Bulletin nº 162 Mai-juin 1967

URSI

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CCIR :

ICSU :

ORGANISATION METEOROLOGIQUE MONDIALE — WORLD METEOROLOGICAL ORGANIZATION :

NÉCROLOGIE

L. V. Berkner

L'URSI vient de subir une grande perte par le décès de son Président d'honneur, le Dr L. V. Berkner, survenu le 3 juin 1967.

Le Dr L. V. Berkner fut, pendant de nombreuses années, un des soutiens les plus dévoués et les plus éminents de l'URSI.

Nous présentons à sa famille et au Comité national des Etats-Unis nos condoléances les plus sincères.

OBITUARY

Dr. L. V. Berkner

URSI suffered a great loss by the death of his Honorary President, Dr. L. V. Berkner, who passed away on June 3, 1967.

During years Dr. L. V. Berkner was one of the most devoted and eminent supports of URSI.

We present his family and the US National Committee with our most heart-felt sympathy.

XVIe ASSEMBLÉE CÉNÉRALE

Invitation du Comité national canadien

(*Traduction*)

Nous publions l'extrait ci-dessous d'une lettre reçue du Dr. R. S. Rettie, Président du Comité national canadien :

« Le Comité national canadien se fait un plaisir d'inviter l'Union Radio Scientifique Internationale à tenir sa XVIe Assemblée générale à Ottawa, Canada, du 18 au 29 août 1969.

Etant donné la distance entre l'Europe et le Canada, les délégués éventuels des pays européens pourraient vouloir dès maintenant explorer les possibilités d'un voyage aérien en groupe. Le Comité national canadien se tient à leur disposition pour les aider de quelque manière que ce soit à mettre au point des arrangements de ce genre.

Une première brochure d'information sera distribuée vers la fin de cette année ».

XVI[e] GENERAL ASSEMBLY

Invitation from the Canadian National Committee

We quote the following from a letter sent by Dr. R. S. Rettie, President of the Canadian National Committee :

« The Canadian National Committee is pleased to invite the International Scientific Radio Union to hold its XVIth General Assembly at Ottawa, Canada from August 18 to August 29, 1969.

In view of the distance from Europe to Canada, prospective delegates from European countries might well wish to explore the possibilities of group travel by air and the Canadian National Committee would be pleased to assist in any way it can in making such arrangements.

A first announcement for general circulation may be expected towards the end of this current year ».

URSI General Assemblies

We publish hereunder a letter sent by Prof. S. Silver, President of URSI, to the Board of Officers, the Honorary Presidents and the Chairmen and Vice-Chairmen of Commissions.

This letter deals with the organization and running of the scientific part of URSI General Assemblies.

* * *

Dear Colleagues :

This report, long delayed because of some personal matters, is a summary of the exchange of letters among us and the discussions of the Board of Officers in February on the subject of the General

Assemblies. I must first express my heart-felt appreciation for the prompt and considered responses to my letter, and I am confident that by a succession of such exchanges we shall achieve even more effective Assemblies than we have had before.

1. *Purpose and Content of the Assembly.* — In a broad sense, there seems to be agreement among us that the URSI Assembly has a quite different purpose from that of an open symposium. For some ten years we have emphasized the « review concept », to borrow from Prof. Booker's letter, namely, that the primary function of the URSI Assembly is to review progress made since the previous assembly. In fact, the concept has been interpreted rather broadly. The one formal expression it has had is the arrangement for one or two review papers for each technical session. There have been many departures from the « rules » which were set up covering discussions, contributed papers, presentations by authors vs. those by representatives and so on. It is perhaps the flexibility that has prevailed over the formal body of rules which kept the technical programs from being sterile by virtue of being repetitions of material already published or presented at other meetings.

Prof. Booker has written quite incisively about this aspect of the Assembly and I am appending a copy of the pertinent section of his letter to this report (Appendix I). I certainly agree with him that the technical sessions should have depth, that a review which is nothing more than a recounting of activities is of little interest or even of use to the participants. I suggest, however, that a critical review which makes an assessment of the state of the subject and points to new lines of research is most desirable and appropriate to the nature of the General Assembly. It is extremely important that we have further exchanges of ideas on this subject.

2. *Attendance — National Delegations.* — My letter seems to have generated a misunderstanding on the point of national delegations. I did not intend to promote nationalism in science. My point was that the character of the Assembly and the nature of the technical sessions are necessarily conditioned by the fact that attendance at the Assembly is limited to members designated by the *National Committees* and that there is a well-established agreement among the National Committees that the delegations

will be quite restricted in size. We are very careful to respect prerogatives of each National Committee in naming members of its delegation. As a result, the organization of a technical program is not a free-for-all and we do not always get the actual research man whose is of primary interest to the Assembly.

The Board of Officers were quite firm about the position to be taken by URSI on this point. The emphasis is on representation of the work in the various member countries. The open solicitation of papers is, therefore, ruled out of the procedures and by the same taken the delegates who are present at an Assembly should regard themselves as spokesmen not only for their personal research work but for that done in their country at large. This does not mean that a member of one country may not speak about the work in another country. We do observe certain courtesies regarding the reading of papers by one national for a national of another country but these courtesies are not restrictive on discussions in any way.

3. *Choice of Topics.* — The selection of topics for the 1969 General Assembly will be made by the Coordinating Committee when it meets in Brussels in the spring of 1968. There were several interesting suggestions put forth in your letters regarding the topics and how the technical sessions should be built around them. I shall not try to summarize these discussions at this point because it is difficult to distill a guiding principle out of the material I have. Allow me to defer this to a future communication. One recommendation that several of you made is very significant : The National Committees should discuss within their own meetings topics for the General Assembly, and their official members for each commission should correspond with their counterparts in other countries on topics and special objectives for the 1969 Assembly. I urge the chairmen of our international commissions to spur this exchange of views.

4. *Joint Sessions.* — My request or proposal for more joint sessions was in no way an expression of condemnation of any commission. I would say, quite to the contrary, that we have done extremely well. The sessions of the Munich Assembly were quite broad in scope and we had a good body of joint sessions. What I was proposing is that we try to develop more interchange among our Commissions. We should not be a collection of eight

societies, and I simply want to seek out those problem areas that call for concerted activity on the part of all groups of our Commissions. I feel that we shall have more exciting sessions as a result of such planning.

5. *Scheduling.* — A most important point was raised by Prof. Hines regarding the scheduling. He proposes that technical sessions be held in the mornings; that there be no formal schedules for the afternoons so that discussion groups and *ad hoc* working parties can be formed and be able to meet easily without conflicts. The Board approved this idea enthusiastically and also directed me to work with the Canadian National Committee in a program schedule which will avoid conflicts between administrative sessions and technical sessions and also which will lighten the load of social events to allow again more time for scientific exchanges.

6. *Publications.* — This subject deserves a report of its own and I shall make a report to you on the *Progress in Radio Science*, 1963-66, in the near future. We must come to grips with this subject. We have shown that it is possible to publish the proceedings quickly. The present volumes are not of the best quality by far but we can easily make a tremendous improvement without loss of time, if all concerned will cooperate. The cost, however, will be much greater; I underestimated my costs by a very large amount.

One important point to consider if we decide to continue the publications is how to make the summaries of the discussions more meaningful. Here I wish to quote a proposal from Prof. Gordon to the effect that we set up working groups for each session who will consolidate the discussion and, further, make an assessment of the state of the subject and the directions for further research as they evolved in the course of the session.

There are many other significant points in your letters which I must gather and report on to you collectively. However, this will be a starting point for the next exchange of ideas and I urge you to consider these matters again and let me hear from you by July 31. I am sure I shall see many of you at the IQSY-COSPAR Assembly in London (July 17-29). If you would let me know your plans for attending the Assembly, I shall try to arrange a meeting and, thus, we shall get a head start on the work of the Coordinating Committee.

My apologies to all of you for the unfortunate delay in my reporting to you. I want to thank you again for your interest and support.

Best personal regards.

Sincerely,

Samuel SILVER,
President.

May 19, 1967

APPENDIX I. — *Professor Booker's Remarks*

The first few assemblies after World War II were small by current standards. There was almost no preparation by commission chairmen before the assembly started. A scientific program was made up on the first day in the light of the people actually attending and the papers that they had in their brief cases. Some poor presentation took place, but the worst were eliminated by ruling that no paper could be presented except by the author himself. The best presentations were, however, outstandingly good since they consisted of original thought about current problems by some of the best people in radio science. The original work presented during those assemblies made up, in my opinion, for the lack of prior organization. Publication of the material was in the scientific literature in the usual way.

As assemblies got bigger the lack of prior organization lead inevitably to an unsatisfactory situation. One suggestion was to separate the technical and administrative aspects of an assembly in the way that IUPAP did, and I suppose still does. According to this suggestion, the technical program would become a symposium, and the assembly proper would be reduced to a day or two of administrative meetings, probably immediately following a symposium. Such a radical change was unacceptable to many people, and the compromise that emerged is basically the one that we are still operating. The technical program associated with an assembly would continue, but it would be concerned with reviewing the past three years. Original work would be left to symposia. It is on the basis of this compromise that the elaborate program of progress reports to and from the assembly has been built.

In practice, the « review concept » of assemblies has not worked out as badly as was feared by some of us. This is because, following the review paper, a session can be operated in such a way as to permit the presentation of current research in the usual way. There is, in fact, no objection to the idea of beginning a session with a review paper, so long as the session then departs from the purely review concept. To make the session a scientific success, however, it is necessary to arrange at the assembly for original contributions to be presented in a manner more or less contrary to URSI instructions.

In short, what has happened is that the concept of assemblies existing shortly after World War II has been preserved but a large amount of review paper work has been superimposed. The administrative machinery is concerned with this paper work, but the typical young delegate is interested in the original contributions and discussions that are inserted into the program more or less illegally.

The idea convassed in the 1950's of putting the original contributions into symposia was largely forgotten. The concept of symposia was revived for Belgrade, but for quite a different reason, namely, the overlapping interests of four ICSU bodies.

Where do we go from here ?

