Bulletin nº 168 Septembre 1968

U. R. S. I.

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URSI SECRETARIAT — TELEGRAPHIC ADDRESS

As announced in Document URSI-N3(68), which has been circulated to all National Committees, the telegraphic address of the URSI Secretariat is

URSISEC BRUSSELS

It is not necessary to add any additional words in cables or telegrams.

URSI MEMORIAL LECTURES

XVI General Assembly, Ottawa 1969

At its meeting in March 1958, the URSI Board of Officers discussed various ways of achieving the aims of the General Assemblies of URSI. One of the proposals was to institute a series of lectures, by distinguished scientists, on some scientific topic of general interest to the delegates. Each of these lectures was to be dedicated to someone who had given outstanding services to URSI. The series began in 1960 and was continued at the Assemblies in 1963 and 1966. The lecturers and those to whom the Memorial Lectures were dedicated are shown below.

URSI Assembly	*Dedicated to*	*Lecturer*
1960 London	Dr. Robert B. Goldschmidt (First Secretary General of URSI)	Dr. Lloyd V. Berkner (Science in Space)
1963 Tokyo	Prof. Balthasar van der Pol (Honorary President 1952-1959)	Sir Martyn Ryle (Giant Radio Telescopes)
1966 Munich	Dr. John H. Dellinger (Honorary President 1952-1962)	Dr. J. H. Chapman (The Alouette I Spacecraft)

For the 1969 Assembly in Ottawa, the Board of Officers, on the proposal of Prof. Koga, has decided to dedicate the Memorial Lecture to Dr. Lloyd V. Berkner who was President of URSI from 1957 to 1960 and who himself delivered the first lecture in the series in 1960.

The 1969 Assembly will be the occasion also of the Appleton Lecture and this will be given by the winner of a prize offered by the Royal Society of London and the URSI Committee in the United Kingdom. Sir Edward Appleton was President of URSI from 1934-1952 and it was he who gave a lecture in 1957 in Boulder from which later the concept of a series of such lectures originated.

The names of the two lecturers and the subjects of their lectures will be announced later.

THE URSI COMMITTEE FOR SPACE RESEARCH

For many years radio probing techniques provided the only method for obtaining information about the upper atmosphere, the ionosphere and interplanetary space. However, during the past decade, scientific instruments have been developed for use in space vehicles which can penetrate these regions and transmit valuable scientific information back to the Earth.

The data obtained from space vehicles are of two kinds. In some cases they are complementary to those obtained at ground stations; for example, the observations made by top-side sounders and by ground-based ionosondes are both required to give a full N(h) profile of the ionosphere. In other cases the data from space vehicles are supplementary to those obtained on the ground and important conclusions can be drawn from the agreement or discordance of the two sets of data.

It is clear, therefore, that great advantages can be gained from the combined study of the information obtained from space vehicles and from ground stations.

In view of the importance of making full use of the new information obtained by space vehicles, in 1960 URSI established its Space Radio Research Committee which provided a focal point for the interests of all the URSI Commissions in space science, and also a link with the ICSU Committee on Space Research (COSPAR). The URSI Committee was

disbanded at the XVth General Assembly mainly because the membership of the Committee was almost identical with that of the URSI Coordinating Committee which remained active.

Since 1963 the President has represented URSI on the Executive Council of the ICSU Committee on Space Research (COSPAR). As a result of the much closer relations which now exist between COSPAR and the Unions, URSI has nominated several representatives to COSPAR Working Group 2 for the Design and Coordination of Experiments, and in future it may be necessary to appoint URSI representatives to other Working Groups of COSPAR also.

At its meeting in March 1968, the Coordinating Committee endorsed a proposal made by the Board of Officers, namely that the URSI representatives mentioned above should be recognised collectively by URSI as a Committee. It was therefore agreed that this group should be provisionally constituted as the "URSI Committee for Space Research", with the Terms of Reference given below, pending approval of this action at the XVIth General Assembly in 1969.

The members of the URSI Committee for Space Research have already been active during the recent COSPAR Assembly in Tokyo and it is expected that they will continue to provide an effective link between URSI and COSPAR which will ensure the maximum cooperation between the two bodies.

Provisional Terms of Reference and Membership

1. — Terms of Reference.

The principal objectives of the URSI Committee for Space Research are as follows :

1.1. To stimulate the interest of URSI and its Commissions in radio research based on observations and measurements made with the help of space vehicles;

1.2. To encourage combined studies of data obtained using space vehicles and ground stations, bearing in mind that the data from either one of these two sources may be complementary or supplementary to those from the other;

1.3. To ensure an effective relationship between URSI and COSPAR;

1.4. To maintain effective contact with the URSI-STP Committee especially with respect to the exploitation of space vehicles for research in those branches of solar-terrestrial physics that are of interest to URSI;

1.5. To advise the Board of Officers on questions relating to the use of space vehicles for research in radio science.

2. — MEMBERSHIP.

The membership of the URSI Committee for Space Research shall be as follows :

(*a*) Chairman. The URSI Representative on the COSPAR Executive Council.

(*b*) Members. The URSI Representatives on COSPAR Working Groups.

Note : The present members are as follows :

Prof. S. Silver (COSPAR Executive Council);

Profs H. G. Booker, S. A. Bowhill, K. Gringauz, C. O. Hines and K. Maeda (COSPAR Working Group 2 for the Design and Coordination of Experiments).

19 July 1968.

COMITE DE L'URSI POUR LES RECHERCHES DANS L'ESPACE

Pendant de nombreuses années le sondage radioélectrique a constitué la seule méthode permettant d'obtenir des informations sur la haute atmosphère, l'ionosphère et l'espace interplanétaire. Toutefois, au cours des dix années écoulées ont été développés des instruments scientifiques pouvant être utilisés à bord de véhicules spatiaux qui pénètrent dans ces régions et transmettent de précieuses données scientifiques vers la Terre.

Les données fournies par les véhicules spatiaux sont de deux sortes. Dans certains cas, elles viennent compléter celles obtenues par les stations au sol; par exemple, aussi bien les observations effectuées par sondage par le haut que celles effectuées au moyen d'ionosondes au sol sont nécessaires pour avoir un profil N(h) complet de l'ionosphère. Dans d'autres cas les données en provenance des véhicules spatiaux viennent s'ajouter à celles obtenues au sol et la concordance ou la divergence des deux séries de données permet d'aboutir à d'importantes conclusions.

Il est clair dès lors qu'il y a grand avantage à combiner l'étude des informations en provenance des véhicules spatiaux avec celle des informations obtenues par les stations au sol.

Etant donné l'importance que revêt la pleine exploitation des données nouvelles obtenues au moyen des véhicules spatiaux, l'URSI a constitué en 1960 un Comité pour les Recherches radioélectriques dans l'Espace, qui centralisait les intérêts de toutes ses Commissions pour la science de l'espace et servait en même temps de liaison avec le Comité du CIUS pour les Recherches dans l'Espace (COSPAR). Le Comité de l'URSI a été dissous lors de la XV[e] Assemblée générale, principalement en raison du fait que la composition de ce Comité était presque identique à celle du Comité de Coordination de l'URSI.

Depuis 1963 le Président a représenté l'Union au Conseil Exécutif du COSPAR. Suite au resserrement sensible des relations entre le COSPAR et les Unions, l'URSI a désigné plusieurs représentants au Groupe de Travail 2 du COSPAR pour la Conception et la Coordination des Expériences et elle pourrait être amenée ultérieurement à désigner des représentants à d'autres Groupes de Travail.

Au cours de sa réunion de mars 1968, le Comité de Coordination a accepté une proposition du Bureau tendant à ce que les représentants de l'URSI précités soient reconnus collectivement par l'Union en tant que Comité. Il a donc été décidé de constituer provisoirement un « Comité de l'URSI pour les Recherches dans l'Espace », avec le mandat ci-dessous, en attendant l'approbation de la XVI[e] Assemblée générale en 1969.

Les membres du Comité de l'URSI pour les Recherches dans l'Espace se sont déjà montrés actifs lors de la récente Assemblée du COSPAR à Tokyo et il est espéré qu'ils continueront de maintenir une liaison efficace entre l'URSI et le COSPAR, assurant ainsi un maximum de coopération entre les deux organisations.

Mandat et Composition provisoires

1. — Mandat.

Le Comité de l'URSI pour les Recherches dans l'Espace a pour objectifs principaux :

1.1. de stimuler l'intérêt de l'URSI et de ses Commissions pour les recherches radioélectriques se basant sur les observations et mesures effectuées à l'aide de véhicules spatiaux;

1.2. d'encourager les études combinées des données obtenues au moyen de véhicules spatiaux et par les stations au sol, en tenant compte du fait que les données en provenance de l'une de ces deux sources peuvent être de nature complémentaire ou supplémentaire pour l'autre;

1.3. d'assurer une liaison efficace entre l'URSI et le COSPAR;

1.4. de maintenir des contacts efficaces avec le Comité de l'URSI pour la Physique solaire-terrestre (URSI-STP), particulièrement en ce qui concerne l'utilisation des véhicules spatiaux pour la recherche dans les disciplines de la physique solaire-terrestre qui présentent de l'intérêt pour l'URSI;

1.5. de fournir au Bureau de l'URSI ses conseils sur les questions relatives à l'utilisation des véhicules spatiaux dans les recherches en radioélectricité scientifique.

2. — COMPOSITION.

Le Comité de l'URSI pour les Recherches dans l'Espace se composera :

a) d'un Président : le représentant de l'URSI au Conseil exécutif du COSPAR;

b) de membres : les représentants de l'URSI aux Groupes de Travail du COSPAR.

Note : Composition actuelle du Comité :

Prof. S. Silver (Conseil exécutif du COSPAR);

Profs H. G. Booker, S. A. Bowhill, K. Gringauz, C. O. Hines et K. Maeda (Groupe de Travail 2 du COSPAR pour la Conception et la Coordination des Expériences).

19 juillet 1968.

COMMITTEE ON SPACE RESEARCH (COSPAR)

XI Assembly, Tokyo, May, 1968

1. — INTRODUCTION

URSI is represented on the Executive Council of COSPAR by its President, Professor Silver who attended the recent COSPAR Assembly in Tokyo. Professor Silver's report on the Assembly is given below (Sect. 2) and also the report from URSI to COSPAR which he presented at the Plenary Meeting (Sect. 3).

