

The Introduction and Conclusion reproduced below have been extracted from the booklet and acknowledgments are made to Dr. Unwin.

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Introduction

Since it was first settled by Europeans nearly 150 years ago New Zealand, isolated from Australia by nearly 2,000 km of ocean, and from major nations of Europe, the Americas, and Asia by many times this distance, has had problems in long-distance communications. This led to an early interest in HF radio propagation and ionospheric research in which there was a well established tradition in the universities and the Department of Scientific and Industrial Research by the time of the International Geophysical Year in 1957. Since the IGY a chain of stations has operated from Scott Base in the Antarctic (L✓32) through Campbell Island (L✓4) and New Zealand to the tropics, approximately along a meridian. Campbell Island and southern New Zealand are conjugate to southern Alaska and the Aleutians. With these advantages research

in the last twenty years has covered a variety of phenomena associated with the low- to the high-latitude ionosphere, the aurora, VLF, geomagnetism and ULF, and airglow.

With this tradition of active research in mind, the Royal Society of New Zealand decided to organise an international symposium, with the title "The Magnetosphere and its Environment", during the International Magnetospheric Study in which New Zealand workers are involved. Backed by the Institute of Physics in New Zealand, and co-sponsored by the International Union of Radio Science and the American Geophysical Union, the symposium was held at the University of Canterbury in Christchurch in January 1977. Nearly 80 scientists took part, thirty coming from nine countries outside New Zealand.

The symposium was divided into eight major topics and sub-topics. Each was introduced by an invited speaker and followed by contributed papers as summarised in Table I. It concluded with a two-hour session consisting of summaries by each invited speaker and discussion.

Table I

	Invited Speaker	Contributed Papers
The Solar Wind and its Interaction at the Magnetospheric Boundary	W.I. Axford	5
Macroprocesses in the Magnetosphere	C-G.Fälthammar	7
Microprocesses in the Magnetosphere		
(a) Wave-wave Interactions	R.L. Dowden	4
(b) Wave-particle Interactions and Plasma Instabilities	R.M. Thorne	4
Magnetosphere/Ionosphere Coupling:		
(a) High Latitude	K.D. Cole	7
(b) Plasmapause and Low Latitude	J.E. Titheridge	4
Physics of Ionosphere/Neutral Atmosphere Interactions	W.L. Jones	5
Solar Activity and The Weather	J.M. Wilcox	3

A feature of the symposium was the time available for discussion. The Organising Committee encouraged speakers to allow one-quarter to one-third of the time allocated (generally one hour for invited speakers and 30 minutes for contributed papers) for discussion, and on the whole this was quite adhered to.

No formal publication of either the invited or the contributed papers is planned, but it is hoped that the content of most of them will appear in the literature during 1977.

Conclusion

The symposium was successful in bringing together a number of scientists, both theoretical and experimental, concerned with a wide variety of aspects of the overall topic of the magnetosphere and its environment. Although there were a number of aspects that were not covered in depth if at all (e.g., the polar cap ionosphere and corresponding region of the magnetosphere), the symposium gave all participants an opportunity to hear about and discuss research in all regions of the atmosphere from the troposphere to the interplanetary medium. In the opinion of the writer such opportunities are all too rare in these days of either large conferences with too many parallel sessions, or specialist meetings which tend to deal with more and more restricted aspects of an overall topic.

As well as offering a forum for the presentation of scientific papers, the symposium was also successful in providing a congenial atmosphere for the initiation of personal contacts, and the exchange of current ideas and future plans. This was of particular value to New Zealand scientists, whose opportunities for personal contact with colleagues in other countries, particularly those in the Northern Hemisphere, are relatively limited. Even if only a small proportion of the ideas and suggestions for future lines of research and cooperative study are followed through, the symposium will have demonstrated its worth as a stimulus to all those who participated, and, hopefully, to the development of research in the field.

August 1977

R.S. Unwin

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INTEGRATED OPTICS AND OPTICAL FIBRE COMMUNICATION

Tokyo 1977

The First International Conference on Integrated Optics and Optical Fibre Communication was held from 18 to 20 July 1977 in Tokyo; in addition, a Post-Conference Meeting took place on 22 July 1977 in Osaka.