I suggest that scientific meetings can be classified by function somewhat as follows :

1. Meetings to present papers and hold somewhat superficial discussions involving all people who can afford to attend.
2. Meetings to present papers and hold rather deep discussions involving only participants selected by invitation.
3. Meetings to discuss a general area (e.g. radio science).
4. Meetings to discuss specific topics (e.g. ionospheric drifts).
5. Meetings to organize group experiments (e.g. IQSY).
6. Meetings to maintain an identifiable scientific structure to which Governments can contribute support (e.g. ICSU).

A symposium, as currently understood, performs functions 1 and 4. An URSI type assembly performs functions 3 and 6, and could perform function 2. An IUPAP type assembly performs function 6 alone. COSPAR is supposed to perform functions 5 and 6 but in practice it becomes involved in all of the functions listed.

It would be possible to have a symposium that performed function 2 but, for some reason, this is not internationally customary. Nevertheless, scientific meetings aimed at deep discussion are known to be quite successful provided that attendance is strictly limited to people who have a major contribution to make. This suggests that, in contrast to an open symposium, the technical program at an URSI assembly could aim at exploiting the potentialities of participation by invitation only. On this basis, the « review concept » of an assembly would be de-emphasized and each country would be encouraged to send to an assembly :

1. Its research workers (mostly young) who are unusually active in radio science, who can participate deeply in original thought and discussion about the commission topics, and who can assure that assemblies perform function 2.
2. Its scientific organizers in radio science who can assure that the assembly performs function 6.

Of course, there would be no real necessity for the active research workers involved in function 2 to meet at the same time and place as the scientific organizers involved in function 6. However, I see no objection to coincident meetings; in fact, it is almost certainly a good idea.

If this were done, what would be the effect on future URSI assemblies ? Probably not very much. The emphasis on review paper work might decrease somewhat. National committees would be better able to justify sending young, active research workers. The contemporary scientific discussion that, in fact, takes place in assemblies would be legitimized and even encouraged. All this seems to me desirable, but scarcely revolutionary. The only pit to be avoided would be the publication of original scientific papers by URSI instead of by the regular scientific journals. I believe that we should play up the URSI assembly as an opportunity for discussion in depth by an invited audience, and play down the « review concept » of an assembly that has dominated the last decade.

NATIONAL COMMITTEES

USA

1967 FALL MEETING

Call for papers

The 1967 Fall Meeting sponsored by the US National Committee of URSI, October 16-18, 1967, will be held in conjunction with the 1967 IEEE International Antennas and Propagation Symposium, October 17-19, 1967, at The University of Michigan, Ann Arbor, Michigan. URSI and IEEE G-AP technical programs will be separately arranged except for appropriate coordination. Papers are solicited in all theoretical, experimental and development fields of interest to

the following URSI Commissions :

1. Radio Measurement Methods and Standards.
2. Radio Propagation in Non-Ionized Media.
3. Ionospheric Radio.
4. Magnetospheric Radio.
5. Radio and Radar Astronomy.
6. Radio Waves and Transmission of Information.
7. Radio Electronics.

G-AP under the following topics :

Antennas.
Electromagnetic Theory.
Radio Wave Propagation.
Scattering and Diffraction.
Radar Astronomy.
Radio Astronomy.
Plasma Physics.
Radio Physics.

Authors are invited to submit, in duplicate, 200 word abstracts of papers for presentation at URSI sessions to : Dr. Thomas B. A. Senior, Radiation Laboratory, The University of Michigan, 201 Catherine Street, Ann Arbor, Michigan 48108.

Authors are invited to submit 400 to 600 word summaries of papers for presentation at G-AP sessions to : Dr. Thomas B. A. Senior, Radiation Laboratory, The University of Michigan, 201 Catherine Street, Ann Arbor, Michigan 48108.

Deadline for receipt of URSI abstracts is August 1, 1967.

Please state Commission preferences.

Deadline for receipt of G-AP summaries is July 1, 1967.

N. B. special instructions below.

Additional instructions for G-AP authors :

Summaries only of accepted papers will be printed in the symposium digest. An author will therefore retain the right to submit his complete paper to a journal of his choice, such as the IEEE Transactions for formal publication. The original and two copies of a summary should be submitted in final format, according to the following requirements, to permit direct processing for printing.

The text should be typed elite type, single spaced on white 8-½ × 11″ paper. The title should be centered in capital letters one inch from the top of the first page. The authors and complete organization affiliation should be two lines below the title and the text should start four lines below this. Left and right hand margins should be 1-½ inches. A one inch margin should be left at the top and bottom of all pages. A maximum of 6 illustrations is acceptable. Line illustrations should be prepared with the same margins as the text; photographs should be glossy prints of convenient size. Use a double space between paragraphs. No exceptions please !

If you wish to receive an advance program or other information on meeting arrangements, please contact Mr. A. L. Maffett, Conductron Corporation, P. O. Box 614, Ann Arbor, Michigan 48107.

ANNOUNCEMENT OF A SPECIAL ISSUE OF RADIO SCIENCE ON ANTENNA ARRAYS

A special issue of Radio Science devoted to the subject of the Theory of Antenna Arrays is planned. Papers will be welcomed

which deal with new mathematical methods for analyzing or synthesizing antenna arrays. These may be :

(*a*) of the aperture type or have discrete elements;

(*b*) one dimensional or multidimensional;

(*c*) located in free space or in a special environment.

Concise articles discussing special applications of array theory such as in Radio Astronomy are also welcome.

Manuscripts intended for consideration should be submitted to the Guest Editor, (M. T. Ma, Radio Science, Environmental Science Services Administration, Boulder, Colorado 80302) as soon as possible, but before October 31, 1967. The manuscripts should be prepared in accordance with the Instructions to Authors in a current issue of *Radio Science*. Papers which are less than 15 typewritten pages in length will be given special preference. To facilitate editorial planning it would be appreciated if prospective authors would submit a short abstract or summary of their paper to the Guest Editor at their earliest convenience.

RADIO SCIENCE

CONTENTS OF VOL. 2, Nº 4, APRIL 1967

USSR

A. S. POPOV GOLD MEDAL CONTEST

The Academy of Sciences of the USSR announces the Contest for A. S. Popov Gold Medal

A. S. Popov Gold Medal is awarded for distinguished scientific works and inventions in the field of radioengineering and electronics.

The medal is awarded both to the Soviet and Foreign scientists. The Gold Medal is awarded only to one competitor for best original scientific work or for series of works of great scientific value, for distinguished discoveries or inventions.

The papers can be submitted by research and educational institutes, design offices, scientific societies, by academicians, corresponding members and foreign members of USSR Academy of Sciences.

For the A. S. Popov's Gold Medal Contest are to be submitted : inventions in triplicate; a testimonial of the scientific value and the importance of this work for the progress of science and engineering, it should be appended by a brief biografical note of the author with a list of main scientific papers and inventions.

The papers with the inscription « For the A. S. Popov Gold Medal Contest » should be addressed to the Academy of Sciences of the USSR, Moscow B-71, Lenin Prospekt 14. The Division of General and Applied Physics.

The deadline for submitting papers — February 1, 1968.

Presidium of the USSR,
Academy of Sciences.

COMMISSIONS AND COMMITTEES

Commission I on Radio Standards and Measurements

SYMPOSIUM ON LASER MEASUREMENTS

A symposium on laser measurements will be held under the auspices of URSI Commission I in Warsaw on the 16th, 17th and 18th September, 1968, at the invitation of the Polish National Committee of URSI and the Polish Academy of Sciences.

The secretary of the local organizing committee is Dr. S. Hahn and the address is : Komitet Narodowy URSI, Warsaw, IPPT, Swietokrzyska, 21.

Those wishing to participate are asked to notify the secretary by 1st February, 1968 and abstracts of papers should be sent to the Chairman Commission I, URSI (Dr. L. Essen), National Physical Laboratory, Teddington, Middlesex, United Kingdom. Full details of the symposium will be published later by the Polish organizing committee.

LETTER TO OFFICIAL MEMBERS OF COMMISSION I

Standard frequency transmissions

Dear Colleague,

In accordance with Recommendation 1.3 of the XVth General Assembly, I propose to call a meeting on September 19th to 21st, 1967. The meeting will take place in Brussels through the courtesy of the General Secretary.

The discussions will be of an informal and technical nature and participation should be limited to at most two representatives from each agency responsible for a standard frequency service in Europe.

Representatives are invited to submit items for the agenda and any comments they wish to make for distribution. The general object of the meeting is to discuss European co-operation in achieving a satisfactory service in the European area, without interference and unnecessary duplication.

In the European area the following stations are in operation :

	MHz				KHz
MSF Rugby	2.5	5	10		60
EFH Paris	2.5				
IAM Rome		5			
IBF Turin		5			
RWM-RES Moscow		5	10	15	100
OMA Prague	2.5				50
HBG Prangins					75
HBN Neuchatel		5			
DCF77 Mainflingen					77.5

In addition a number of communication transmitters are closely controlled in phase. Examples are GBR 16 KHz, Droitwich 200 KHz and the Omega station in Norway. The latter station and several Loran-C stations are the responsibility of USA agencies.

The subject is, of course, of continuous interest to CCIR and a copy of this letter is being sent to the Director, CCIR and the Chairman, Study Group VII.

Yours sincerely,

L. Essen,

Chairman, Commission I,
National Physical Lab.,
Teddington, Middlesex,
United Kingdom

May, 1967

Commission III on the Ionosphere

INDICES FONDAMENTAUX DE LA PROPAGATION IONOSPHÉRIQUE

(Extrait du *Journal des Télécommunications*, Vol. 34, nº 5, mai 1967)

Les tableaux ci-après, contenant les valeurs des indices fondamentaux de la propagation ionosphérique, ont été établis par le Secrétariat spécialisé du Comité consultatif international des radiocommunications (CCIR) conformément à la résolution 4-1, à l'Avis 371 et au rapport 246-1 de la XIe Assemblée plénière du CCIR (Oslo, juin-juillet 1966).

VALEURS OBSERVÉES :

● R_{12} (moyenne glissante sur douze mois du nombre de taches solaires) :

Année \ Mois	1	2	3	4	5	6	7	8	9	10	11	12
1965	12	12	12	13	15	15	16	17	19	21	23	25
1966	28	31	34	37	41	45	50	56	63	67		

● I_{F_2} (indice ionosphérique)* :

Mois (année 1966).