At the final Plenary Meeting, a number of Resolutions and Recommendations were adopted and those which are of some interest to URSI are reproduced in Sect. 4. Attention is drawn particularly to Decision No. 2 regarding participation of the Unions in future COSPAR Assemblies.

URSI National Committees which wish to suggest topics for discussion at these Assemblies are invited to submit their suggestions to the Acting Secretary General or one of the Chairmen of Commissions. At the 1969 COSPAR Assembly URSI will be responsible for discussions on the International Reference Ionosphere.

2. — Report on XI COSPAR Assembly prepared by Prof. Silver, President of URSI

The plenary meetings of the COSPAR extended from May 13 to May 22. They were preceded by a symposium on Solar Flares, May 9-11, organized jointly by the COSPAR and the IAU, the IUGG, and the URSI. The program brought together in an effective manner observational data on solar flares obtained by means of ground-based and space-borne equipment over a wide range of frequencies. Magnetospheric and ionospheric effects of solar flares were also reviewed. While a large body of information was presented in a rather coordinated fashion it remained apparent that much has yet to be learned before a satisfactory theory of the mechanisms of generation of flares will be developed. There is an important area of work here to which the URSI should direct attention in a joint effort with the IAU, the IUGG, and the COSPAR.

A second symposium of interest to the URSI—Small Rocket Instrumentation Techniques—dealt with a variety of measurements in the upper atmosphere and the exosphere. Of special interest to our commissions was the discussion on electric fields in the ionosphere and the magnetosphere. Both the phenomena of electric fields and the methods for measuring them should receive more attention on our part.

The third symposium on biology was peripheral to our interests; none of the URSI representatives attended the sessions of this symposium which was held concurrently with sessions on the physical sciences.

It is important to note that the efforts made by the Unions and the COSPAR to develop closer working relationships among them have been very productive. The Tokyo meetings were marked by a spirit of greater participation of the Unions in both the scientific and administrative work. Our union has presently six official representatives to COSPAR, the member on the Executive Council and five members of Working Group II. Of the five members of Working Group II—Prof. Booker, Prof. Bowhill, Dr. Gringauz, Prof. Hines and Prof. Maeda—all but Dr. Gringauz were present. In addition Prof. Dieminger, Prof. Rawer, and Mr. Horner attended the COSPAR. This made it possible for the URSI to keep in close contact

with the developments in the Working Groups of special interest to us.

The Inter-Union Commission on Solar Terrestrial Physics took the opportunity of its members being present at the COSPAR Assembly to hold meetings of its Working Groups. This resulted also in a very close and effective interaction of the URSI with the IUCSTP.

The URSI representatives held two meetings to cover the work of URSI in the program of the COSPAR. The first meeting was held on Friday, May 10, in which our vice-president, Prof. Dieminger also participated, and the second was held on Friday, May 17, at which Prof. Dieminger and Prof. Rawer joined into the discussions. A number of topics and important questions were discussed by the group. The following covers the highlights of our deliberations.

One major topic was the project on the International Reference Ionosphere. It will be recalled that following the London meetings of the COSPAR, the URSI-STP Committee reconstituted its *ad hoc* group on the Reference Ionosphere into a joint URSI-COSPAR Working Party under the chairmanship of Prof. Bowhill. The purpose of the group was to explore the need for an International Reference Ionosphere and the feasibility of developing a Reference Ionosphere. The group was charged with the responsibility of carrying out a study and reporting to Working Group II of the COSPAR, as well as to the URSI, at the Tokyo meetings.

The report of the joint URSI-COSPAR group recommends that a project be initiated to prepare a Reference Ionosphere. This report, submitted by Prof. Bowhill to Prof. Beynon, chairman of the URSI-STP committee, will appear separately in the *Information Bulletin*. For the present, it is important to note the reaction of the COSPAR to this report in the form of a resolution drawn by Working Group II.

"COSPAR approves the concept of an International Reference Ionosphere described in the report of the URSI-COSPAR Working Party, and offers its collaboration to URSI in this project. In this connection COSPAR invites URSI to hold a formal session at the time of the 1969 COSPAR Assembly to present and discuss material collected by that time."

The Executive Council subsequently endorsed the foregoing resolution and expressed also its support of this project for which URSI is to take the leadership and main responsibility.

At the May 17 meeting of the URSI representatives the dimensions of the job of developing the Reference Ionosphere were assessed. The group recognized that the work on this project must be coordinated with the International Reference Atmosphere and with a study of the various techniques for determining the physical quantities describing the iono-

sphere. The subject of intercomparison of techniques was also one of our major topics and special note was made of the importance of moving ahead with the intercomparison study to give the Reference Ionosphere project the needed information. It was also noted that coordination should be effected with the work of the CCIR on a related project. The group felt that Prof. Rawer was an excellent choice for the chairmanship of this next phase. Prof. Rawer expressed willingness to take on this project and the group decided to recommend him to the URSI-STP Committee for this task.

The discussion on intercomparison of techniques for measuring the properties and parameters of the atmosphere above a height of 50 km developed as part of a more general consideration of the program the URSI has set for its 1969 Assembly on *electromagnetic probing of the atmosphere.* A tremendous interest has developed in this subject among several Unions and Inter-Union Committees. We took the opportunity of our gathering in Tokyo and the concurrent meetings of the IUCSTP to review the problem areas and to lay out some ideas to be submitted to Prof. Gordon who is heading our program for the 1969 Assembly.

Prof. Maeda and Prof. Bowhill directed our attention to the urgent need to put together the information which is available on the region 50 km to 100 km and on the techniques used to obtain the data, and to make a critical evaluation of both the techniques and the data. It became apparent that though the URSI deals primarily with radio science, and, therefore, would be concerned largely with electromagnetic propagation as the probing mechanism, it is essential to compare all techniques which lead to values for electron densities, electron and ion temperatures, ionization and recombination rates, and so on. The group, accordingly, recommends that the URSI program on the electromagnetic probing of the atmosphere be extended in scope to include an intercomparison of all techniques.

One of the functions of the Unions is to help the COSPAR in planning the symposia for its annual meetings. The 1969 meetings of the COSPAR will take place in Prague in mid-May. The URSI group drew up several suggestions for the use of the URSI representative on the Executive Council. At the meetings of the Coordinating Committee in March, 1968, Prof. Booker and Prof. Dungey expressed the interest of Commission IV in holding a symposium on *Aurora and VLF Propagation* as part of the COSPAR program in 1969. The URSI representatives decided, however, in Tokyo that this topic could be held over until 1970 when it would perhaps find a more appropriate place in the comprehensive symposium on Solar-Terrestrial Physics being planned by the IUCSTP in conjunction with the member Unions.

The URSI representatives suggested two other topics : (*a*) Global wind-system effects in F-region morphology, based on data from rockets and satellites, (*b*) Thomson-scattering studies and the agreement among data obtained for upper atmosphere properties from ground-based rocket, and satellite experiments. These proposals were submitted to the Executive Council by Prof. Silver. These subjects were taken by the Executive Council and combined with a proposal submitted by Prof. Nicolet for the IAGA for a symposium on hydrogen and helium in the upper atmosphere. It was left to Prof. Nicolet and Prof. Silver to work out a joint URSI-IAGA symposium on the upper atmosphere which will cover the three topics already mentioned.

The symposium on X-ray and γ-ray Astronomy which had been proposed by the COSPAR and which we discussed at our Board meetings of last March was approved by the Executive Council of the COSPAR to be organized jointly with the IAU. However, the arrangements with the IAU were left unsettled at the close of the Tokyo meeting. If the symposium is to cover the recent work in pulsars, and the correlation of the radio observations with X-ray and γ-ray observations, Commission V of the URSI should express an interest in participating in the program.

Another administrative action by the Executive Council should be noted here. A new Working Group—The Moon and the Planets—was created by the Council on a proposal submitted by an *ad hoc* study group of Working Group II. The subject matter to which this new Working Group will be directed naturally falls into the domain of interest of Commission V and also of Commission II according to our recent redefinition of the terms of reference of that Commission.

The Working Group on the The Moon and the Planets was set up on a provisional basis because the Executive Council took action to reorganize all the Working Groups. This has been necessitated by the large growth of the Working Groups, the shifting importance of certain subject areas, and because over the past ten years new discoveries have placed certain subjects into new relationships with others which the present Working Group structure does not take into account effectively. Dr. Friedman, Prof. Nicolet, Prof. Gratton, and Prof. Silver were appointed to a working party to draw up a plan for reorganization.

The COSPAR passed a number of resolutions and recommendations of varying degrees of interest to the URSI. When the final, edited, version of the resolutions and recommendations are issued by the COSPAR Secretariat it will be appropriate to publish them in our *Information Bulletin*.

In closing, I should state that the official representation of the URSI in the Working Groups was very effective. I am indebted to my colleagues for the material they provided to me during the meetings which helped me serve more effectively on the Council and helped me in preparing this report. It is quite clear that the URSI, as well as the other Unions, should utilize the COSPAR Assemblies as fully as possible to effect liaison with the COSPAR and to increase the level of interaction with other scientific bodies

3. — Report of URSI to the XI COSPAR Assembly, submitted by Prof. Silver

Mr. President, Ladies and Gentlemen :

It is again my pleasant duty to bring the greetings of the International Scientific Radio Union to the Committee on Space Research on the occasion of its XIth General Assembly. In the interval between the 1967 General Assembly of the COSPAR and the present one, the URSI has participated in four symposia dealing with subjects of interest to various phases of space research :

1. The International Symposium on the Theory of Information, organized by Commission VI of the URSI, the IEEE, and the Italian National Committee for the URSI, was held in San Remo during the period September 11-15, 1967. Topics of this symposium, such as those dealing with coding, are of direct interest to data handling in space experiments. The "Transactions on Information Theory of the IEEE" carry a report on the proceedings of this symposium.

2. The Colloquium on Atmospheric Winds, Waves and Motions in the Ionosphere was held in St.Gallen, Switzerland, October 3-4, 1967, as part of the General Assembly of the IUGG. The colloquium was organized jointly by URSI and IAGA. The proceedings will be published by IAGA.