The Conference and the Meeting were organised by the Institute of Electronics and Communication Engineers of Japan jointly with The Institute of Electrical Engineers of Japan; they were cosponsored by national organizations in Italy, UK, USA, F.R. Germany, France and others in Japan. URSI was the international organization which also cosponsored this Conference.

About 130 papers were presented in English, with an additional 26 invited papers, to nearly 650 participants from 15 countries; about 130 participants came from abroad.

The Conference Digest contained 628 pages in one volume. Late papers were included in a separate volume of 65 pages printed in only two days: proof of the excellent work done by the Organizing Committee (Prof. H. Yanai, Chairman) and of the Programme Committee (Prof. S. Saito, Chairman). (see p.22).

Opening remarks were presented by Prof. H. Yanai and followed by a keynote address by Dr. Bun-ichi-Oguchi (Senior Managing Director and Chief Engineer of the Nippon Telegraph and Telephone Public Corporation) under the title: "Light in Telecommunications - Present Status and Future Prospects".

A special issue (March 1978) of the Transactions of the Institute of Electronics and Communication Engineers of Japan (Part E in English) will be devoted to the papers on optical communications. Prof. S. Saito is the Guest Editor.

During the Conference an exhibition was held. It showed the great progress made by industrial firms concerned with optical communications.

During the Conference a technical visit to the Sinjuku Power Station in Tokyo was arranged, and a second visit to another Power Station in Osaka, where the participants were shown some applications of fibres to the maintenance of high-power distribution system. During the

second visit an experimental CATV service using optical fibres was shown.

IOOC'77 demonstrated the remarkable progress in the science and technology of optical fibre communications made in recent years and months, not only in Japan but also in other progressive countries. Optical fibres will be responsible for changes in systems of communications in the next decade.

Prof. A. Smolinski
Chairman, URSI Commission D
URSI Representative for IOOC'77

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HISTORY OF SCIENCE

The XV Congress of the International Union of History and Philosophy of Science was held in Edinburgh from 10-19 August 1977. It was attended by nearly 1,000 participants, plus "day members", from about 40 countries. The number of papers and their contents demonstrated the growing interest, among those concerned with very different branches of science, in questions relating to the history of science. One gains the impression that, at the present time, scientists are becoming more and more aware of the need to draw conclusions from an evolution of their subject which has been too rapid, and to gain a clearer insight, through a study of the past, into the meaning of their present work.

Radio Science was one of the subjects which received attention. In Section IV (Modern Physics) the following papers, among others, were presented:

- O. Knudsen (Denmark): Electric displacement and the development of optics after Maxwell;
- J. Cazenobe (France): Retour sur les origines de la radioélectricité;
- V. Mukherji (India): Some aspects of Sir J.C.Bose's microwave research during 1895-1900;
- CH. Säskind (USA): Factors affecting scientific reputation: Ferdinand Braun, a case study;
- A.L. Norberg (USA): Cross fertilisation of innovation in science and technology: radio-frequency circuits and particle accelerations in the 1930's;

- S. d'Agostino (Italy): Maxwell's experimental researches on electrical standards and the development of the electromagnetic theory of light.

The General Assembly of IUHPS decided to establish a Commission having the responsibility for collaborating with URSI in a proposed study of the origins of radio science.

September 1977

J. Cazenobe

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RADIOASTRONOMY: POST-ASSEMBLY SYMPOSIA

URSI Commission J is organising two symposia which will take place in Europe just after the URSI General Assembly which ends on 8 August.

Attendance at these Symposia will be by invitation only and those who would like to participate are advised to write to the Chairman of the Scientific Organising Committee.

1. Symposium on Image Processing in Astronomy
(co-sponsored by IAU and URSI)

Date: 10-12 August 1978 at Groningen, Netherlands.

Chairman of Scientific Organising Committee:

Dr. W.N. Brouw,
Radiosterrewacht Dwingeloo,
NL-7514 Dwingeloo, Netherlands.

Main topics: Errors in measurements and imaging procedures; optimum image estimation techniques; image display, and digital and analogue methods of image formation.