1	2	3	4	5	6	7	8	9	10	11	12
15	20	34	37	46	54	54	53	42	46	64	68

Mois (année 1967)

1	2	3	4	5	6	7	8	9	10	11	12
78	93	113	114								

(*) Pour plus de détails, voir le Journal des Télécommunications (avril 1964, page 119, et janvier 1966, pages 43-47).

● Φ (flux du bruit solaire moyen mensuel) ** :

Année \ Mois	1	2	3	4	5	6	7	8	9	10	11	12
1966	88	84	90	97	98	96	107	106	111	109	113	125
1967	148	147	161	130								

(**) Renseignements obligeamment fournis par le « National Research Council », Ottawa.

PRÉVISIONS :

● R_{12} *** :

Année \ Mois	5	6	7	8	9	10
1967	84	87	91	94	98	101

(***) Renseignements obligeamment fournis par le professeur Waldmeier, Observatoire fédéral de Zurich.

Estimation de l'erreur sur les prévisions, six mois d'avance, de R_{12} : $\pm$ 25.

Note : Les valeurs de R_{12}, I_{F_2}, les prévisions de Φ et l'erreur moyenne sur les prévisions de I_{F_2} et de Φ sont calculées, à partir du mois d'avril 1967, à l'aide de l'ordinateur de l'UIT.

● I_{F_2} ****

Année \ Mois	4	5	6	7	8	9	10
1967	106	103	107	112	116	120	(124)

(****) Renseignements obligeamment fournis par le « Department of Scientific and Industrial Research, Radio and Space Research Station », Slough.

La valeur prévue six mois à l'avance est donnée entre parenthèses.

Erreur moyenne sur les prévisions de I_{F_2} basée sur les 12 mois précédents :

Temps de prévision (mois)	0	1	2	3	4	5	6
Erreur moyenne	—8,3	—11,9	—13,4	—14,5	—14,9	—14,9	—14,6
Ecart-type de l'erreur	±9,5	±12,1	±12,5	±12,7	±12,3	±11,7	±12,1

● Φ *****

Année \ Mois	5	6	7	8	9	10	11	12	1	2
									1968	
1967	158	(164)	(171)	(177)	(184)	(191)	(199)	(207)	(215)	(223)

(*****) Prévision selon une méthode d'extrapolation envisagée au Secrétariat du CCIR en application de la Résolution 30 de la XIe Assemblée plénière du CCIR (Oslo, 1966). Pour les valeurs mises entre parenthèses, l'erreur dépasse probablement la valeur de ± 10 unités de Φ.

Erreur moyenne sur les prévisions de Φ basée sur les 12 mois précédents :

Temps de prévision (mois)	0	1	2	3	4	5	6	7	8	9
Erreur moyenne	—0,4	—1,3	—3,3	—5,2	—6,7	—8,7	—10,8	—13,3	—16,6	—19,9
Ecart-type de l'erreur	±12,5	±12,5	±13,6	±12,3	±11,6	±11,4	±13,1	±13,5	±15,6	±16,0

BASIC INDICES FOR IONOSPHERIC PROPAGATION

(Reprint from *Telecommunication Journal*, Vol. 34, nº 5, May 1967)

The following tables, giving values of the basic indices for ionospheric propagation, have been prepared by the Specialized Secretariat of the International Radio Consultative Committee (CCIR) in accordance with Resolution 4-1, Recommendation 371 and Report 246-I of the XIth CCIR Plenary Assembly (Oslo, June-July 1966).

PARAMETERS :

● R_{12} (smoothed mean, over twelve months, of the number of sunspots observed) :

Year \ Month	1	2	3	4	5	6	7	8	9	10	11	12
1965	12	12	12	13	15	15	16	17	19	21	23	25
1966	28	31	34	37	41	45	50	56	63	67		

● I_{F_2} (ionospheric index) * :

Month (year 1966).

1	2	3	4	5	6	7	8	9	10	11	12
15	20	34	37	46	54	54	53	42	46	64	68

Month (year 1967).

1	2	3	4	5	6	7	8	9	10	11	12
78	93	113	114								

(*) For further details, see the Telecommunication Journal, April 1964, page 119, and January 1966, pages 43-47.

● Φ (monthly mean value of solar noise flux) ** :

Year \ Month	1	2	3	4	5	6	7	8	9	10	11	12
1966	88	84	90	97	98	96	107	106	111	109	113	125
1967	148	147	161	130								

(**) Data kindly supplied by the National Research Council, Ottawa.

FORECASTS :

● R_{12} ***

Year \ Month	5	6	7	8	9	10
1967	84	87	91	94	98	101

(***) Data kindly supplied by Professeur Waldmeier, Federal Observatory, Zurich.

Estimated error in forecasts of R_{12} six months in advance : $\pm$ 25.

Note : R_{12} and I_{F_2} values, Φ predictions and mean error in I_{F_2}, and Φ predictions were calculated as from 1967 with the aid of the ITU computer.

● I_{F_2} ****

Year \ Month	4	5	6	7	8	9	10
1967	106	103	107	112	116	120	(124)

(****) Data kindly supplied by the Department of Scientific and Industrial Research, Radio and Space Research Station, Slough.

The figure in brackets is the value forecast six months in advance.

Mean error in I_{F_2} predictions calculated over the 12 preceding months :

Periods of prediction (months)	0	1	2	3	4	5	6
Mean error	—8.3	—11.9	—13.4	—14.5	—14.9	—14.9	—14.6
Standard deviation of the error	±9.5	±12.1	±12.5	±12.7	±12.3	±11.7	±12.1

● Φ *****

Year \ Month	5	6	7	8	9	10	11	12	1 1968	2
1967	158	(164)	(171)	(177)	(184)	(191)	(199)	(207)	(215)	(223)

(*****) Prediction by a method of extrapolation devised by the CCIR Secretariat, pursuant to Resolution 30 of the XIth CCIR Plenary Assembly (Oslo, 1966). For the values in brackets, the error probably exceeds the value of ± 10 units of Φ.

Mean error in Φ predictions calculated over the 12 preceding months :

Period of prediction (months)	0	1	2	3	4	5	6	7	8	9
Mean error	—0.4	—1.3	—3.3	—5.2	—6.7	—8.7	—10.8	—13.3	—16.6	—19.9
Standard deviation of the error	±12.5	±12.5	±13.6	±12.3	±11.6	±11.4	±13.1	±13.5	±15.6	±16.0

INTERACTIONS BETWEEN THE NEUTRAL AND THE IONIZED PARTS OF THE ATMOSPHERE

Cospar Information Bullelin (nº 36 February 1967) contains a complete and condensed report of the 1966 COSPAR Symposium on the interactions between the neutral and the ionized parts of the atmosphere (Vienna, May 1966).

The report drafted by Dr. J. W. King, consists of seven sections which are :

Section 1. — Neutral atmosphere and apparent ionosphere motions (Discussion leader : Prof. C. O. HINES).

Section 2. — Wind shears and the sporadic-E layer (Discussion leader : Dr. J. D. WHITEHEAD).

Section 3. — Stratosphere — ionosphere coupling effects and turbopause changes (Discussion leader : Dr. E. A. LAUTER).

Section 4. — Stratosphere — ionosphere coupling effects and turbopause changes (Discussion leader : Dr. F. S. JOHNSON).

Section 5. — The Working Group II Panel on the interactions between the neutral atmosphere and the ionosphere.

Section 6. — Recommendations accepted by Working Group II of COSPAR as a result of proposals from the Panel on the interactions between the neutral atmosphere and the ionosphere.

Those recommendations read as follows :

COSPAR WORKING GROUP II,

noting the importance of ground-based measurements for continuous monitoring of the upper atmosphere and detection of atmospheric coupling effects, and that the understanding of physical and chemical processes for direct and indirect measurement is quite insufficient for some height regions,

recommends

(*a*) that the interactions between the neutral and ionized parts of the atmosphere be explored on a broader scale by both rocket and ground-based methods, including both short and long-term variations and,

(*b*) that available rocket results be used for better interpretation of the ground-based measurements, and that rocket launching sites may become prime stations for ground-based networks.

COSPAR Working Group II,

noting that considerable progress has been made in the understanding of the sporadic-E phenomenon through coordinated rocket and ground-based measurements of neutral winds and electron densities,

recommends :

(*a*) That observers combine, wherever possible, simultaneous measurements of additional parameters such as ion composition and magnetic field and,

(*b*) that such experiments be accompanied by similar measurements on occasions when sporadic-E is absent.

Section 7. — Suggestions and recommendations passed to the Panel by individual scientists.

Those were as follows :

This section contains suggestions on a variety of topics from individual scientists. The Panel welcomes suggestions on topics relevant to the work of the Panel, and believes that these suggestions should generally be released for discussion. Publication in the COSPAR Bulletin does not necessarily i dicate that the Panel agrees with the suggestions. From time to time the Panel will discuss the suggestions and make appropriate recommendations to Working Group II of COSPAR. The suggestions received to date are as follows :

1. — *The turbopause* (F. S. Johnson).

To develop a more complete understanding of the region around the turbopause, additional measurements are needed. Some of the measurements that should prove useful include the following :

(*a*) Vertical profiles of atmospheric composition above 100 km with improved accuracy and with emphasis on He, Ar, O, and N_2. It is also necessary to obtain composition data below 100 km, particularly the atomic oxygen concentration.

(*b*) Vertical temperature profiles in the lower thermosphere with sufficient accuracy to accurately evaluate the heat transfer associated with given rates of eddy transfer.

(*c*) Horizontal patterns of atmospheric composition near 200 km to indicate the horizontal patterns of vertical mixing near 100 km.

(*d*) Improved vapour cloud dissipation studies optimized for determination of diffusion rather than winds.

2. — *Ionospheric-stratospheric coupling effects; ground-based and rocket-borne experiments* (E. A. LAUTER).

It appears from the recent results of ionospheric-stratospheric coupling effects, mainly received from ground-based measurements, that the radio methods (A3 measurements and LF- and VLF-phase observation) will become a much more useful tool if comparisons between ground-based and rocket experiments are made on a suitable scale.