3. The Conference on Transmission of Frequency Standards in the European Area was organized by Commission I of the URSI and held in Brussels, Belgium during September 19-21, 1967. The proceedings of the conference have been reported on in the *URSI Information Bulletin*, No. 164 dated Sept.-Oct. 1967.

4. The Symposium on the 1966 Solar Eclipse, organized by the Brazilian Space Center was co-sponsored by the URSI. The meetings were held at the Space Center at San José dos Campos during Feb. 6-11, 1968. The symposium was an integrated survey of studies conducted on solar activity, phenomena in the upper atmosphere, and related phenomena in the stratosphere during the November, 1966 eclipse by means of ground-based instrumenta-

tion, balloon-borne, rocket-borne, and aircraft-borne instrumentation along the path of the eclipse across South America. The proceedings will appear shortly in book form.

The Union also co-sponsored the Solar Flare Symposium which was held last week as part of the scientific programme of this Assembly; no further remarks need to be made about this symposium at this time other than to express our congratulations to Dr. Švestka and his organizing committee on the excellence of the programme.

The Board of Officers and the Coordinating Committee of the URSI met in Brussels to plan the 1969 General Assembly of the Union. As a result of many experiences gathered from the scientific meetings referred to above and others, the planning group decided to make the subject of Probing the Atmosphere by Means of Electromagnetic Waves the central theme of the 1969 Assembly. It is hoped to make an intensive study of the state of the art, and of the underlying physical theories, and to compare data obtained by various techniques.

The Board of URSI wishes to express its gratification with the progress made by the Executive Council in July, 1967, in developing closer and more harmonious relations between COSPAR and the Unions. The URSI responded quickly to the action taken by COSPAR whereby the Unions may name representatives to the Working Groups, and named five representatives to Working Group II. Four of them were already members, so our action did not load the working group unduly.

The Union appointed a Working Party subsequent to our 1966 Assembly to consider the subject of a Reference Ionosphere. This Committee under the chairmanship of Prof. S. Bowhill became a joint committee of URSI and COSPAR at the 1967 Assembly of the COSPAR with instructions to report its findings to this Assembly. I am happy to report that Prof. Bowhill's committee was hard at work this past year and has made significant progress in developing the subject. Professor Bowhill will make his report at the appropriate session of Working Group II.

I believe, Mr. President, that our joint efforts to bring about fuller participation of the Unions in the work of the COSPAR have been very fruitful. The URSI is most pleased to have been part of this venture and extends to you, the members of the Bureau, and the organizing committees for the scientific symposia its felicitations and congratulations on the excellent programme of this Assembly.

4. — Resolutions and Recommendations of COSPAR (May 1968) of interest to URSI

Decision No. 2. — Participation of Unions in COSPAR Assemblies
proposed by the Executive Council.

COSPAR, *noting*

(1) that W. G. II Panel on Interaction of the Neutral and Ionized Atmosphere congratulates IUCSTP on the broad approach that it has taken to the problems of the D and E regions, coordinating specialized means of investigation, such as space vehicles, radio sounding, and meteorological studies;

(2) the expressed desire of Union Representativee to take the opportunity of annual COSPAR Assemblies to hold meetings on special topics of common interest with COSPAR,

invites the Unions and IUCSTP to initiate proposals for such meetings at future COSPAR Assemblies.

Decision No. 5. — Lunar corner reflectors for use with lasers
proposed by the Executive Council on a suggestion of Working Group I.

COSPAR,

considering that laser ranging techniques are able to measure the great distances in space with an accuracy of a fraction of a meter, and

recognizing that distance measurements to points on the Moon can provide valuable information on the position and motion of the spin axis of the Earth, on the variations in the rotational speed of the Earth, on displacements of the Earth's crust and on the librations of the Moon,

encourages all agencies engaged in lunar landings to take the necessary action to consider the possibilities of placing one, or preferably three, well-distributed optical corner reflectors on the Moon.

Decision No. 6. — Consolidation of Radio Tracking and Telemetry, and Real Time Transmissions Groups
proposed by the Executive Council on a suggestion of Working Group I.

W.G.I Recommendation on the Reorganization and Consolidation of W.G.I Sub-Group on Radio Tracking and Telemetry (I-RTT) and W.G.II Panel on Real Time Transmissions (II-RTT).

Considering the high degree of overlap in the interests of I-RTT and II-RTT which has led to duplicated effort,

COSPAR

resolves to consolidate the above Groups into a single Sub-Group of W.G.I and

requests the Chairmen of these Groups to prepare detailed proposals for action at the 1969 meeting.

DECISION No. 7. — RECEPTION OF SATELLITE RADIO SIGNALS

proposed by the Executive Council on a suggestion of Working Groups I and II.

COSPAR,

considering

(1) the difficulties experienced by research workers in obtaining official permission to receive satellite radio signals, and

(2) the difficulties experienced in the elimination of interfering transmissions using the procedure of Art. 17 of the "International Radio Regulations",

recommends that the adhering scientific bodies of satellite owning countries which have not yet done so, request their respective competent national administrations to inform other countries through appropriate international communications channels :

(1) that satellite radio transmissions at the frequencies given in launching announcements to COSPAR may be received by scientists in any country and utilized for orbital and wave propagation studies of all kinds,

(2) that in this context decoding of telemetry signals is only allowed when such participation in particular experiments is invited specifically in an announcement to COSPAR or is directly authorized by the experimenter or experimenters concerned.

DECISION No. 8. — INTERNATIONAL REFERENCE IONOSPHERE

proposed by the Executive Council on a suggestion of Working Group II.

COSPAR,

approves the concept of an International Reference Ionosphere described in the report of the URSI-COSPAR Working Party, and offers its collaboration to URSI in this project. In this connection COSPAR invites URSI to hold a formal session at the time of the 1969 COSPAR Assembly to present and discuss material collected by that time.

DECISION No. 17. — SPACEWARN SYSTEM

proposed by the Executive Council on a suggestion of Working Group III.

COSPAR,

noting that most countries are providing advance information on their spacecraft experiments in their reports to COSPAR, that orbital information is readily available from national computing organizations, and that additional information on satellites and space probes is being provided by other channels,

requests Working Group III, through its Correspondents on SPACEWARN, to review continually the SPACEWARN system to ensure

(1) that scientists are being provided with timely information on the satellites and space probes which they require to conduct their research, and

(2) that the information being provided via SPACEWARN does not duplicate that readily available through other channels, and

(3) that suitable use is being made of mail and telegrams in providing information which it is necessary to provide through SPACEWARN in an effective and economical manner.

DECISION No. 18. — INFORMATION FOR SPACEWARN BULLETINS

proposed by the Executive Council on a suggestion of Working Group III.

COSPAR,

noting the effectiveness of the SPACEWARN Bulletin as a means of distribution of timely information on scientific satellites and space probes, and the mounting communications cost with the increasing number of launchings,

recommends that launching countries provide IUWDS with available information on the spacecraft experiments, if possible, about one month prior to launch, and also a report of satellite or space probe launchings in the format given by Appendix 2 to the COSPAR Guide via airmail within a week after launch for inclusion in the SPACEWARN Bulletins; and that the launching announcements introduced as telegrams in the SPACEWARN System (with copy by *mail* to the Secretariat of COSPAR) be shortened to include where available : the date and time of launch; approximate apogee, perigee, orbital period, angle of inclination of the orbit for satellites; expected approximate flight path for space probes and radio frequencies and approximate power.

DECISION No. 19. — PROPERTIES OF THE THERMOSPHERE UP TO 200 KM
proposed by the Executive Council on a suggestion of Working Group IV.

COSPAR,

noting the need for more data on neutral atmospheric properties in the termosphere up to 200 km,

recommends that rocket investigations in this altitude range, in particular the measurements of atmospheric composition, density and winds should be coordinated internationally in such a way as to give best coverage of these properties as functions of local time, solar activity, geomagnetic activity and latitude.

DECISION No. 20. — WIND MEASUREMENTS TO ABOUT 180 KM
proposed by the Executive Council on a suggestion of Working Group IV.

COSPAR,

noting that there is now a considerable amount of neutral wind data available up to 180 km, and also noting that the satellite results of King-Hele suggest very high winds at higher altitudes, where there are not yet very many data,

recommends that in planning future rocket research programs emphasis be placed on measurements of winds above 180 km, using chemical release or any other suitable techniques.

DECISION No. 23. — ESTABLISHMENT OF NEW WORKING GROUP VII
proposed by the Executive Council on a suggestion of the Study Group.

COSPAR,

noting that the exploration of the Moon and Planets, as well as associated ground-based observations and theoretical work, represents an expanding area of scientific activity, and

noting that it has been found necessary to include sessions on the Moon and Planets at the 1967 and 1968 meetings, even though no specific working group exists for this purpose,

resolves to establish a new working group to be known as *Working Group VII for Space-Related Studies of the Moon and Planets.*

Working Group VII is to organize meetings within COSPAR on the subject of its title, to coordinate its activities with interested Unions, particularly with Commission 16 and 17 of the International Astronomical Union and Commission V of the URSI, and to function otherwise in a manner similar to the other Working Groups.

COSPAR,

intends to leave such traditional matters as lunar and planetary nomenclature and cartography entirely to the IAU, and

establishes Working Group VII with the initial membership as appended.

PROPOSED MEMBERSHIP OF COSPAR WORKING GROUP VII
SPACE-RELATED STUDIES OF THE MOON AND PLANETS

Kuzmin A. D., *Chairman*, Lebedev Physical Institute, Moscow, USSR (Radio-astronomy).

Sagan C., *Vice-Chairman*, Center for Radiophysics and Space Research, Cornell University, Ithaca, N. Y., USA (Planetary Astronomy).

Abyzov S. S., Laboratory of Cosmic Biology, USSR Academy of Sciences, Moscow, USSR.

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Troitskii V. S., Institute of Radiophysics, Gorkii State University, Gorkii, USSR (Lunar Radioastronomy).

UNITED ARAB REPUBLIC

The United Arab Republic has been granted provisonal membership of URSI in Category 1 and formal application for membership will be submitted to the XVI General Assembly.

The formation of a National Committee is under consideration by the Ministry of Scientific Research in Cairo.

CANADIAN NATIONAL COMMITTEE

as at 11 June 1968

President : Dr. M. P. Bachynski, Research Laboratories, RCA Victor Co. Ltd, 1001 Lenoir Street, Montreal 30, Quebec.