2. Symposium on Very-long-baseline Interferometry
(sponsored by URSI)

Date: 14-17 August 1978 at Bonn, F.R. Germany.

Chairman of Scientific Organising Committee:

Dr. I. Pauliny-Toth,
Max-Planck-Institut für Radioastronomie,
Auf dem Hügel 69,
D - 53 Bonn, F.R. Germany.

Main topics: Structure of extragalactic radio sources; molecular maser sources; terrestrial radio sources and astrometry; pulsars; relativity tests; instrumentation and image formation.

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Those who are interested in URSI Commission J are asked to note Dr. Westerhout's new address:

Dr. G. Westerhout,
Chairman, URSI Commission J,
Scientific Director,
US Naval Observatory,
Washington D.C. 20 390, USA.

(Phone: (202)254-4539
Telex: (710)822-1970).

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EUROPEAN MICROWAVE CONFERENCE, PARIS

The 8th European Microwave Conference will be held in the UNESCO Building, Paris and will begin on 11 September 1978 under the Chairmanship of Prof. E. Constant of the Université des Sciences et Techniques.

Papers are invited describing original unpublished work. They may deal with theory, technology or applications in such fields as:

- microwave measurements, metrology, acoustics, integrated circuits, signal processing, tubes, antennae and arrays;
- communication systems and applications of microwaves;
- sub-mm components and circuits;
- sub-nm and gigabit electronics.

Further information and copies of the Call for papers are available from:

Microwave Exhibitions and Publishers Ltd,
Temple House,
36 High Street,
Sevenoaks, Kent TN13 1JG,
England.

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ANTENNAE AND PROPAGATION

The Institution of Electrical Engineers (London), in association with URSI and several other bodies, will organise a Conference on Antennae and Propagation in London during the period 28-30 November 1978.

The aim of the Conference is to promote interaction between those who are active in the fields of antenna theory and design and of electromagnetic wave propagation. The scope of the Conference will include telecommunications, navigational aids and radio astronomy.

Papers are invited on the following topics:

Antennae

- A1 Adaptive antennae
- A2 Antenna measurements
- A3 Arrays
- A4 Computer-aided design of antennae
- A5 Conformal and planar antennae
- A6 Lenses and radomes
- A7 Multiple-beam antennae
- A8 Numerical techniques
- A9 Reflectors, feeds and horns
- A10 Scattering and diffraction
- A11 VLF to UHF antennae
- A12 Others

Propagation

- P1 Ionospheric propagation
- P2 Millimetric wave propagation
- P3 Propagation at frequencies below 30 kHz
- P4 Surface and sub-surface wave propagation
- P5 VHF to microwave propagation
- P6 Others.

Those wishing to offer contributions must submit synopses of their papers not later than 31 March 1978. Each synopsis should be 3 pages in length (including illustrations) and should give sufficient detail to permit the assessors to evaluate the contribution. Each synopsis must be marked with the relevant subject designation (e.g. P4) as indicated in the list above. If necessary, several subject designations may be used.

Authors will be notified of the decision of the Organising Committee in May 1978. The final text of papers accepted (not exceeding 4,000 words) will be reproduced in

the Conference Publication which will be issued to all registered participants.

The Conference programme and registration forms will be published in June 1978 and copies will be sent to those who provide the following information:-

To: IEE Conference Department (Ref. ICAP 78)
Savoy Place, London WC2R 0BL, England

Number of Programmes/Registration Forms required.....
Title of contribution offered.....
Name.....
Address.....

Please use block capitals when providing this information.

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SOLAR TERRESTRIAL PREDICTIONS

A coordinated programme consisting of the publication of Proceedings, discussion of the papers by correspondence in Working Groups and, finally a series of Workshop sessions in Boulder, Colorado, is being planned by the NOAA Environmental Research Laboratories in Boulder. It is tentatively planned to hold the Workshop in Boulder during the week beginning 22 April 1979.

The objective of the Programme is to stimulate discussion on the preparation and utilisation of predictions of various kinds and to encourage interaction between the different groups concerned with research on prediction techniques or with their practical applications.