The following experiments seem to be desirable :

(*a*) Comparison of rocket-borne plasma probe experiments with a multi-frequency absorption experiment (A3 or A1) at the launching site, both for normal and disturbed periods, and for daytime and sunrise conditions.

(*b*) More complex rocket experiments which give not only the plasma structure but also, at the same time, information about the neutral gas density, temperature and composition, and also about the distribution of minor constituents in the altitude range 60-100 km.

(*c*) Especially needed for investigating the winter anomaly apparent in the behaviour of the mesopheric plasma are data about winds in the transition region between the thermo- and mesopheres.

(*d*) It is desirable that a continuous patrol of ionospheric plasma behaviour should be made in future on a network basis with radio methods such as radio-wave absorption and VLF phase measurements, especially if there is a rocket-launching station (for stratospheric and mesospheric investigations), available in the network. Measurements in low latitudes should be especially encouraged.

3. — *The neutral wind* (J. W. WRIGHT).

In view of the fact that many laboratories are undertaking measurements of neutral winds by photographing chemical trails and that all the available information from these experiments is not generally extracted, it seems desirable that, in future, wind data should be obtained throughout the whole observable lifetime

of the trails (rather than only the first few minutes as at present), in order to obtain information about the time changes or divergence of the wind. If possible, regions of globular *vs* laminar structure should be stated, and the average globular structure size (or other parameters of the structure) should be given.

4. — *Neutral wind profils* (J. W. WRIGHT).

Since little is known about vertical movements or about daytime neutral wind profiles, it may be worth considering how greater use could be made of the point or puffed trails. Further, the development of neutral wind profile methods during daytime should be strongly encouraged.

5. — *Scheduling of trail experiments* (J. W. WRIGHT).

Since the dominant gravity wave periods in the E region are 50-150 minutes, it seems desirable that trail experiments should on occasions be scheduled at intervals of less than one hour.

6. — *Scheduling of vapour-trail releases* (C. O. HINES).

High-altitude neutral vapour-trail releases, for the study of winds, should be launched whenever possible in succession with (at most) a one — or two-hour separation between firings, in order to resolve tidal from shorter-period gravity-wave components.

7. — *The study of global circulations* (C. O. HINES).

Extension of the Meteorological Rocket Network to provide greater geographical coverage should be encouraged, in order to ensure that the properties being studied are characteristic of global circulations, or, alternatively, to establish the geographic variations that exist.

8. — *The need for data from greater heights* (C. O. HINES).

Extension of the Meteorological Rocket Network upward in height, to at least 100-120 km, should be encouraged, in order to permit closer comparison with ionospheric observations and in order to investigate more carefully the role of meridional circulation with its attendant vertical movements.

9. — *Stratospheric circulation data* (C. O. HINES).

More extensive balloon soundings of the stratospheric circulation should be encouraged, with special emphasis on a chain of stations

distributed along a circle of latitude (or on a series of long-lived circumpolar balloons), in order to determine with greater certainty the spectral distribution of planetary waves.

10. — *Measurements needed in conjunction with wind measurements* (C. O. HINES).

Thermospheric wind measurements should be accompanied, when possible, by measurements of pressure or temperature variations with height, in order to check on the theoretical relationships between these parameters and the winds. Density measurements if sensitive to fluctuations of only one percent or so, should be included for the same purpose.

11. — *Measurements of turbulence* (C. O. HINES).

The intensity of turbulence beneath the turbopause, and the level of the turbopause, should be monitored systematically to establish the diurnal and seasonal variations. Their geographic (or at the very least, their latitudinal) variations should also be established. These temporal and spatial variations should be linked to compositional changes at higher lewels, and to the wind shears in the immediate vicinity of the turbulence.

12. — *Simultaneous wind and drift measurements* (C. O. HINES).

Many more simultaneous measurements of wind and of ionospheric drift motions at the same altitude should be undertaken, for altitudes both below and above the turbopause.

13. — *Comparison of neutral winds and spaced radio receiver drifts* (J. W. WRIGHT).

Since the comparison of neutral winds and spaced radio receiver drifts using sporadic-E reflections leads to interesting results, it would be dersirable to extend these measurements to a regime in which the neutralionized coupling is distinctly different. Perhaps TMA or Na trails should be used at night to give neutral winds up to 200 km for direct comparison with spaced radio receiver drifts from lower F-region reflections.

14. — *The data most needed by sporadic-E theorists* (J. D. WHITEHEAD).

The data most needed by theorists would come from an experiment in which ion composition, electron density and tempera-

ture, magnetic field (to give current flow) and neutral winds were measured simultaneously. A minimum of two sets of measurements should be taken, one in which strong sporadic-E had been observed for a few hours covering an area within a few hundred kilometers of the launching site, and the other in which no sporadic-E had been observed for a few hours within the area.

15. — *The type of ground-based measurements of sporadic-E required* (J. D. WHITEHEAD).

It seems that the disagreement between the experimental results for the association between wind shears and electron density is either the result of non-simultaneity, or because the sporadic-E present may have been remnants of clouds formed before.

Experiments should, therefore, be designed to measure winds and electron density as nearly as possible at the same place and time. Also, the full history of the sporadic-E must be known; the use of a single ionosonde does not satisfy this latter condition completely. It would be more satisfactory to have a network of at least three ionosondes spaced about 40 km apart so that it would be possible to distinguish between a sporadic-E cloud drifting into the region and one developing within the region.

16. — *Daytime sporadic-E studies* (J. D. WHITEHEAD).

Studies of daytime sporadic-E are as important as night-time sporadic-E experiments. It is recommended therefore, that great effort be put into development of wind measurements during daytime. Ion composition experiments, with and without sporadic-E, up to 140 km during daytime, should also be encouraged.

17. — *An experiment to investigate sporadic-E* (J. D. WHITEHEAD).

It is not known how the electron content varies when sporadic-E is formed. Perhaps the following simple experiment would provide useful results :

A rocket is fired to a height of 150 km on a maximum horizontal range trajectory; it will remain above 130 km for a reasonable time. It should carry a small CW transmitter, at about 8 Mc/s. After launch an inflatable balloon should be ejected carrying the aerial wire which is pulled out as the balloon is dragged through

the thin air. Faraday rotation could then be measured using two or three receivers on the ground. The experiments should be performed when sporadic-E exists over part of the trajectory only; the sporadic-E pattern would have to be determined by three or four ionosondes spaced 50 km apart under the trajectory.

Perhaps the experiment may be suitable for a gun-launched vehicle.

18. — *Night-time sporadic-E* (J. D. WHITEHEAD).

Night-time sources of ionozation seem to be required to explain night-time sporadic-E. It is recommended, therefore, that rockets carrying the usual U-V detectors and energetic particle detectors be launched at night.

19. — *An experiment to test the validity of the wind-shear theory* (C. O. HINES).

A rocket-released cloud of long-lived ions (or readily ionized material) should be deposited in the E region at the level of an existing strong sporadic-E layer; its failure to form into a layer within a time of the order ½ hour would constitute prima facie evidence against the wind-shear theory while the reverse would at least demonstrate qualitative consistency with that theory and might be examined in adequate detail to establish quantitative agreement as well.

20. — *An experiment to elucidate the structure of the sporadic-E associated with the electrojet* (K. R. RAMANATHAN).

Ionospheric drifts in the region of the equatorial electrojet occur almost every day, and they have a definite diurnal variation; the medium drift velocity (east to west) occurs between 8 to 9 hours local time when H is increasing rapidly. It is suggested that we should arrange on a particular day three or four rocket ascents (Nike-Apache) for electron density measurements at an equatorial station at 8, 12 and 16 hours together with measurements of

(*a*) magnetic recording for variations of ΔH and ΔV,

(*b*) ground-based drift measurements on 3 frequencies 2, 2.5 and 4 Mc/s, and

(*c*) ionosonde data.

If possible, on the same day sodium vapour releases should be arranged at dawn and dusk. A favourable time would be February 1968.

21. — *Neutral composition of the F region* (J. W. WRIGHT).

The F-region ionization shows evidence, in its seasonal and geographical behaviour, of systematic changes in neutral gas composition which may result from changes in mixing or transport processes. It is obviously desirable, therefore, that neutral mass spectrometer rocket flights into the F region should be encouraged. These flights should be scheduled so as to separate seasonal and diurnal effects. (The largest diurnal contrast is between 0500 and about 1600 LMT; the most unambiguous seasonal contrast should be found by comparing summer and winter observations at 0500 LMT. The latitude range should be as large as possible without encountering auroral zone heating effects; latitudes up to 60° N at the 105° W meridian are satisfactory, while latitudes above 45° N at 75° W may not be).

22. — *Electric fields in the F region* (C. O. HINES).

Many more determinations of the F-region electric field should be undertaken, under varying conditions of time and location. Coordination between these determinations and studies dependent upon them (e.g. windshear sporadic-E) should be established.

23. — *Scattering of quasi-trapped photoelectrons by neutral particles* (YU, I. GALPERIN and T. M. MULYARCHIK).

It appears that scattering processes effecting photoelectrons take place at altitudes up at least 1600 km, but the definite identification of the scattering mechanism calls for measurements of the photoelectron energy spectrum and an analysis of their anisotropy at different heights. It seems that in the altitude range between about 500-1600 km at low and middle latitudes, a decisive factor is the scattering of quasitrapped photoelectrons by neutral particles and ions of the upper atmosphere within ten and a thousand latitude oscillations. Thus, an investigation into the properties of dissipating photoelectrons probing the « closed » and also « open » (polar) regions of the magnetosphere along the field tubes where there must be no quasitrapping allows new information on the magnetosphere to be obtained.

Difficulty in carrying out the measurements is caused by the fact that the apparatus must be orientated in the magnetic field when using satellites for measuring electrons whose energies are tens of eV.

A reasonable experiment would seem to be the employment of a manned spacecraft flow at low and middle latitudes, and of a vertically-oriented unmanned satellite in polar regions. Regular observations carried out from the moon surface near the full-moon period may also be found fruitful.

SOLAR-TERRESTRIAL PHYSICS

Belgrade Inter-Union Symposium Publication

A text book based on the ten review papers presented at the Inter-Union Symposium on Solar-Terrestrial Physics, Belgrade 1966, will be published in July 1967 by Academic Press, London and New York. The Symposium was organized jointly by URSI, IAU, IUGG and COSPAR.