Secretary : Mr. W. A. Cumming, Radio and Electrical Engineering Division, National Research Council of Canada, Ottawa 7, Ontario.

Chairmen of National Commissions :

Commission I : Mr. C. F. Pattenson, Radio and Electrical Engineering Division, National Research Council of Canada, Ottawa 7, Ontario.

Commission II : Dr. D. R. Hay, Department of Physics, University of Western Ontario, London, Ontario.

Commission III : Dr. J. H. Meek, Defence Research Board, A Building, DND, Ottawa, Ontario.

Commission IV : Dr. F. J. F. Osborne, Research Laboratories, RCA Victor Co. Ltd, 1001 Lenoir Street, Montreal 30, Quebec.

Commission V : Prof. V. A. Hughes, Department of Physics, Queen's University, Kingston, Ontario.

Commission VI : Dr. J. L. Yen, Department of Electrical Engineering, University of Toronto, Toronto 5, Ontario.

Commission VII : Prof. G. W. Farnell, Department of Electrical Engineering, McGill University, Montreal 2, Quebec.

Commission VIII : Mr. E. A. Walker, DRTE, Defence Research Board, Shirley Bay, Ottawa, Ontario.

Members :

Dr. L. J. L. Boulet, Quebec Hydro-Electric Commission, 75 Dorchester Blvd. W., Montreal, P. Q.

Prof. M. Boisvert, Vice-Dean, Faculty of Sciences, Laval University, Quebec City, Quebec.

Prof. R. E. Burgess, Department of Physics, University of British Columbia, Vancouver 8, B. C.

Dr. John H. Chapman, Deputy President, Defence Research Board, Ottawa, Ontario.

Dr. G. G. Cloutier, Département de Physique, Université de Montréal, Montréal, P. Q.

Dr. P. A. Forsyth, Director, Centre for Radio Science, University of Western Ontario, London, Ontario.

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Dr. C. O. Hines, Department of Physics, University of Toronto, Toronto 5, Ontario.

Dr. A. Kavadas, Director, Space Engineering Division, University of Saskatchewan, Saskatoon, Saskatchewan.

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

Mr. F. G. Nixon, Telecommunications and Electronics Br., Department of Transport, No3 Temp. Building, Ottawa, Ontario.

Mr. J. C. R. Punchard, Northern Electric Research Labs., Box 3511, Station "C", Ottawa, Ontario.

Dr. R. S. Rettie, Space Research Facilities Branch, National Research Council of Canada, Ottawa 7, Ontario.

Dr. G. Sinclair, Dept. of Electrical Engineering, University of Toronto, Toronto 5, Ontario.

Mr. R. H. Tanner, Northern Electric Research Labs., Box 3511, Station "C", Ottawa, Ontario.

Dr. H. E. Turner, Meteorological Branch, Department of Transport, 315 Floor Street, West, Toronto 5, Canada.

Dr. E. S. Warren, DRTE, Defence Research Board, Shirley Bay, Ottawa, Ontario.

Dr. J. R. Whitehead, Principal Science Advisor, Science Secretariat, Privy Council Office, East Block., Ottawa, Ontario.

NIGERIA

as at 1 July 1968

President : Professor O. Awe, School of Mathematical and Physical Sciences, University of Lagos, Lagos.

Secretary : Dr. Ebun Oni, Department of Physics, University of Ife, Ibadan.

Official members of Commissions :

Mr. A. A. Bodede, Nigerian External Telecommunications, Newcom House, 15, Marina, P. O. Box 173, Lagos (for Commissions I, II, VI and VII).

Professor N. J. Skinner, Department of Physics, Ahmadu Bello University, Zaria (for Commissions III and V).

Dr. J. A. Dawson, Department of Physics, Ahmadu Bello University, Zaria (for Commission IV).

Mr. J. O. Shotunde, Nigerian Broadcasting Corporation, Broadcasting House, Ikoyi, Lagos (for Commission VIII).

SCAR

The present membership of the SCAR Permanent Working Group on Upper Atmosphere Physics is as follows :

Chairman : T. Nagata (Japan).

Members : D. K. Bailey (USA);
L. Harang (Norway);
E. P. Heilmaier (Chile);
P. G. Law (Australia);
A. Lebeau (France);

S. M. Mansurov (USSR);
M. Nicolet (Belgium);
W. R. Piggott (UK);
O. Schneider (Argentina);
R. W. Vice (South Africa);
W. H. Ward (New Zealand).

In addition to the National Delegates, the membership of SCAR includes Permanent Delegates from URSI (F. J. Hewitt, South Africa), IUGG (V. Troitskaya, USSR) and five other ICSU Unions.

PROPOSAL FOR A LOGARITHMIC SCINTILLATION INDEX TO BE APPLIED TO SATELLITE RADIO SIGNALS

The Real Time Telemetry Panel of COSPAR WG II at its Tokyo meeting considered four papers (1) in which methods are described to determine scintillation indices, their relevant merits and practical use. After discussion the panel came to the following conclusions :

(1) One should have a basic strict definition which compares easily with the known parameters of possible statistical distributions.
(2) The definition to be adopted should cover amplitude as well as power measurements. If different from indices used before this time, the new index system should be clearly distinguished from the older one.
(3) On a trial basis a logarithmic system indicating decibels below a level of maximum scintillation is proposed. It uses, essentially, the ratio of a standard deviation, σ, to the mean value, m, for a given sample, or the sum of several samples, covering an appropriate time interval. The defining formulae are (the bar — indicating a mean) :

$$S_L = -20 \log_{10} (\sigma/m)_{|\bar{A}|}$$

with

$$(\sigma/m)^2_{|\bar{A}|} = \overline{(A - \bar{A})^2}/\bar{A}^2$$

A being the instantaneous amplitude value (proportional to the field-strength at the antenna).

(4) Experimental procedures to be applied should try to satisfy the above definition to a reasonable approximation, so that it can easily be used at stations. It is understood that, in this regard, one may replace

$$(\sigma/m)^2_{|\bar{A}|} \text{ by } (\bar{A}^2/\bar{A}^2) - 1$$

in case of amplitude determination, or by

$$(\bar{P}/\bar{p}^2_{\frac{1}{2}}) - 1$$

in case of power determination where $p = P^{\frac{1}{2}}$.

(5) The total sampling time should, on the one hand, be long enough so that the index is stationary but, on the other hand, practical limitations may preclude an upper limit, for example in the presence of Faraday fading.

(6) Standard, artificially produced scintillation records should be procured, exactly calibrated and made available to all interested stations by the undersigned.

Prof. K. Rawer,

REFERENCES

The papers by K. Bischoff and B. Chytil; Ch. Münther; V. Cappellini, P. Checcacci and M. de Giorgio; H. Whitney, C. Malik and J. Aarons are to be published in a forthcoming edition of *Radio Science*.

RADIO AURORAL NOMENCLATURE

NOTE BY ACTING SECRETARY GENERAL

The above subject was discussed by IAGA at St Gallen in September 1967 and subsequently by correspondence. As a result Dr. R. S. Unwin's Working Group of IAGA Commission VI has recently completed a set of provisional recommendations which will be reviewed again by IAGA in 1971 in the light of experience over the next two or three years. Prof. Hines (Chairman of URSI Commission III) proposes to arrange for the recommendations to be discussed at the URSI General Assembly in 1969 and the results of this discussion will be submitted to Dr. Unwin.

The full text of the IAGA document is reproduced below.

* * *

IAGA COMMISSION VI

Recommendation of Working Group on Radio Auroral Nomenclature

Composition of Working Group :

Reporter : R. S. Unwin (New Zealand).

Members : P. A. Forsyth, A. Kavadas, A. G. Namara (Canada);
P. Glöde (German Democratic Republic);
G. Lange-Hesse (German Federal Republic);
T. R. Kaiser (United Kingdom);
H. F. Bates, M. Gadsden, R. L. Leadabrand (USA);
E. A. Pomonarev, Y. U. Sverdlov (USSR).

Consultants : D. Brooks, C. Collins, G. F. Lyon, C. W. Waite (Canada);
K. Sprenger (German Democratic Republic);
J. Oksman (Finland);
L. Liszka (Sweden);
K. Bullough, D. Shipstone (United Kingdom);
R. Cohen (USA).

The general term "radio aurora" has been applied to a variety of plasma phenomena occurring in the high latitude ionosphere, usually under conditions of magnetic disturbance. At auroral latitudes magnetic disturbance at night time is usually accompanied to some degree by visual auroral display. However, many independent observations have shown that they are not necessarily in the same place. The term "radio aurora" applies to the ionization irregularities observed in the vicinity of the auroral zones and polar caps which give rise to scattering of radio waves from a ground-based transmitter in the HF, VHF and UHF bands. The amplitude of the scattered radio waves invariably exhibits a degree of sensitivity to the angle between the incident wave normal and the direction of the earth's magnetic field, and this aspect sensitivity has been interpreted as indicating that the irregularities are elongated in the local field direction. Ionization irregularities of a similar nature have been observed at middle latitudes unconnected with magnetic disturbance, and from the region of the equatorial electrojet, but are not included in the term "radio aurora", which is essentially a high latitude phenomenon. Backscatter echoes from the radio aurora are usually Doppler shifted, indicating line of sight velocities of the order of hundreds of metres per second. The term "radio aurora" was introduced by Collins and Forsyth [5].

Whatever the frequency or method of observation, all workers agree that the character of the scattered radio waves varies considerably from time to time and place to place, and a number of different classifications with different definitions have been used. At the XIVth General Assembly of the IUGG held in September/October 1967, Commission VI of the IAGA formed a Working Group specifically to deal with the subject of nomenclature, with the aim of bringing some standardization to the situation. It is hoped that future authors will use the nomenclature recommended here, which will remove some of the confusion that has existed up till now.