The topics to be covered include predictions of solar activity, of disturbances in the geomagnetic field and in magnetospheric particles, of the ionosphere, of conditions for radiocommunications, etc., etc. Contributed papers on such topics are invited and must be received before 1 November 1978. Priority will be given to papers on short- and long-term predictions rather than on those based on real-time monitoring.

Anyone wishing to contribute a paper or to participate in a Working Group should write, before 1 March 1978, for further information (including instructions to

authors) to the Chairman:

Dr. R.F. Donnelly,
STP/P-W Programme,
Space Environment Lab.,
NOAA ERL,
Boulder, Colorado 80302, USA.

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SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

The 2nd United Nations Conference on Science and Development will be held in 1979 and the Secretary General of the Conference, Dr. J.F. da Costa, met the Executive Board of ICSU in May 1977. The Conference, which will be governmental, will attempt to link science and technology with political will, and it is intended that, after the usual declarations of aims and statements of intent, there shall be a follow-up campaign.

The Conference will concentrate its attention on four or five subjects which will be decided in January 1978. Each participating country will send an official delegation as well as submitting documents prepared by the national scientific and technological communities.

The Secretary General of ICSU invites the Member Committees of the Scientific Unions to impress upon their governments the importance of this Conference and the need for the input documents referred to above.

A small Symposium on a subject of importance to the Conference will be held in Athens, Greece at the time of the ICSU General Assembly in 1978. Suggestions for topics and speakers would be welcomed and should be submitted to:

Executive Secretary, ICSU,
Boulevard de Montmorency 51,
F - 75016 Paris, France.

It is particularly important that the developing countries should be active during this Conference and, in an article in COSTED Newsletter (July 1977), Dr. Radhakrishna remarks:

"It is for the developing countries to take the initiative and ensure for themselves that the forthcoming Conference will enable them to improve the overall quality of life in their countries. A coordinated and well-

"defined approach will undoubtedly help the developing "countries in this objective".

COSTED has prepared a "model national paper" which is designed to assist developing countries in presenting their material to the best advantage and in the format required by the UN Conference Secretariat. Copies can be obtained on request from:

Dr. S. Radhakrishna,
Scientific Secretary, COSTED,
Bangalore 560012,
India.

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URSI MEMBER COMMITTEES

The following list of names and addresses of Presidents and Secretaries of URSI Member Committees is based on information available in the URSI Secretariat on 15 November 1977. It would be appreciated if any errors or modifications could be notified to the URSI Secretariat before 15 May 1978 for inclusion in the June issue of the URSI Bulletin.

ARGENTINA:

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

Secretary: Prof. V.A. Padula-Pintos, Instituto Tecnológico
de Buenos Aires, Av. Madero 351, Buenos Aires.

AUSTRALIA:

President: Dr. B.J. Robinson, CSIRO, Division of Radio-
physics, P.O.Box 76, Epping N.S.W. 2121.

AUSTRIA:

President: Univ. Prof. Dr. O.M. Burkard, Institut für
Meteorologie und Geophysik, Universität Graz, Halbärth-
gasse 1, A-8010 Graz.

BELGIUM:

President: Prof. P. Hontoy, Laboratoire de Radioélectri-
cité, Université Libre de Bruxelles, 50 avenue D.F.
Roosevelt, B-1050 Bruxelles.

Secretary: Prof. R. Gonze, Observatoire Royal de Belgique,
3 avenue Circulaire, B-1180 Bruxelles.

BRAZIL:

President: Dr. Nelson de Jesus Parada, Director INPE, C.P.
515, Sao José dos Campos, Sao Paulo.

BULGARIA:

President: Prof. Dr. K. Serafimov, Scientific Secretary,
Bulgarian Academy of Sciences, ul. 7 noemvri 1, Sofia.

Secretary: Dr. A. Spassov, Institute of Electronics,
Bulgarian Academy of Sciences, ul. 7 noemvri 1, Sofia.

CANADA:

President: Dr. F.J.F. Osborne, RCA Ltd Research Labora-
tories, Ste-Anne-de-Bellevue, Quebec.

Secretary: Dr. J.Y. Wong, National Research Council of
Canada, Montreal Road, Bldg M-50, Ottawa, Ontario,
K1A 0R8.