The publication entitled « Solar-Terrestrial Physics » has been jointly edited by J. W. King and W. S. Newman, and it deals in ten chapters with the properties of interplanetary space, the quiet and disturbed magnetosphere, energetic charged particles, micropulsations, aurorae, and particle temperatures in the ionosphere and magnetosphere. The contributors are J. W. Dungey, J. V. Evans, K. I. Gringauz, V. I. Krassovsky, R. Lust, N. F. Ness, T. Obayashi, B. J. O'Brien, E. N. Parker and V. A. Troitskaya.

Orders for the book, price 90 shillings (UK) may be placed with booksellers or directly with Academic Press of London and New York.

CCIR

Collaboration avec le CCIR

(See English text p. 39)

Nous publions ci-après la liste des documents de la XI[e] Assemblée Plénière du CCIR (Oslo, 1966) qui intéressent l'URSI.

Des exemplaires de ces documents peuvent être obtenus au Secrétariat Général de l'URSI.

DOCUMENTS DE L'ASSEMBLÉE PLÉNIÈRE

OSLO, JUILLET 1966

I. — Documents demandant explicitement la collaboration de l'URSI

Commissions d'Etudes du CCIR	Numéros et titres	Commissions de l'URSI intéressées
III	*Résolution 1-I* (Doc III/1046) — Utilisation plus efficace du spectre radioélectrique. Complétée par le *Rapport 414* (Doc III/1038 — Même titre.	VI-IUCAF
V	*Question 2/V* (Doc V/1019) — Influence des régions non ionisées de l'atmosphère sur la propagation des ondes — Radiométéorologie.	II-IUCRM
VI	*Vœu 22* (Doc VI/1001) — Sondages réguliers de l'ionosphère.	III
VI	*Question 7/VI* (Doc VI/1005) — Bruit radioélectrique dans l'ionosphère et au delà.	III, VIII

Commissions d'Etudes du CCIR	Numéros et titres	Commissions de l'URSI intéressées
VI	*Programme d'Etudes 16 A/VI* (Doc VI/1014) — Evanouissements des signaux à propagation ionosphérique. Complété par le *Rapport 266-1* (Doc VI/1037) — Evanouissement des signaux se propageant par l'ionosphère.	III
VI	*Question 2/VI* (Doc VI/1015) — Distribution géographique et programme d'observations ionosphériques régulières.	III
VI	*Programme d'Etudes 2 A/VI* (Doc VI/1016) — Amélioration du programme mondial d'observations ionosphériques pour la cartographie numérique.	III
VI	*Question 6/VI* (Doc VI/1023) — Problèmes particuliers aux radiocommunications en ondes décamétriques liés à l'ionosphère équatoriale. Complété par le *Rapport 343* (Doc VI/1059) — Même titre.	III
VI	*Question 5/VI* (Doc VI/1025) — Propagation par guidage au-dessus du maximum d'ionisation de la région F. Complétée par le *Rapport 341* (Doc VI/1036) — Même titre.	III
VI	*Programme d'Etudes 4 A/VI* (Doc VI/1033) — Prévision de l'ionisation sporadique de la région E. *Complété par le Rapport 259-1* (Doc VI/1038) — Propagation des ondes métriques, par l'intermédiaire de la région E sporadique ou, par d'autres phénomènes d'ionisation anormale.	III
VII	*Résolution 14-I* (Doc VII/1001) — Emissions de fréquences étalon et de signaux horaires.	I

Commissions d'Etudes du CCIR	Numéros et titres	Commissions de l'URSI intéressées
VII	*Vœu 26* (Doc VII/1011) — Etudes et expériences relatives aux émissions de signaux horaires. Complété par le *Rapport 366* (Doc VII/1016) — Méthode de classification des systèmes qui fournissent dans une même émission des informations de temps et de fréquence.	I

II. — Documents intéressant l'URSI sans que sa collaboration soit explicitement sollicitée

Commissions d'Etudes du CCIR	Numéros et titres	Commissions de l'URSI intéressées
III	*Question 5/III* (Doc III/1035) — Théorie des communications. Complétée par le *Rapport 196-1* (Doc III/1027) — Quelques aspects de l'application de la théorie des communications.	VI
IV	*Rapport 204-1* (Doc IV/1001) — Termes et définitions concernant les radiocommunications spatiales.	II, III, VI
IV	*Rapport 224-1* (Doc IV/1002) — Radioastronomie. Caractéristiques et facteurs affectant le partage des bandes de fréquences avec d'autres services.	V-IUCAF
IV	*Rapport 226-1* (Doc IV/1003) — Facteurs influant sur la possibilité de partager des bandes de fréquences entre l'astronomie par radiodétection et d'autres services.	II-III-V, IUCAF

Commissions d'Etudes du CCIR	Numéros et titres	Commissions de l'URSI intéressées
IV	*Rapport 397* (Doc IV/1005) — Les raies OH en radioastronomie.	V
IV	*Rapport 223-1* (Doc IV/1007) — Raies ou bandes spatiales spectrales de 30 G Hz à 300 G Hz provenant de phénomènes naturels et intéressant la radioastronomie et les sciences connexes.	V
IV	*Avis 314-1* (Doc IV/1013) — Protection des fréquences utilisées pour les mesures radioastronomiques.	V, IUCAF
IV	*Question 15/IV* (Doc IV/1040) — Utilisation des fréquences dans la région située au-dessus de l'ionosphère et sur la face cachée de la lune.	II, IV
IV	*Question 16/IV* (Doc IV/1043) — Phénomènes d'écran dus à l'ionosphère.	III
IV	*Rapport 211-1* (Doc IV/1055) — Systèmes de télécommunications par satellites actifs — Etude comparative des méthodes de modulation utilisables.	VI
V	*Avis 369-1* (Doc V/1009) — Définition d'une atmosphère de référence.	II
V	*Avis 310-1* (Doc V/1018) — Définitions de termes se rapportant à la propagation dans la troposphère.	II
VI	*Avis 313-1* (Doc VI/1011) — Echange des observations en vue de l'établissement de prévisions à court terme et transmission des avertissements de perturbations ionosphériques.	III-IUWDS

Commissions d'Etudes du CCIR	Numéros et titres	Commissions de l'URSI intéressées
VI	Complété par le *Programme d'Etudes 10 A/VI* (Doc VI/1002) — Détermination des signes précurseurs de variations à court terme dans les conditions de propagation ionosphériques et méthode permettant de décrire les perturbations ionosphériques et la qualité des circuits radioélectriques.	
VI	*Vœu 23* (Doc VI/1019) — Observations nécessaires en vue du choix des indices fondamentaux de la propagation ionosphérique. Complété par la *Résolution 4-1* (Doc VI/1007) — Diffusion de renseignements relatifs aux indices fondamentaux de la propagation ionosphérique, et par le *Rapport 246-1* (Doc VI/1040) — Choix des indices fondamentaux de la propagation ionosphérique.	III-IUWDS
VI	*Programme d'Etudes 18 A/VI* (Doc VI/1018) — Propagation sur ondes myriamétriques dans l'ionosphère et à travers l'ionosphère.	III

III. — Documents dans lesquels il est fait référence à des publications de l'URSI

Commissions d'Etudes du CCIR	Numéros et titres	Commissions de l'URSI intéressées
VI	*Avis 373-1* (Doc VI/1030) — Définitions des fréquences maximales de transmission.	III
VII	*Avis 374-1* (Doc VII/1012) — Emissions de fréquence étalon et de signaux horaires.	I
VII	*Rapport 267-1* (Doc VII/1014) — Fréquences étalon et signaux horaires.	I

Collaboration with CCIR

(Texte français p. 34)

We publish hereunder the list of the documents of the XIth Plenary Assembly of the CCIR (Oslo, 1966) which are of interest to URSI.

Copies of those documents are available at the General Secretariat of URSI.

DOCUMENTS OF THE PLENARY ASSEMBLY

OSLO, JULY 1966

I. — Documents asking explicitly for URSI collaboration

CCIR Study Groups	Numbers and titles	Interested URSI Commissions
III	*Resolution 1-I* (Doc II/1046) — Improved efficiency in the use of the radio-frequency spectrum. Completed by *Report 414* (Doc III/1038) — Same title.	VI-IUCAF
V	*Question 2/V* (Doc V/1019) — Influence of the non-ionized regions of the atmosphere on wave propagation — Radiometeorology.	II-IUCRM
VI	*Opinion 22* (Doc VI/1001) — Routine-ionospheric sounding.	III
VI	*Question 7/VI* (Doc VI/1005) — Radio noise within and above the ionosphere.	III, VIII
VI	*Study Programme 16 A/VI* (Doc VI/1014) Fading of signals propagated by the ionosphere. Completed by *Report 266-1* (Doc VI/1037) — Same title.	III

CCIR Study Groups	Numbers and titles	Interested URSI Commissions
VI	*Question 2/VI* (Doc VI/1015) — Geographic distribution and programme of regular ionospheric observations.	III
VI	*Study Programme 2 A/VI* (Doc VI/1016) — Improvement in the world-wide ionospheric observing programme for numerical mapping purposes.	III
VI	*Question 6/VI* (Doc VI/1023) — Special problems of HF radiocommunication associated with the equatorial ionosphere. Completed by *Report 343* (Doc VI/1036) — Same title.	III
VI	*Question 5/VI* (Doc VI/1025) — Propagation by ducting above the ionization maximum of F region. Completed by *Report 341* (Doc VI/1036) — High frequency propagation by ducting above the maximum of F region.	III
VI	*Study Programme 4 A/VI* (Doc VI/1033) — Prediction of sporadic E. Completed by *Report 259-1* (Doc VI/1038) — UHF propagation by way of sporadic-E and other anomalous ionizations.	III
VII	*Resolution 14-1* (Doc VII/1001) — Standard-frequency and time-signal emissions.	I
VII	*Opinion 26* (Doc VII/1011) — Studies and experiments concerned with time-signal emissions. Completed by *Report 366* (Doc VII/1016) — A method for classifying systems which yeld time and frequency information from the same radio emission.	I