Until the physics of the situation giving rise to the radio aurora is understood, the nomenclature must rest to some extent on the technique of observation. If the scattering angle is defined as the angle between the vector direction of propagation of the incident and scattered radiation, we define cases where the scattering angle $> 90^{o}$ as backscatter and where $< 90^{o}$ as forward-scatter. While there are very few pulse forward-scatter measurements, there is enough experience with pulse backscatter to suggest that a meaningful division can be made between forward- and backscatter, and hence two systems of nomenclature are recommended, one for backscatter and one for forward-scatter. It is not thought that there is any fundamentally different phenomenon introduced by variation of the pulse length, though the loss of range discrimination with long pulse lengths must be taken into consideration in the interpretation. It seems that backscatter echoes obtained with long pulse lengths and with CW transmissions are essentially similar, and can be compared with backscatter echoes obtained with short pulse lengths. The same should hold true for forward-scatter, but further work is required. Ultimately it should be possible to relate forward and backscatter observations, at which time a unified nomenclature can be devised.

The radio aurora occurring in the E region has received a great deal of study over the last twenty years, but much less work has been done on the F region phenomenon which has been observed only at HF. It is considered that too little is known about the latter for any system of nomenclature to be recommended at the present time, so the recommendations below are confined to the E region radio aurora.

Although descriptive terms are desirable, they must be uniquely defined, but this has not been the case in the past. Hence it is recommended that the use of terms such as "diffuse" and "discrete", which have been defined in at least four different ways [4, 7, 8, 10] be discontinued. For backscatter observations the code B followed by a numerical subscript is recommended. For forward-scatter observations the code A is used (following partly the nomenclature of Collins and Forsyth [5]). The definitions are given in the

Tables under two headings, basic characteristics of the scattered radio waves, and typical properties of the radio aurora giving rise to the radio wave scattering. The references included are ones that contain illustrations, and in most cases precise definitions, and should be consulted before the new nomenclature is used in published work. The classifications have specifically been made without reference to local time or latitude, as it is known that the occurrence of the different types varies with both.

It is considered that the definitions are such that future workers will be able to recognize the type of radio aurora observed, though without good height discrimination it will not be possible to measure the height and thickness of the radio aurora, and with CW or very long pulse lengths it may be difficult to distinguish between types B_1 and B_3. It is important that the recommended subdivisions be used in published work only when they can be certainly recognized; if this is not possible the coding B or A should be used with a description and, if possible, illustration.

In order to increase our understanding of the radio aurora it is essential that equipment parameters and location of observations be precisely stated in published work. It is recommended that, where possible, there should be sufficient recording of appropriate type to enable the different categories of the radio aurora to be recognized. This applies particularly to pulse radars with continuously rotating antennas where it is difficult to recognize types which are easily distinguished on a range-time display.

There has been considerable variation in the past in the terminology used to describe the polarization of backscatter signals from the radio aurora. The following definitions are recommended :

Unpolarized wave	a wave whose direction of polarization varies randomly with time.
Depolarized wave	a wave whose degree of polarization is less than the degree of polarization on the transmitted wave.
Cross-polarized wave	if the transmitted wave is polarized in a given (complex) direction which may be identified with one (complex) axis in an orthogonal frame of reference, the scattered wave is cross-polarized if it has a coherent component along another axis.

The recommended nomenclature should be regarded as provisional only. The subject will be reviewed at the IAGA Meeting of the next IUGG General Assembly.

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TABLE I. — *Backscatter* (Scattering Angle > 90°)

	Basic characteristics of scattered radio waves		Typical properties of radio aurora					Observations before 1968		
Type	Duration	Fading rate[a]	Extent in range	Mean height[b]	Vertical extent[c]	Magnetic aspect sensitivity[d]	Association with magnetic disturbance	Freqn.	Name	Re
B_1	Minutes to hours	Fast	Tens to hundreds of km	112 km	< 5 km to ~ 15 km	Strong	Very strong	HF	Diffuse	2
								VHF	Diffuse	1, 4, 10
									Diffuse with structure	10
								UHF	Diffuse	8
B_2	⩽ 1 min	Fast	Usually up to 40 km, occasionally to 100 km	120 km	10 to 25 km	Strong	Very strong	HF	Discrete	2
								VHF	Discrete	1, 3, 4
									Short discrete	10
								UHF	Discrete	8
B_3	1-30 min	Fast	Up to 20 km	~ 100 km	⩾ 15 km	Strong	Strong	HF	Discrete	2
								VHF	Discrete	1, 4
									Long discrete	10
								UHF	Discrete	8

[a] Characteristic value at 50 mc/s 100 to 200 Hz, and at least for B_1 fading rate approximately proportional to frequency, but see [9].
[b] Quoted values for subauroral latitudes [10], in polar cap heights for B_2 about 105 km [3].
[c] Applies to group as a whole, extent of individual irregularities unknown.
[d] For recent experimental results on aspect sensitivity see [6] and [7].

TABLE II. — *Forward scatter* (Scattering Angle $<90^{o}$).

	Basic characteristics of scattered radio waves		Typical properties of radio aurora			Observations before 1968		
Type	Duration	Fading rate	Height	Magnetic aspect sensitivity	Association with mag. disturbance	Freqn.	Name	Ref.
A_1	1-15 min	Fast 1 to 250 Hz	$>$ 100 km but $<$ 150 km	Strong	Yes	HF VHF	A_1	5
A_2	5-30 min	Slow 0.1 to 0.01 Hz	$>$ 100 km but $<$ 150 km	Moderate	Yes	HF VHF	A_2	5
A_3	10-200 min	Slow, deep 1 to 0.05 Hz	$<$ 100 km	Weak	Yes	(HF) VHF	A_3	5
A_4	10-200 min	Slow, deep 1 to 0.05 Hz	$<$ 100 km	Weak	No (Daytime)	(HF) VHF	S	5

INTERNATIONAL URSIGRAM AND WORLD DAYS SERVICE (IUWDS)

CIRCULAR LETTER RWC-104

To : Regional Warning Centers, Associate Regional Warning Centers and National Warning Contacts (Information copies to IUWDS Steering Committee)

BROADCASTS OF SOLAR AND GEOPHYSICAL INFORMATION ON WWV AND WWVH

This circular replaces Circular Letter RWC-101 on the broadcast of the daily GEOALERT message. It provides additionally for a symbol to indicate that a proton event or magnetic storm is in progress at the time of the broadcast. The prior scheme only provided for information on proton events or magnetic storm if forecast to begin, or if one had begun, within the 28 hours before time of issue of the GEOALERT. The new scheme also provides for designating a GEOALERT "in progress", if the proton event or magnetic storm lasts for more than 28 hours. The beginning of the proton event or magnetic storm normally would have been announced in the previous GEOALERT message (or still earlier). In exceptional cases the condition may not have been recognized within the first 28 hours after the beginning and thus the first notice would be a GEOALERT "in progress" issued more than 28 hours after the beginning. *The modified system becomes effective October 1, 1968.*

The GEOALERT decisions will continue to be made at 0400 UT by the World Warning Agency (SOLTERWARN) operated by the Space Disturbance Forecast Center, Environmental Science Services Administration, Boulder, Colorado, USA. The GEOALERT for a given day is first broadcast at 0418 UT on station WWV, Fort Collins, Colorado then at 0448 UT on station WWVH, Maui, Hawaii, and at hourly intervals until the next alert is issued. In case of delay in receipt of the daily message, WWV and WWVH will be silent at 18 or 48 minutes after the hour UT, respectively, until the new message is received. The frequencies used are for
WWV : 2.5, 5, 10, 15, 20, 25 MHz; and for WWVH : 2.5, 5, 10, 15 MHz.

Each message begins with letters GEO in Morse Code and the coded information follows. This coding permits three types of information at

each broadcast : each in the form of letters repeated three times in slow International Morse Code. The first set concern the *forecast* of solar or geophysical events or the *observation* of a stratospheric warming (or the *observation* of a stratospheric warming together with a *forecast* of either solar or geophysical event). The letters which may occur in the first set and their meaning are as follows :

Ist letter set :

EEE (·) No forecast (or STRATWARM observation) statement (NIL)
III (··) FLARES expected
SSS (···) PROTON FLARE expected
TTT (–) MAGSTORM expected
UUU (··–) FLARES and MAGSTORM expected
VVV (···–) PROTON FLARE and MAGSTORM expected
HHH (····) STRATWARM observed
DDD (–··) STRATWARM observed and FLARES expected
BBB (–···) STRATWARM observed and PROTON FLARE expected
MMM (– –) STRATWARM observed and MAGSTORM expected

The second and third sets of letters refer to the occurrence of *observed* solar and geophysical events. The time of onset, or the existence, of the phenomenon is included by the letter broadcast. The coding for the time and type of event is shown in the table given below :

	Day before that of issue (hours UT)				Day of issue	In progress	Nil
	00-06	06-12	12-18	18-24	00-04		
2nd letter set : Proton event	MMM (– –)	TTT (–)	HHH (···)	SSS (···)	III (··)	GGG (– – ·)	EEE (·)
3rd letter set : Geomagnetic storm	UUU (··–)	AAA (·–)	BBB (–···)	DDD (–··)	NNN (–·)	PPP (·– ··)	EEE (·)

The letters have no significance; however, in general the older the event is at the hour the message is issued, the longer is the broadcast time of the coded symbol.

Sample messages (in International Morse Code) :

GEO SSS EEE DDD

signifies : GEO = solar geophysical message
SSS = PROTON FLARE expected
EEE = no PROTON EVENT between 0000 UT yesterday and 0400 UT today
DDD = GEOMAGNETIC STORM occurred (began) between 1800-2400 UT yesterday

GEO III GGG NNN

signifies : GEO = solar geophysical message
III = FLARES expected
GGG = PROTON EVENT in progress
NNN = GEOMAGNETIC STORM began between 0000-0400 UT today.

DEFINITION OF GEOALERT.

Flares : Among the numerous centers of solar activity, certain of them (a small number) give very many flares, with the result that because of their presence on the solar disk one can expect numerous flares of various importance. The GEOALERT "FLARES EXPECTED ONE (OR TWO)" thus signifies that one or more of these centers has been identified on the disk, and there is a good probability that numerous flares will be produced. However, it will not discriminate between "ONE" flares of less than importance two, or "TWO" flares of more than importance two, that are expected.

Protons : Certain flares (about forty per solar cycle) are accompanied by proton emission of high energy (of the order of 20 MeV) and with very intense geophysical effects. They are produced when the centers of activity take on certain configurations that one can recognize before the event itself. It is this identification which is expressed by the GEOALERT "PROTON FLARE EXPECTED". If solar protons have been observed the GEOALERT is "PROTON EVENT IN PROGRESS".