CZECHOSLOVAKIA:

President: Prof. Dr. J. Stransky, Faculty of Electrical
Engineering, Technical University of Prague, Suchbata-
rova 4, Praha 6 - Dejvice.

Secretary: Dr. L. Kratena, Institute of Radio Engineering
and Electronics, Czechoslovak Academy of Sciences,
Lumumbova 1, Praha 8 - Kobylisy.

DENMARK:

President: Dr. E. Ungstrup, Danish Space Research Insti-
tute, Lundtoftevej 7, DK-2800 Lyngby.

EGYPT, ARAB REPUBLIC OF:

President: Prof. A.I. Naguib, Department of Scientific
Societies and International Unions, Academy of Scien-
tific Research and Technology, 101 Kasr El-Eini Street,
Cairo.

GERMAN D.R.:

President: Prof. Dr. Ing. H. Frühauf, Technische Univer-
sität Dresden, Helmholtzstrasse 18, DDR-8027 Dresden.

Secretary: Dr. V. Kempe, Institut für Elektronik, Rudower
Chaussee 6, DDR-1199 Berlin-Adlershof.

GERMANY, F.R.:

President: Dr. W. Becker, Max-Planck-Institut für Aeronomie, D-3411 Lindau/Harz.

Secretary: Ing. K.-H. Kappelhoff, Fernmeldetechnisches Zentralamt, FI 31-2, Postfach 800, D-6100 Darmstadt.

FINLAND:

President: Prof. M. Tiuri, Helsinki University of Technology, E.E. Department, Otakaari 5 A, SF-02150 Espoo 15.

Secretary: Dipl. Eng. M. Hallikainen, Helsinki University of Technology, E.E. Department, Otakaari 5 A, SF-02150 Espoo 15.

FRANCE:

President: Prof. M.-Y. Bernard, CNAM, Laboratoire de circuits et mesures, 292 rue Saint-Martin, F-75141 Paris Cedex 03.

Secretary: M. D. Lombard, CNET, TCR-EFT, 30 rue du Général Leclerc, F-92131 Issy-les-Moulineaux.

HUNGARY:

President: Dr. G. Bognar, Member of the Hungarian Academy of Sciences, Münnich F. u.7, H-1055 Budapest.

Secretary: Prof. K. Géher, Technical University of Budapest, Stoczek u.2, H-1111 Budapest.

INDIA:

President: Dr. M.K. Basu, Wireless Planning and Coord. Wing, Ministry of Communication, Sardar Patel Bhavan, Parliament Street, New Delhi 110001.

Secretary: Dr. B.M. Reddy, Radio Science Division, National Physical Laboratory, Hillside Road, New Delhi 120012.

ISRAEL:

President: Prof. W. Low, Department of Experimental Physics, The Hebrew University of Jerusalem, Jerusalem.

ITALY:

President: Prof. G. Barzilai, Istituto di Elettronica, Facolta d'Ingegneria, Via Eudossiana 18, I-00184 Roma.

Secretary: Dr. G. d'Auria, Istituto di Elettronica, Facolta d'Ingegneria, Via Eudossiana 18, I-00184 Roma.

JAPAN:

President: Prof. A. Kimpara, Chubu Institute of Technology, 1200 Matsumoto-cho, Kasugai, Aichi 487.

Secretary: Prof. T. Obayashi, Institute of Space and Aeronautical Science, University of Tokyo, Komaba, Meguro, Tokyo 153.

MEXICO:

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The following list of Official Members of URSI Commissions is based on information received in the URSI Secretariat up to 15 November 1977. Where the names of Official Members of Commissions have not yet been submitted, a blank space has been left so as to permit them to be inserted when they become available.

Additions and modifications to these lists will be published in the June issue of the URSI Bulletin. It would be appreciated if notification of these could be submitted so as to arrive in the URSI Secretariat not later than 15 May 1978.

The next complete lists will be published in the December 1978 issue of the Bulletin.

Commission A - Electromagnetic Metrology

Chairman: Dr. H.M. Altschuler, National Bureau of Standards, Physics Building, Room 318, Washington D.C. 20234, USA.

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