II. — Documents interesting URSI but not asking explicitly for its collaboration

CCIR Study Groups	Numbers and titles	Interested URSI Commissions
III	*Question 5/III* (Doc III/1035) — The Communication theory. Completed by *Report 196-1* (Doc III/1027) — Some aspects of the application of communication theory.	VI
IV	*Report 204-1* (Doc IV/1001) — Terms and definitions relating to space radiocommunication.	VI
IV	*Report 224-1* (Doc IV/1002) — Radioastronomy — Characteristics and factors affecting frequency sharing with other services.	V-IUCAF
IV	*Report 226-1* (Doc IV/1003) — Factors affecting the possibility of frequency sharing between radar astronomy and other services.	II, III, V IUCAF
IV	*Report 397* (Doc IV/1005) — The OH — lines in radioastronomy.	V
IV	*Report 223-1* (Doc IV/1007) — Line frequencies on bands, of interest to radioastronomy and related sciences, in the 30 to 300 G Hz range arising from natural phenomena.	V
IV	*Recommendation 314-1* (Doc IV/1013) — Protection of frequencies used for radioastronomical measurements.	V, IUCAF
IV	*Question 15/IV* (Doc IV/1040) — Frequency utilization above the ionosphere and on the far side of the moon.	II, IV, V

CCIR Study Groups	Numbers and titles	Interested URSI Commissions
IV	*Question 16/IV* (Doc IV/1043) — Shielding effects due to the ionosphere.	III
IV	*Report 211-1* (Doc IV/1055) — Active communication satellite systems — A comparative study of possible methods of modulation.	VI
V	*Recommendation 369-1* (Doc V/1009) — Definition of a basic reference atmosphere.	II
V	*Recommendation 310-1* (Doc V/1018) — Definitions of terms relating to propagation in the troposphere.	II
VI	*Recommendation 313-1* (Doc VI/1011) — Exchange of information for the preparation of short-term forecast and the transmission of ionospheric disturbance warnings. Completed by *Study Programme 10 A/VI* (Doc VI/1002) — Identification of precursors indicative of short term variations of ionospheric propagation conditions and methods for describing ionospheric disturbances and the performance of radio circuits.	III, IUWDS
VI	*Opinion 23* (Doc VI/1019) — Observations needed to provide basic indices for ionospheric propagation. Completed by *Resolution 4-1* (Doc VI/1007) — Dissemination of basic indices for ionospheric propagation and by *Report 246-1* (Doc VI/1040) — Choice of basic indices for ionospheric propagation.	III, IUWDS
VI	*Study Programme 18 A/VI* (Doc VI/1018) — Very low frequency propagation in and through the ionosphere.	III

III. — Documents referring to URSI publications

CCIR Study Groups	Numbers and titles	Interested URSI Commissions
VI	*Recommendation 373-1* (Doc VI/1030) — Definitions of maximum transmission frequencies.	III
VII	*Recommendation 374-1* (Doc VII/1012) — Standard-frequency and time-signal emissions.	I
VII	*Report 267-1* (Doc VII/1014) — Standard-frequencies and time signals.	I

Commissions d'études

(See English text p. 48)

COMMISSION D'ÉTUDES I. — *Emetteurs*

MANDAT :

1. Etude et présentation de propositions sur les questions relatives aux émetteurs radioélectriques et aux caractéristiques des émissions radioélectriques; de façon générale, coordination de toutes propositions visant à l'utilisation rationnelle du spectre des fréquences radioélectriques au point de vue des émissions radio-électriques.
2. Etude des rayonnements non désirés provenant des appareils et installations électriques et des brouillages causés aux radiocommunications par ces rayonnements.

Rapporteur principal : M. J. LOCHARD (France).

Vice-Rapporteur principal : Professeur S. RYZKO (R. P. de Pologne).

Commission d'études II. — *Récepteurs*

Mandat :

Détermination du choix et de l'importance pratique des différentes caractéristiques des récepteurs. Mesure de ces caractéristiques et relevé des valeurs types pour les différentes classes d'émission et les divers services. Recherche des améliorations à apporter aux récepteurs en vue de résoudre les problèmes rencontrés dans l'exploitation des radiocommunications.

Rapporteur principal : M. Y. Place (France).

Vice-Rapporteur principal : M. N. Chistiakov (URSS).

Commission d'études III. — *Systèmes utilisés dans les services fixes*

Mandat :

1. Etude des questions relatives aux systèmes radioélectriques complets utilisés dans le service fixe (à l'exclusion des systèmes de relais radioélectriques) et dans les services connexes, avec leur appareillage terminal associé, et y compris les systèmes utilisant le mode de propagation par diffusion dans l'ionosphère même s'ils fonctionnent sur des fréquences supérieures à 30 MHz.
2. Etude des applications pratiques de la théorie des communications.

Rapporteur principal : M. H. C. A. van Duuren (Pays Bas).

Vice-Rapporteur principal : M. S. Aritake (Japon).

Commission d'études IV. — *Systèmes utilisés dans les télécommunications spatiales, et radioastronomie*

Mandat :

Etude des questions techniques relatives aux systèmes de télécommunications avec et entre les points de l'espace, et à la radioastronomie.

Rapporteur principal : Professeur I. Ranzi (Italie).

Vice-Rapporteur principal : M. W. Klein (Suisse).

COMMISSION D'ÉTUDES V. — *Propagation à la surface de la terre et dans les régions non ionisées de l'atmosphère*

MANDAT :

Etude de tous les problèmes se rapportant à la propagation des ondes radioélectriques à la surface de la terre et dans les régions non ionisées de l'atmosphère, dans la mesure où ces problèmes intéressent les radiocommunications.

Rapporteur principal : M. R. L. SMITH-ROSE, CBE (Royaume-Uni).

Vice-Rapporteur principal : M. A. KALININ (URSS).

COMMISSION D'ETUDES VI. — *Propagation ionosphérique*

MANDAT :

Etude de toutes les questions relatives à la propagation d'ondes radioélectriques (y compris le bruit) dans l'ionosphère, dans la mesure où elles intéressent les radiocommunications.

Rapporteur principal : M. D. K. BAILEY (Etats Unis).

Vice-Rapporteur principal : M. E. K. SMITH (Etats Unis).

COMMISSION D'ETUDES VII. — *Fréquences étalon et signaux horaires*

MANDAT :

Organisation d'un service mondial d'émissions de fréquence étalon et de signaux horaires. Amélioration de la précision des mesures.

Rapporteur principal : M. B. DECAUX (France).

Vice-Rapporteur principal : Professeur M. BOELLA (Italie).

COMMISSION D'ÉTUDES VIII. — *Contrôle international des émissions*

MANDAT :

Etude des problèmes techniques et d'exploitation dont la solution dépend principalement de considérations d'ordre tech-

nique relatives aux stations de contrôle participant au service de contrôle international des émissions en ce qui concerne :

1. en collaboration avec l'IFRB, les moyens propres à vérifier et signaler les brouillages nuisibles, selon les dispositions de la Convention internationale des télécommunications et du Règlement des radiocommunications;
2. la mise au point de méthodes et de procédures à utiliser dans les stations de contrôle en vue de déterminer l'occupation du spectre radioélectrique, les caractéristiques des émissions et de procéder à la localisation des sources d'émission par des méthodes radiogoniométriques;
3. les spécifications relatives au choix des emplacements des antennes, et autres équipements et appareillages.

Rapporteur principal : M. AMARO VIEIRA (Portugal).

Vice-Rapporteur principal : M. P. BOUCHIER (Belgique).

COMMISSION D'ÉTUDES IX. — *Faisceaux hertziens*

MANDAT :

Etude, sous tous leurs aspects, des faisceaux hertziens en visibilité directe et transhorizon, ainsi que de l'appareillage, fonctionnant sur des fréquences supérieures à 30 MHz environ, à l'exclusion de ceux dont le fonctionnement utilise la transmission par des satellites sur orbite ou la propagation ionosphérique.

Rapporteur principal : M. E. DIETRICH (RF d'Allemagne).

Vice-Rapporteur principal : M. T. KILVINGTON (Royaume-Uni).

COMMISSION D'ÉTUDES X. — *Radiodiffusion*

MANDAT :

Etude des aspects techniques de l'émission et de la réception de la radiodiffusion sonore (à l'exception de la radiodiffusion tropicale), ainsi que des normes d'enregistrement et de reproduction du son destinées à faciliter l'échange international des programmes; étude des aspects techniques de l'enregistrement de la télévision en liaison avec la Commission d'études XI.

Rapporteur principal : M. A. Prose WALKER (Etats Unis).

Vice-Rapporteur principal : M. H. RINDFLEISCH (RF d'Allemagne).

COMMISSION D'ÉTUDES XI. — *Télévision*

MANDAT :

Techniques de la télévision.

Rapporteur principal : M. E. ESPING (Suède).

Vice-Rapporteur principal : M. G. HANSEN (Belgique).

COMMISSION D'ÉTUDES XII. — *Radiodiffusion tropicale*

MANDAT :

Normes pour assurer un service de bonne qualité dans la zone tropicale pour les systèmes de radiodiffusion tropicale; brouillage dans les bandes partagées; puissance permettant d'assurer un service acceptable; spécification d'antennes appropriées à la radiodiffusion tropicale à courte distance; conditions optimales pour l'utilisation des bandes de fréquence employées par la radiodiffusion dans la zone tropicale; autres questions connexes.

Rapporteur principal : M. CHAMAN LAL (Inde).

Vice-Rapporteur principal : M. C. NOGBOU (Côte d'Ivoire).

COMMISSION D'ÉTUDES XIII. — *Services mobiles*

MANDAT :

Etude des questions techniques et d'exploitation intéressant les services mobiles aéronautique, maritime et terrestre, le service de radiolocalisation et le service de radionavigation (à l'exception des services utilisant des satellites artificiels, lesquels relèvent actuellement du mandat de la Commission d'études IV).

Rapporteur principal : M. G. H. M. GLEADLE (Royaume Uni).

Vice-Rapporteur principal : M. N. J. SØBERG (Norvège).

COMMISSION D'ÉTUDES XIV (*Vocabulaire*)

MANDAT :

Etude, en coopération avec les autres Commissions d'études et, s'il y a lieu, avec le CCITT, des questions qui touchent aux sujets suivants pour le domaine des radiocommunications :

vocabulaire, répertoire des définitions, liste des symboles graphiques et littéraux, autres moyens d'expression, classification systématique, unités de mesure, etc.