Geomagnetic storm : These are geophysical events that one observes on the average two times a month, and which during part of the solar cycle (decreasing and minimum) have the tendency to recur every 27 days, but which during maximum are associated with certain solar flares. This is the sense of the GEOALERT "MAGSTORM IN PROGRESS". The identification of flares by their optical or radio characteristic permits the prediction of geomagnetic storms. This is the sense of the GEOALERT "MAGSTORM EXPECTED".

STRATWARM : Certain stratospheric warmings in the high-latitude regions of the earth are associated with a gross distortion of the normal circulation associated with the seasons. The observation of this event corresponds to the GEOALERT "STRATWARM IN PROGRESS".

P. Simon,
Secretary
J. Virginia Lincoln,
Deputy Secretary

12 July 1968.

FLARE FORECASTING

by

P. SIMON, *Secretary, IUWDS, Meudon Observatory,*
M. J. MARTRES, *Meudon Observatory,*
J. P. LEGRAND, *Secretary, SPARMO, Meudon Observatory*

Presented by Dr. Simon in Tokyo on 11 May 1968
at the Symposium on Solar Flares

1. — INTRODUCTION

The interest in the forecasting of flare activity has grown quickly during recent years. Many solar astronomers kindly contribute to the network of the International Ursigram and World Days Service (IUWDS) and the larger countries have built up special world-wide networks to survey solar activity continuously. This interest is related to the new experiments which are being carried out in satellites and space probes, to the more general problem of the high cost of many experiments or of the reduction of the data and, in many cases, to the need to save time : the time of the scientists, the time of the computers and the time of the experiment. The forecast of solar or geophysical activity is a new component in many scientific enterprises.

2. — KNOWLEDGE OF SOLAR ACTIVITY

We must point out that fortunately our knowledge of solar activity is improving, because of the general use of new techniques : cinematographic patrol of the sun, magnetic field observations, X-ray satellites, increase of the resolving power of the telescope and radioastronomical data. Other improvements are due to a few cooperative projects such as the CSSAR

project and the Proton Flare Project. Thus the scientific background for the forecasts is better and the approach is easier than it was ten years ago.

2.1. — WHERE DOES A FLARE OCCUR ?

The flares are not distributed at random among the centres of activity [1]. Briefly, we can report that almost 80 % of the centres have no or only a few flares, and that 80 % of the flares occur in a few active centres. To identify the active flare centres, as is well known, the flares occur in the bright Hα features [2].

The magnetic classification of the spot groups is another first approach for the identification of these active flare centres [3] but the most useful feature is the complexity of the magnetic structure of the active centre itself [4, 5].

The most interesting components of this magnetic structure are the inversion lines and the strong gradients; the first bright knots of a flare appear close to the border of this inversion line [4] with some preference for the regions of bifurcation. Most of the time there are two or more knots on each side of this line [6].

The strong gradients ($\nabla H \geqslant 0.1$ gauss km^{-1}) are favourable to the appearance of a flare [7]; such a strong gradient is related to the birth and growth of several solar centres close to each other or overlapping [8].

2.2. — WHEN DOES A FLARE OCCUR IN A FLARE CENTRE ?

The most striking feature is a link with the evolution of the centre : the birth and the growth phases of a centre are very often flare-producing times. The rate of growth of the spot area is an important component of the flare activity [3]. Some relationships between flare activity, the area of the spot group, and the intensity of the field have been proposed for a proton centre [9].

More precisely for any flare, according to a qualitative study of the CSSAR material [10, 11] just a few parts of an active centre are involved in the flare occurrence. These two or three spotted or spotless evolving magnetic structures are areas of opposite polarities; the important point is that they are very close together and that they evolve exactly in the opposite way, the smallest increasing and the largest decreasing in size.

2.3. — WHAT IS THE DIFFERENCE BETWEEN ONE FLARE AND ANOTHER ?

A flare is actually a chromospheric feature and the IAU recommended taking into account the area and the brightness in deciding on its classification. However, many other events can be related to a flare occurrence : radio bursts, X-ray bursts, SID, geomagnetic storms, proton and electron

events, etc. For practically most of the time, a forecast is required for a scientific programme related to the study of one kind of these types of event. Unfortunately there is no simple link between the chromospheric classification and these geophysical events [12, 13].

Briefly, to give an example for 1957-1963, out of the 358 major flares (mostly classes 3 and 3+) 74 % were associated with a SID, 27 % with a geomagnetic storm, and 12 % with a PCA. But, on the other hand, out of 419 major SID reported during the same period, only 53 % were associated with major flares [14]. From this sample, it is clear that another factor plays an important role in these differences in "geophysical" behaviour.

Beginning with the most powerful events, the Proton Flares, we can have a first approach to this problem. The building up of a proton centre can be suspected if there is a change in the "colour" of the solar X-ray spectrum [15] or a report of low-energy protons (0.6 to 13 MeV) coming from a large part of the solar corona [16] or a small decrease in the cosmic ray flux [17].

The spectrum [18] and the magnitude of the microwave brightness of the group [19], and also details of the spot feature [20, 21] can be useful in identifying a proton centre.

More precisely, for the flare itself, the flux of the microwave burst is strongly related to the proton effect [22]. It has been pointed out earlier that any centimetric burst is related to the location of the flare close to the spots, and that there is a relationship between this flux and the spot coverage [23]. This observation implies that, at least for a proton event, the position of the flare in the magnetic field is the important factor. It implies also that when the neutral line and the strong gradients are in the "right place" between two umbras very close together, several flares occur in a group and would not be the good ones to accelerate particles [24, 24*a*].

We must also report some preference for the occurrence of proton flares near relatively large and simple evolving features [11] and for several occurrences at the same heliographic longitude distributed over a period of one year or more [25]. We shall not discuss here the effects of directivity as it has been reported by many authors [26].

The SIDs are related to flare occurrences during the growth of the sunspot groups and more precisely to certain aspects of their evolutionary features.

The relation with geomagnetic storms is more difficult to understand fully; we must be careful about the microwave burst, the metric noise storm and the existence or not of a preceding geomagnetic storm [27].

Most of this knowledge must be improved in the future with the data from new telescopes; higher resolution will clarify many things.

3. — Preparation of Forecasts

According to these views there are two main components in flare forecasting : one is related to the study of the magnetic structure and the other to an evaluation of the stage of evolution of the centres.

The study of the magnetic structure is a difficult problem. First of all we need sufficient resolving power to describe correctly the complexity of the magnetic field. The small islands of opposite polarity are interesting features for flare forecasting and we must also appreciate the strength of the gradients and locate precisely the inversion lines. To-day we must separate two points distant from 5 to 10 seconds of arc to obtain a useful magnetic map.

The simplest studies of the magnetic structure use the Zeeman effect but they give only the longitudinal component of the field. This field is not radial above the centres and some mistakes can arise from the "seeing" effect for the plage near the limb. Many optical structures, such as Calcium plages and filaments are the counterparts of this magnetic structure [8, 28] and must be used to confirm the magnetic data.

We must point out the interest in the precise location of the sunspots in relation to the magnetic structures; most of the time the magnetometer gives its best information for the weak magnetic fields (from a few tens to a few hundreds of gauss) but the fields in the spots are stronger. To identify out the high gradients, the easy way is to locate carefully the sunspots in relation to the inversion lines; it is also important to evaluate the forecast geophysical effects of the flares.

In practice, we must make a composite drawing : the magnetic field is easy to locate in relation with the Calcium plages, and the Kl data give simultaneously the locations of the plages and the biggest spots. It is easy then to complete the composite with the white-light images of the sunspots and the Hα features of the plages and the filaments. It then becomes possible to improve the indications of the magnetic structure by giving emphasis to the inversion lines and the highest gradients of the magnetic field.

Incidentally we must point out that this work can be carried out only at the observatory by experimented solar astronomers using their original material, and that the interval between the observation and the final reduction can be from two to three hours.

The evaluation of the stage of evolution of the centres is a ticklish problem. Some components of this evaluation come from the material itself : the structure of the spot groups and the brightness distribution of the Calcium plage, compact or scattered, give useful information.

From this brightness distribution, it is possible to identify the birth of new active centres in old or young plages and this is important in forecasting the evolution of the sunspot group and the building up of high gradients in the field. The brightest parts of Hα plages are good indicators for forecasts of flares : all the flares occur at these points.

Some useful information is contained in reports on the brightness distribution at centimetric and millimetric wavelengths, and on the size of the radiospots and their spectrum at these wavelengths.

Some types of information come from the continuous survey of solar activity : the flares reports and their related effects, such as noise storms on metre wavelengths, are useful signs of some evolution of the group. The fine structures also can be used with an emphasis on the movements in them.

We must point out that it is difficult to obtain reliable optical data for the survey of the solar activity. From day to day, at the same observatory, there are often differences in the quality of the seeing; with the resulting series of good and bad images, it is sometimes difficult to follow definitely the evolution of the sunspots of a centre.

4. — Exchange of Data

This last remark takes us to the problem of the exchange of data. Many data can be circulated very easily in an encoded form : the flares and their effects (SID, X-ray and radio bursts), the radio, geophysical, and coronal data, and so on. But the most important material is the information on the magnetic structure; at present we are working on this problem and during the first experiments carried out a few months ago between Meudon and Rome observatories, descriptions of magnetic structures in a simple encoded form were exchanged successfully. Such exchanges must be improved in the future, but up to now it appears that they have been very limited. The two correspondents at Meudon and Rome are experienced solar astronomers and these messages can best be used just to follow, on an overclouded day, the evolution of the active centres observed a few days before. This is a promising first step in the exchange of these very important data, but it does not change our opinion that at present this material can be successfully used for forecasting only in a solar observatory.

5. — The Forecast

The last, and not the least of the problems is related to the issue of the forecast itself. This message must help some scientist in his work : usually to help him to decide on the launching of a balloon or the turning on of a

satellite experiment, or perhaps the place to watch a flare with the slit of his spectrograph or the time of launching a manned space probe. These situations are very different from each other : the balloon would require two hours before commencing operations at its ceiling where it will stay for ten or twenty hours; the spectrograph can be used by a man in an earth satellite during only thirty usuable minutes each hour during a few days; the space probe can remain in orbit for a week or much longer. From these examples it is easy to understand why each experiment must be studied very carefully in collaboration with the forecasting experts before the stages in the issue of the alerts.