Rapporteur principal : M. R. VILLENEUVE (France).

Vice-Rapporteur principal : M. A. FERRARI-TONIOLO (Italie).

CMTT. — *Commission mixte CCITT/CCIR pour les transmissions télévisuelles*

MANDAT :

Etude en coopération avec les Commissions d'études du CCIR et du CCITT, des spécifications auxquelles devront satisfaire les systèmes de télécommunication pour permettre la transmission de radiodiffusion sonore et visuelle sur une grande distance.

Rapporteur principal : Professeur Y. ANGEL (France).

Vice-Rapporteur principal : M. R. H. FRANKLIN (Royaume-Uni).

Study groups

STUDY GROUP I. — *Transmitters*

TERMS OF REFERENCE :

1. Study and representation of proposals on questions relating to radio transmitters and to the characteristics of radio emissions; in general, the coordination of all proposals concerning the rational and economic use of the radio frequency spectrum for the aspect of radio emissions.
2. Study of unwanted radiations from electrical apparatus and installations and the interference caused to radio-communications by these radiations.

Chairman : Mr. J. LOCHARD (France).

Vice-Chairman : Professor S. RYZKO (P. R. of Poland).

STUDY GROUP II. — *Receivers*

TERMS OF REFERENCE :

The selection and study of the more important characteristics of the various types of receivers. Measurement of these characteristics of receivers and tabulation of typical values for the different classes of emission and the different services. Investigations of improvement that might be made in receivers to solve problems encountered in radio-communication.

Chairman : Mr. Y. PLACE (France).

Vice-Chairman : Mr. N. CHISTIAKOV (USSR).

STUDY GROUP III. — *Fixed service system*

TERMS OF REFERENCE :

1. To study questions relating to complete systems for the fixed and allied services and terminal equipment associated therewith (excluding radio-relay systems). Systems using the so-called ionospheric-scatter mode of propagation, even when working on frequencies above 30 MHz, are included.
2. To study the practical application of communication theory.

Chairman : Dr. H. C. A. van DUUREN (Netherlands).

Vice-Chairman : Mr. D. ARITAKE (Japan).

STUDY GROUP IV. — *Space systems and radioastronomy*

TERMS OF REFERENCE :

To study technical question regarding systems of telecommunication with and between locations in space and radioastronomy.

Chairman : Professor I. RANZI (Italy).

Vice-Chairman : Mr. W. KLEIN (Switzerland).

STUDY GROUP V. — *Propagation over the surface of the earth and through the non-ionized regions of the atmosphere*

TERMS OF REFERENCE :

To study all matters relating to the propagation of radio waves over the surface of the earth and through the non-

ionized regions of the atmosphere in so far as they concern radiocommunication.

Chairman : Dr. R. L. SMITH-ROSE, CBE (United Kingdom).

Vice-Chairman : Dr. A. KALININ (USSR).

STUDY GROUP VI. — *Ionospheric propagation*

TERMS OF REFERENCE :

To study all matters relating to the propagation of radio waves (including noise) through the ionosphere, in so far as they concern radiocommunication.
Chairman : Dr. D. K. BAILEY (USA).
Vice-Chairman : Dr. E. K. SMITH (USA).

STUDY GROUP VII. — *Standard-frequencies and time-signals*

TERMS OF REFERENCE :

Organization of a world-wide service of standard-frequency and time-signal emissions. Improvement of measurement accuracy.

Chairman : Mr. B. DECAUX (France).

Vice-Chairman : Professor M. BOELLA (Italy).

STUDY GROUP VIII. — *International monitoring*

TERMS OF REFERENCE :

To study technical and operating problems, the solution of which depends principally on considerations of a technical character relating to monitoring stations participating in the international monitoring system with regard to :

1. in collaborating with the IFRB, ways in which harmful interference can be verified and reported, in accordance with the International Telecommunication Convention and the Radio Regulations;
2. the develoment of methods and procedures to be used by monitoring stations in determining occupancy of the radio-frequency spectrum and the characteristics of emissions and in locating the source of an emission by direction-finding techniques;

3. specifications regarding the selection of sites, antennae and other equipment and instrumentation.

Chairman : Mr. AMARO VIEIRA (Portugal).

Vice-Chairman : Mr. P. BOUCHIER (Belgium).

STUDY GROUP IX. — *Radio-relay systems*

TERMS OF REFERENCE :

To study all aspects of line-of-sight and trans-horizon radio-relay systems and equipment operating at frequencies above 30 MHz, excluding those systems which utilize transmission via orbiting satellites or the ionosphere.

Chairman : Mr. E. DIETRICH (Federal Republic of Germany).

Vice-Chairman : Mr. T. KILVINGTON (United Kingom).

STUDY GROUP X. — *Broadcasting*

TERMS OF REFERENCE :

To study the technical aspects of transmission and reception in the sound broadcasting service (except for tropical broadcasting), including standards of sound recording and sound reproduction to facilitate the international exchange of programmes; to study also the technical aspects of video recording in liaison with Study Group XI.

Chairman : Mr. A. Prose WALKER (USA).

Vice-Chairman : Dr. H. RINDFLEISCH (Federal Republic of Germany).

STUDY GROUP XI. — *Television*

TERMS OF REFERENCE :

Technical aspects of television.

Chairman : Mr. E. ESPING (Sweden).

Vice-Chairman : Mr. G. HANSEN (Belgium).

STUDY GROUP XII. — *Tropical broadcasting*

TERMS OF REFERENCE :

To study standards required for good quality service in the tropical zone, and for tropical broadcasting systems; interference in the shared bands; power requirements for acceptable service; design of suitable antennae for short-distance tropical broadcasting; optimum conditions for the utilization of frequency bands used for broadcasting in the tropical zone; other associated questions.

Chairman : Mr. CHAMAN LAL (India).

Vice-Chairman : Mr. C. NOGBOU (Ivory Coast).

STUDY GROUP XIII. — *Mobile services*

TERMS OF REFERENCE :

To study technical and operating questions concerning the aeronautical, maritime, land mobile, radiolocation and radionavigation services (except services that involve the use of earth satellites which, at present, are the concern of Study Group IV).

Chairman : Mr. G. H. M. GLEADLE (United Kingdom).

Vice-Chairman : Mr. N. J. SØBERG (Norway).

STUDY GROUP XIV. — *Vocabulary*

TERMS OF REFERENCE :

To study, in collaboration with the other Study Groups and, if necessary, with the CCITT, the radio aspect of the following : vocabulary of terms and lists of definitions, lists of letter and graphical symbols and other means of expression, systematic classification, measurement units, etc.

Chairman : Mr. R. VILLENEUVE (France).

Vice-Chairman : Mr. A. FERRARI-TONIOLO (Italy).

CCIR/CCITT JOINT STUDY GROUP. — *Television transmission*

TERMS OF REFERENCE :

To study, in cooperation with the Study Groups of the CCIR and the CCITT, the specifications to be satisfied by telecom-

munication systems for the transmission of sound and television broadcasting signals over long distances.

Chairman : Professor Y. ANGEL (France).

Vice-Chairman : Mr. R. H. FRANKLIN (United Kingdom).

XIe Assemblée Plénière

OSLO, 1966

TEXTES FINALS

A la suite des décisions prises par la XIe Assemblée Plénière du CCIR, le Directeur de ce Comité a examiné avec le Service des publications du Secrétariat général la manière dont les textes finals adoptés par cette Assemblée pourraient être publiés en éditions séparées anglaise, française et espagnole.

De même que pour les documents de l'Assemblée plénière précédente, les textes résultant de la XIe Assemblée plénière du CCIR seront groupés par sujets (par exemple : émission, réception, radiodiffusion, propagation, etc.), en sorte que l'on trouvera réunis tous les textes relatifs à un sujet donné et à une Commission d'études donnée.

Les textes techniques seront publiés en cinq volumes, les sujets étant répartis de la manière suivante :

Volume I : Emission — Réception — Vocabulaire (Commissions d'études I, II et XIV).

Volume II : Propagation (Commissions d'études V et VI).

Volume III : Service fixe — Service mobile — Fréquences étalon et signaux horaires — Contrôle des émissions (Commissions d'études III, XIII, VII et VIII).

Volume IV : Faisceaux hertziens — Systèmes spatiaux — Radioastronomie (Commissions d'études IX et IV).

Volume V : Radiodiffusion — Télévision (Commissions d'études X, XI et XII et CMTT).

Chaque volume sera en outre pourvu d'une table des matières et contiendra de brèves introductions rédigées par les Rapporteurs principaux des Commissions d'études intéressées.

Ces cinq volumes ensemble atteindront vraisemblablement quelque 1900 pages (Volumes I : 300 pages — Volume II : 400 pages — Volume III : 400 pages — Volume IV : 500 pages — Volume V : 300 pages). Ils seront vendus séparément.

De plus, il sera publié un sixième volume contenant :

La liste des participants — les Procès-Verbaux des séances plénières de la XI[e] Assemblée plénière du CCIR — les Rapports du Directeur du CCIR, de la Commission sur la Coopération technique, de la Commission des Finances et de la Commission d'organisation — la liste des documents (présentés par ordre numérique) — les listes complètes des Avis, Rapports, Vœux, Résolutions, Questions et Programmes d'études du CCIR.

Ce dernier volume comprendra environ 300 pages, et il sera également vendu séparément.

Les renseignements concernant ces publications peuvent être obtenus en s'adressant au : Secrétariat Général de l'Union Internationale des Télécommunications, Division des Radiocommunications, Genève, Suisse.

XIth Plenary Assembly

OSLO, 1966

FINAL TEXTS

Following the decisions taken by the XIth Plenary Assembly of the CCIR (Oslo, 1966) the Director of that Committee has examined with the Publication Division of the General Secretariat, the way in which the final texts adopted by that Assembly could be published in separate English, French and Spanish editions.

In a similar procedure to that adopted for the documents of the XIth Plenary Assembly, the texts of the XIth Plenary Assembly will be arranged by subjects (for example : emission, reception, broadcasting, propagation, etc.) so that all the texts concerning a given subject and a given Study Group are grouped together.