The warning centres have a standard message and a series of alerts related to some specific programmes. The message describes the solar disk with some emphasis on the flare activity; the Boulder and Meudon messages have slightly different contents, but the main common interest is a clear description of the flare activity [13]. The alert is also different : Boulder states the probability of occurrence of a given class of flare during one day : Meudon uses a sophisticated system of observational alerts [29]. The main problem is the same : to give the user a simple means of making his decision. However, although the forecast itself requires a lot of work by several experimented astronomers, the user receives only the final result of this work. The forecaster really makes a decision which is intended to be applied only by the user, and the degree of probability or the type of alert is just a conventional system for the issue of the forecast.

6. — Degree of Success

What is the degree of success of these forecasts ? Many factors contribute to the success or failure of a forecast. One factor is related to the speed of evolution of a centre. A programme may be related to weak flares; they begin to appear during the birth of an active centre and it would be very difficult to identify promptly the centre as it appears. But for the flares with definite geophysical effects, the sunspots must have attained a sufficient area and thus there is more time to issue the forecast. Another point is related to the limb effect; near the limb many data, such as the radio data, the configuration of the spots, and the magnetic data are very poor or they are impossible to obtain.

Another aspect is related to the interval between the forecast and the event. It is easy to make a forecast half a day or one day in advance, but one week or a few weeks in advance is very difficult. The main problem here is not that related to the solar rotation, which could be solved by means of a few solar satellites looking at the far side of the sun; the real problem

is that an unexpected birth can give rise to an active centre in a few days and, unfortunately, at present every solar birth is unexpected.

After one and a half years of cooperation in the forecasting of the flare-active centres and of the proton-flare centres, it seems clear that we can forecast successfully the classical flare-active centres and the classical major events, with their geophysical effects, one day in advance; but many flares would not be included in our forecasts and perhaps the flares of class one or less, and also a few important ones, but no classical events such as the cosmic event of 28 January 1967.

So as to improve this performance, we need a few large instruments with a suitable reduction programme to issue in good time the composite report on the solar disk. It would be necessary to train experienced solar astronomers with an interest in the study of solar activity and who would give part of their time to the practical work of preparing the forecasts. It would be useful to have also some satellites giving real-time transmissions to survey the X-ray spectrum and some large radiotelescopes or interferometers to give the centimetric brightness and spectrum of the active centre.

7. — Conclusion

Forty years ago, in December 1928, General Ferrié, the first President of URSI, initiated the first broadcast of a scientific warning message from the French radio station on the Eiffel Tower. A few years later several National Committees of URSI started the daily Ursigram service. We have travelled a long way since then and it is surprising now to look back at this pioneer situation at a time when the scientific background was very poor. The main interest was the problem of the propagation of the radiation from radio broadcasting stations and it was the duty of URSI to initiate this research work. Now the solar astronomers provide most of the material and the scientific background is reliable. The users include all kinds of scientists and the present problem is the new possibility of putting men or scientific experiments on board of balloons, rockets, satellites or space probes. The present interest in flare forecasting is a test of the development of the solar and geophysical sciences during the last forty years. We must admit that from 1928 until 1958 progress was very slow and that it is only during the last ten years that this new field has been opened up for our investigations. We hope that in 1978 our present efforts will appear as pioneer work.

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ICSU ABSTRACTING BOARD : GENERAL ASSEMBLY, GOSLAR, JULY 1968

REPORT BY THE ACTING SECRETARY GENERAL

1. — Introduction

Although URSI is not a member of the ICSU Abstracting Board (AB), the Union was represented at the Assembly by the Acting Secretary General who attended as an Observer. The Plenary Meeting of the Assembly was held on 11 July in Goslar/Harz (Federal Republic of Germany) and was preceded by meetings of several Working Groups and of the Executive Committee beginning on 8 July.

URSI has not hitherto had close contacts with the AB but, even though the work of the Board is necessarily rather specialised in nature, the decisions it makes and the ultimate consequences of these decisions are of interest and importance to all who use abstracts of scientific papers and who are aware of the new problems raised by the extremely rapid increase in the numbers of papers being published.

Research workers and others concerned with the wide range of disciplines covered by the URSI Commissions are invited to make contact with the Acting Secretary General of URSI if they have special interests in or opinions on the problem of making new information available to those who need it. The services provided by the member organisations of the AB can provide the information which is required by scientists only if they know what these requirements are, and if they are told when these requirements undergo changes. URSI ought to be able to contribute the views of radio scientists as a body although it is equally important for studies to be made of the requirements of many individual scientists, possibly by means of enquiries conducted through national scientific societies.

The remainder of this article is taken up with a report and comments on the proceedings of the Goslar Assembly as seen by the URSI Observer.

2. — The ICSU Abstracting Board and its Plans

The purpose of the AB is to organise and promote the exchange and publication of primary and secondary information in the fields covered by the member Unions of ICSU. The members of the AB include representatives of ICSU, of the Unions with particularly close interests in the work of the AB, and of organisations responsible for publishing specialised journals containing abstracts, summaries, etc. of papers published elsewhere; the present member organisations are responsible for Astronomischer Jahresbericht, Biological Abstracts, Bulletin Signalétique, Chemical Abstracts, Chemisches Zentralblatt, Physics Abstracts, Physikalische Berichte, and Referativniy Zhurnal.

Many of the discussions at Goslar were concerned with the early implementation of practical steps to improve the cooperation between these organisations in the preparation of the abstracts which they are to publish; at present, particular attention is being given to such steps by the journals which prepare abstracts in physics.

It is clear, however, that the AB recognises that the very rapid increase in the volume of new scientific information poses serious problems, and that it has become essential to consider new methods of storing, distributing and retrieving information which differ considerably from the traditional ones : the printing and physical distribution of primary and secondary publications, and their reading by eye. At the same time, it is admitted that, for a long time to come, the publication of papers in scientific journals will retain its place as an indispensable means of disseminating information in many branches of science.

Thus the programme of work envisaged for the future by the AB can be divided into several categories based on the approximate time-scale envisaged : short-, medium-, and long-term plans.

3. — Short-term Plans

These relate mainly to the improvement of existing services, both by internal changes within the organisations, and by the development of practical cooperative arrangements between organisations interested in the same branches of science.

A Working Group reviewed the statistics relating to the many source journals which are scanned in the preparation of abstracts of papers on physics. It appears that about 70 journals provide a large proportion of

the papers on physics abstracted by all the organisations which publish abstracts. These are referred to as the "core" journals, since they have the highest "productivity". At the other extreme, there are several thousand "tail" journals which have a very low "productivity" and which provide only a few, if any, abstracts in a given year. These are scanned by only some of the abstracting organisations.

A trial project has been initiated which is aimed ultimately at avoiding the need for more than one organisation to scan the "tail" journals. Alternatively, the scanning might be shared by the different organisations so as to avoid a large and wasteful duplication of effort.

A second trial project is intended to avoid the need for a paper to be abstracted by a separate scientist for each language. It is admitted that, for example, it is preferable to receive an English abstract, written by a German scientist with a knowldege of English, than to ask a non-expert translator to make an English translation of the German abstract.

It is intended to circulate the list of "core" journals in physics to libraries and documentation centres for their information. While this is a useful first step, it must be remembered that these journals have been identified in terms of numbers of papers only, and without regard to the subject matter. In consequence, the "core" journals tend to be those which publish many papers on a wide variety of subjects, or those with more specialised interests in a field within which many scientists are at present working. On the other hand, the method of selection of the "core" journals tends to exclude specialists journals in fields which are intrinsically important but in which fewer scientists are working.

At some future date, it will probably be necessary to identify the "core" ournals in each of several subdivisions of physics as a whole so as to avoid the anomalies resulting from the present system of selection.

4. — Medium-term Plans

These include, for example :

(*a*) the identification of the individual scientists and the organisations which use existing information services;

(*b*) the acquisition of information on how far the present services satisfy the requirements of users;

(*c*) the need to bring to the attention of the users the inherent possibilities in new methods of making information available to the user when he wants it, and in an appropriate form.

Several of the abstracting bodies have made independent studies of their users, but the techniques used have been very different and hence the results

at present available cannot easily be compared or combined with each other so as to give a more general picture of the users of abstracts.

In addition, there is some doubt as to the precise nature of the information which it is required to obtain when questionnaires are sent out, and as to the particular purposes for which the information acquired is to be used. These difficulties have led to proposals for the development of a questionnaire, based on a carefully thought-out methodology, designed to elicit the essential facts and to avoid questions which overlap in a way which confuses the person completing the questionnaire. If it is followed up, this more fundamental approach to the problem of finding out more about the users of abstracts and their needs seems likely to result in statistical and other data of greater significance than those available at present.

There was some discussion also about the most appropriate ways of distributing such questionnaires and of analysing the replies, and this matter is to receive further consideration. However, it seems necessary to conduct the enquiry in such a way as to ensure that replies are received from many of the individual active scientists who use abstracts, as well as from organisations or from groups of scientists. National scientific societies would probably provide the most direct access to the individual scientists; the Scientific Unions would normally find it necessary to address questionnaires to their national member committees and therefore this indirect approach seems less desirable.

The AB has a current contract with UNESCO which calls for the study of the users of abstracts and their requirements but, in view of the short time remaining and the limited facilities available to the AB, the responses can hardly be more than superficial in nature and a much deeper examination of these questions appears to be necessary.

5. — Long-term Plans

These are concerned with the initiation of a radical review of the needs of scientists in the information field, and the development of new techniques for the storage of information and for providing selected information on demand when required by different types of user.

The Planning and Study Group of the AB reported to the Assembly and made proposals for a complete reorganisation of the AB and its objectives. The main proposals were :

(*a*) to change the name to "International Federation of Information Services in Science and Technology" (INFIS);

(*b*) to extend the scope of the organisation to include technological information outside the interest of the ICSU Unions, and to include serious

studies of types of information, other than abstracts, and novel methods of disseminating them;

(*c*) to undertake an extensive series of investigations and studies of various kinds relating to the collection and dissemination of scientific information of all kinds in accordance with the needs of those who wish to use the information.

Under the new regime, INFIS would no longer be responsible mainly to ICSU, and it would not be concerned primarily, as at present, with the needs of the ICSU Unions; it would be concerned with technological information also and, in view of the extensive programme of investigations proposed, would necessarily have to find important sources of funds from sources other than ICSU.

At the AB Assembly, there was considerable doubt as to the wisdom of accepting the proposals of the Planning and Study Group in their present form, since those present had not had an opportunity of considering them, and also because they implied drastic changes the implications of which would require more careful study. It was agreed that the proposals should be examined in more detail by a new Working Group which would give some thought to the practical aspects of the proposals, including the allocation of responsibility for specific items, the time scales for the various investigations and the finances involved, overlap with the activities of other bodies such as the Fédération Internationale de Documentation, the International Standards Organisation, etc.

The Working Group will submit its report to the AB Executive Committee as soon as possible. If the proposals of the Planning and Study Group are endorsed without much modification, it will be necessary to convene an Extraordinary General Assembly since the proposals would entail major changes in the statutes of the AB as at present constituted.

Under ordinary circumstances, the AB would meet again in mid-1969 and the next General Assembly would be in 1971.

15 July 1968.

COLLOQUIUM ON THE SPECTRA OF METEOROLOGICAL VARIABLES

A Colloquium on the Spectra of Meteorological Variables will be held 9-19 June, 1969 in Stockholm, Sweden under the joint sponsorship of the Swedish National Committee of URSI and the Inter-Union Commission (of URSI and IUGG) on Radio Meteorology. The objective of the meeting is to bring together, for discussion, the experts from the various disciplines concerned, and thus to advance the state of our knowledge of (*a*) the fine-scale structure of the atmosphere and the mechanisms responsible for it, and (*b*) the influence of this structure on the propagation of electro-magnetic waves.

Those scientists dealing with the propagation of electromagnetic waves through the atmosphere, and with scattering from inhomogeneities in it, are concerned with the fine structure of the troposphere, and in particular with variations in temperature and humidity, to a degree of precision not normally called for in studies of the atmosphere. The result of this concern is a growing body of observational and theoretical information which allows us to discuss the question : "What are the spectral properties of the temperature, humidity, refractive index and wind speed of the atmosphere as a function of height, the underlying terrain and atmospheric stability ?" It will be particularly important to try to establish relations between these spectral properties and the profiles of the mean values; information about such relations should make it possible to predict the spectra using the normally available meteorological measurements, especially those which refer to layers. An additional question is concerned with the relation between measurements made at a point in space, and those obtained by various radio, optical and infrared techniques which, in effect, represent integrated measurements over the whole path.

The tentative programme for the Colloquium includes the following topics :

(1) Experimental studies of atmospheric structure and spectra (especially small-scale structure) :
   (*a*) near the ground,
   (*b*) at heights free from ground effects.
(2) Theoretical studies of small-scale structure.

(3) Electromagnetic techniques for fine-scale probing :
   (*a*) Methods depending on propagation beyond the horizon, e.g. tropospheric scatter, beam-swinging;
   (*b*) Radio, radar and optical methods using direct line-of-sight propagation and especially observations of amplitude and phase fluctuations.
(4) Fluid dynamics pertinent to fine-scale structure.

The meeting will include both formal scientific sessions and informal study periods. During the latter, working groups will be formed to prepare state-of-the-art appraisals on each of a number of topics, and recommendations for further research.

In order to provide maximum opportunities for interaction between participants, the colloquium will be limited to approximately 35 scientists from all parts of the world, and attendance will be by invitation only. Inquiries should be addressed to the colloquium chairman :

Dr. Bradford R. Bean, US Department of Commerce, ITSA-ESSA, Room 2223, Boulder, Colorado 80302,
or to
Dr. Folke Eklund, Forsvarets Forskningsanstalt, Avdelning 3, Research Institute of National Defence, Stockholm 80, Sweden.

23 July 1968.

SYMPOSIUM SUR LES CHAMPS MAGNÉTIQUES FAIBLES D'INTÉRÊT EN GÉOPHYSIQUE ET EN RECHERCHE SPATIALE

Un Symposium sur les Champs magnétiques faibles d'intérêt en Géophysique et en Recherche spatiale aura lieu à Paris du 20 au 23 mai 1969. Ce Colloque est organisé par la Commission VII (Radioélectronique) de l'URSI, le Comité national Français de Radioélectricité Scientifique, le Centre National d'Etudes Spatiales et la Société Française des Electroniciens et Radioélectriciens.

PROGRAMME PRÉLIMINAIRE

I. Magnétométrie au-dessous de 1 gamma.
   — Les supraconducteurs en magnétométrie (propriétés, mise en œuvre, diodes de Josephson et dérivées, etc.).

— Le bruit de fond des supraconducteurs et la limite de sensibilité des magnétomètres.
— Enceintes supraconductrices assurant un champ négligeable à leur intérieur. Problème du champ nul.
— Problèmes d'embarquement spatial pour les magnétomètres supraconducteurs (réfrigérateurs à hélium embarquables, etc.).

II. Magnétométrie au-dessus de 1 gamma.
— Magnétomètres spatiaux (progrès récents, attitude, sensibilité, largeur de bande, comparaison).
— Magnétomètres géophysiques (progrès récents, étalonnage, transport, sensibilité, largeur de bande, etc.).
— Problèmes de mesure : mesure des gradients, comparaison simultanée des champs en des points distants, analyse en temps ou en fréquence des signaux magnétiques.
— Laboratoires géomagnétiques, étalonnages, cages de Faraday magnétiques.
— Problèmes de transmission et d'exploitation de mesure : convertisseurs analogues digitaux, transmission optimale des mesures, limite entre le domaine d'évolution pseudo-statique du champ H et la bande des TBF (très basses fréquences).

Comité d'organisation

Prof. P. Grivet, Président de la Commission VII de l'URSI.
Prof. M. Y. Bernard, Président de la Commission VII de la Section française de l'URSI (CNFRS).
Prof. H. Benoit, Faculté des Sciences de Paris.
M. Laverlochère, Centre National d'Etudes Spatiales.

Secrétariat

Prof. H. Benoit, Faculté des Sciences, Paris.

SOLAR-TERRESTRIAL PHYSICS PROGRAMME

General Meeting 1969

The Secretariat of the Inter-Union Commission on Solar-Terrestrial Physics (IUCSTP) has issued a preliminary announcement about a General Meeting on the STP Programme which will be held in London in January or February 1969.

The topics for discussion include :

(*a*) The recommendations about the programme proposed by IUCSTP, a draft version of which has been published in STP Notes No. 1 (April 1968).

(*b*) The International Years of the Active Sun 1969-70.

(*c*) Revision of the CIG Guide to the Interchange of Data.

(*d*) Review of the different networks of stations which provide solar and geophysical data.

(*e*) Special problems in countries participating in the STP Programme.

Further information about the activities of IUCSTP can be obtained from the Secretary : Dr. E. J. Dyer, Jr., IUCSTP Secretariat, National Academy of Sciences, 2101 Constitution Avenue, Washington D. C. 20418.

STP NOTES

STP Notes No. 1 (April 1968) was widely distributed about the middle of June 1968 and is the first of the series to be published by the Inter-Union Commission on Solar-Terrestrial Physics (IUCSTP).

There is a summary of the history of IUCSTP since its formation in 1966, but most of this issue is devoted to outlines of the 12 research projects which have been proposed by IUCSTP. The titles and the names of the Chairmen and Co-Chairmen of the respective Working Groups are as follows :

1. Monitoring of Solar Terrestrial Phenomena :
   A. H. Shapley; N. V. Pushkov.
2. Proton Flares :
   Z. Švestka; P. Simon.

3. Disturbances in the Interplanetary Magnetic Field Configuration :
   H. Carmichael; T. Obayashi.
4. Determination of the Characteristics of the Magnetosphere :
   J. P. Heppner; V. A. Troitskaya.
5. Conjugate Point Experiments :
   J. G. Roederer; R. Schlich.
6. Electric Fields in the Magnetosphere :
   G. Haerendel; C.-G. Fälthammar.
7. Magnetic Storms and Polar Disturbances :
   D. J. Williams; J. A. Jacobs.
8. Low-Latitude Aurorae :
   G. Weill; S.-I. Akasofu.
9. Basic Structure of the Upper Atmosphere :
   F. S. Johnson.
10. Dynamics of the Upper Atmosphere :
    C. O. Hines; E. A. Lauter.
11. Ion Chemistry of D and E Regions :
    S. A. Bowhill.
12. Sudden Ionospheric Disturbances :
    J. W. King.

It is worth noting that information, prepared by IUWDS, about the World Days Programme, Geoalerts and the Abbreviated Calendar Record are now being published in STP Notes. This information was formerly published in IQSY Notes from 1963 to 1967.

Enquiries about the availability of STP Notes should be sent to the Secretary of IUCSTP at the address given above.

BULLETIN HORAIRE DU BUREAU INTERNATIONAL DE L'HEURE

Le dernier numéro de ce Bulletin (n° J24) est daté novembre-décembre 1967.

Le Bulletin est remplacé par :

1. des Circulaires D (mensuelles);
2. le Rapport annuel du BIH.

Le Rapport annuel de 1967 couvre la même période que les Bulletins J19-J24, mais a une forme abrégée. Le Rapport annuel de 1968 sera complet.

Toutes les communications doivent être adressées à : M. le Directeur du Bureau International de l'Heure, 61, avenue de l'Observatoire, Paris 14e, France.

MICROWAVE COMMUNICATION

The Third Colloquium on Microwave Communication was held in Budapest from 19 to 22 April 1966. It was organized by the Department of Technical Science of the Hungarian Academy of Sciences and the Scientific Society of Telecommunication.

Scientists and engineers from 20 countries attended the Colloquium and 107 papers were presented under the following main subjects :

1. Communication Systems Theory (21 papers).
2. Network Theory (22).
3. Electromagnetic Theory (16).
4. Microwave Theory and Techniques (29).
5. Microwave Electronics (8).
6. Systems and Microwave Measurements (11).

The full text of the papers has recently been published in a very well produced volume (1) under the supervision of Academician G. Bognár, Chairman of The Editorial Board and of the URSI National Committee in Hungary.

(1) Proceedings of the Third Colloquium on Microwave Communication, pp. 982 (Akadémiai Kiadó, Budapest, 1968). Price $ 29.50.