The technical texts will be published in five volumes, the subjects being divided as follows :

Volume I : Emission — Reception — Vocabulary (Study Groups I, II and XIV).

Volume II : Propagation (Study Groups V and VI).

Volume III : Fixed service — Mobile service — Standard-frequencies and time-signals — Monitoring (Study Groups III, XIII, VII and VIII).

Volume IV : Radio-relay systems — Space systems — Radio-astronomy (Study Groups IX and IV).

Volume V : Broadcasting — Television (Study Groups X, XI and XII and the CMTT).

Each volume will, in addition, contain table of contents and in each Section short introductions by the Chairman of the Study Groups concerned.

These five volumes, which are expected to contain a total of some 1900 pages (Volume I : 300 pages — Volume II : 400 pages — Volume III : 400 pages — Volume IV : 500 pages — Volume V : 300 pages) will be sold separately.

A sixth volume will also be published containing :

A list of participants — Minutes of the Plenary Meetings of the XIth Plenary Assembly of the CCIR — Reports by the Director of the CCIR, the Committee on Technical Cooperation, the Finance Committee and the Organization Committee — a list of documents (in numerical order) — complete lists of CCIR Recommendations, Reports, Opinions, Resolutions, Questions and Study Programmes.

This volume will contain approximately 300 pages, and will be sold separately.

Further information concerning those publications are available by the General Secretariat : International Telecommunication Union, Radio Division, Geneva, Switzerland.

Listes de Symboles

Le secrétariat du CCIR a publié la Troisième série de listes de Symboles concernant les Télécommunications proposés par le Groupe de travail mixte CCI/CEI pour les symboles graphiques concernant les télécommunications.

Les listes publiées dans ce document, limitées aux sujets qui présentent un intérêt plus direct pour les travaux du CCIR, sont :

Lisle 11. — Symboles pour équipements complets de transmission et d'éléments d'équipements.

Lisle 12. — Symboles pour lasers et masers.

Lisle 13. — Symboles pour cristaux piezo électriques et lignes à retard.

Lisle 14. — Symboles pour satellites et stations de poursuite.

Lisle 15. — Symboles de lignes, de circuits et de liaisons radioélectriques de télécommunications.

Quelques exemplaires de ce document sont disponibles au Secrétariat de l'URSI.

Lists of Symbols

The CCIR Secretariat has published the Third series of Lists of Graphical Symbols for Telecommunications. The lists have been proposed by the Joint CCI/IEC Working Party on Graphical symbols for telecommunications.

The lists published in the document, limited to the subjects which are of most direct interest for the work of the CCIA, are :

Lisl 11. — Symbols for complete equipments or parts of equipments.

Lisl 12. — Symbols for lasers and masers.

Lisl 13. — Symbols for piezo-electric Crystals and delay lines.

Lisl 14. — Symbols for communication satellites and tracking stations.

Lisl 15. — Symbols for telecommunication lines, radiolinks and circuits.

Some copies of that document are available at the URSI Secretariat.

ICSU

Appointment

In accordance with the Rule of Procedure 2.9, the Officers of ICSU have appointed Dr. Carlos Chagas of Brazil as a member of the Executive Committee, in the vacancy caused by the resignation of Dr. R. V. Garcia. Dr. Chagas' term will be until the next General Assembly of ICSU.

General Report for 1966 of those activities of ICSU which provided assistance towards achieving UNESCO's aims

ICSU has issued (April 1st, 1967) the « General Report for the year 1966 of those activities of ICSU which provided assistance towards achieving UNESCO's aims ».

We quote the following parts of the Report :

« For the International Council of Scientific Unions the year 1966 was notable for the 11th General Assembly, which was held in Bombay. The Assembly was attended by representatives of 38 national members, of all the Scientific Unions and of a number of international organizations. The Assembly initiated, with considerable success, a series of general lectures open, on invitation, to the general public. The lectures were : « Science and the problems of Development » by H. J. Bhabha; « The International Biological Programme » by J. G. Baer; and « The International Years of the Quiet Sun » by W. J. G. Beynon. The Assembly created two new committees which promise to play an important role in providing assistance towards achieving UNESCO's aims : they are the Committee on Data for Science and Technology (CODATA), and the Committee on Science and Technology in Developing Countries (COSTED).

The general activities of the Council which provided assistance towards achieving UNESCO's aims are enumerated below, under the following headings :

I. Education.
II. Science.
III. History of Scientific and Cultural Development.

I. — Education

The principal body concerned with education in ICSU, the Inter-Union Commission on Science Teaching (IUCST), held a meeting in Paris in September to study the possibilities of the integration of science teaching at the secondary level.

The meeting considered three successive stages, viz. ages 11 to 13, 13 to 15, 15 to 18, and agreed that it would be convenient to study : (*a*) a common science course for all students; (*b*) studies expected to end before the age of 18 to 19; (*c*) studies leading to a scientific or technical career.

The scientific disciplines considered are those of Mathematics, Mechanics, Physical Sciences (including Chemistry and Crystallography), Biology (including Biochemistry and Biophysics), Earth Sciences (including Geology, Geophysics, Physical Geography), Space Science (including Astronomy) and also the History and Methodology of Science.

These studies are intended to ensure that the pupils are given not only knowledge about essential facts and fundamental laws, but also training in scientific methods (observation, experimentation, generalization, deduction, foresight, etc.) while giving them an idea of the unity of science. They are intended to arouse an interest in science, showing, by means of well-chosen examples, the rôle of science in everyday life and in the world's development.

The meeting proposed a Congress on the Integration of Scientific Teaching at the secondary level to be held in September 1968, probably in South East Europe. The Organizing Committee will meet in March 1967.

Eleven of the International Unions have special commissions concerned with the international exchange of information on teaching, particularly at the post High School level, and with the promotion of teaching materials and aids. Almost all these commissions met in 1966. Three examples are given as an indication of the type of activity being undertaken.

1. The International Commission on Mathematical Instruction (ICMI) has prepared reports on the following subjects :

(i) the university programme for the teaching of mathematics to physicists; and whether or not special courses are required;

(ii) use of axiomatic method in 2nd degree teaching;

(iii) development of mathematical activity in students; rôle of such problems in their development.

The Commission is also preparing six national reports relating to conditions on mathematical education in France, Federal Republic of Germany, Japan, USSR, UK and USA.

2. The Commission on Crystallographic Teaching completed its investigation on the place and rôle of crystallography in teaching and research, and a report giving the information collected was presented to the General Assembly of the International Union of Crystallography (IUCr) in July.

3. The International Astronomical Union (IAU) began a study of the problems of orgnanizing a summer school in Astronomy, the first of which is scheduled for Manchester, UK in 1967, and of allocating grants to students from developing countries. The IAU continued its programme of exchange of astronomers and allocated 28 grants to young astronomers to facilitate their studies and research work in other countries.

II. — Science

Earth Sciences

The following activities promoted and facilitated international collaboration in the scientific study of the Earth :

The International Union of Astronomy continued its programme of exchange of astronomers, and was responsible for organizing symposia or colloquia on : Instability Phenomena in Galaxies, Determination of Radial Velocities, Radio Astronomy in the Galactic System, The Blanketing Effect, Late Type Stars, Atomic Collisions Cross Section, Evolution of Double Stars.

The Committee on Space Research held its ninth plenary meeting and seventh international Space Science symposium in May. The symposium was divided into four basic parts : (1) Moon and Planets, (2) Interaction between the neutral part and the

ionized part of the atmosphere; (3) Life Sciences and Space Research, which was divided into four sub-topics : (*a*) Space Probe Sterilization, (*b*) Flight Observation of Primates, (*c*) Bio-regeneration Systems, and (*d*) other topics; (4) Latest Significant Results.

Application of Science and Technology

The Council created in January a Committee on Science and Technology in Developing Countries (COSTED). The Committee held its first meeting in June and recommended that a number of Regional Panels be established. These were charged with the task of elucidating those problems of special regional interest on which ICSU could most effectively assist. Initial arrangements were made for partial support of the expenses for the visit of a specialist to Malaysia and Thailand.

Collection, Analysis and Dissemination of Astronomical and Geophysical Information

The Federation of Astronomical and Geophysical Services (FAGS) continued to collect, reduce, colate and publish Astronomical and Geophysical Data.

The Council of FAGS met in September and discussed cooperation with the World Data Centres, which had been established for the International Geophysical Year and which had continued to collect data, including those from the programme of the International Years of the Quiet Sun. The Council requested the assistance of ICSU in resolving some of the difficulties encountered by the Solar Particles and Radiations Monitoring Organization (SPARMO) in the use of instrumented balloons in the study of atmospheric and cosmic phenomena. In addition to the meeting of the Council of FAGS, the International Seismological Summary (ISS) met in March and discussed the completion of the Summary and also the question of the complete automation of epicentral determinations. The International Ursigram and World Days Service Steering Committee also met to discuss the Geophysical Calendar in August and a meeting of SPARMO was held in August to consider ways of making the programme more effective.

On the occasion of the Tenth Anniversary of the foundation of FAGS, the Federation prepared a descriptive booklet relating to

all the member Services of FAGS, for publication by UNESCO in French and English.

Information and Documentation

The year 1966 was notable for the progress made in the realization of two projects : the first, relating to critical tables, was approved by the ICSU General Assembly in January, and the second, concerning the feasibility of a World Scientific Information System, resulted in the adoption of this as one of the first ICSU/UNESCO joint projects.

The ICSU Committee on Data for Science and Technology (CODATA) held its first meeting in UNESCO House in June. It was agreed that the general purpose of the Committee is to promote and to encourage on a worldwide basis, the production and distribution of compendia and other forms of collections of critically selected numerical and other quantitatively expressed values of properties of substances of importance and interest to science and technology. The Committee agreed to direct its attention to the following tasks :

(*a*) to ascertain on a worldwide basis through the appropriate Unions and National bodies (i) that work on critical compilation of evaluated numerical data is being carried on in each country; (ii) that work is being sponsored by each Scientific Union or by other international groups; and (iii) what the needs of science and industry are for additional compilations of evaluated data;

(*b*) to achieve co-ordination among, and strengthening of, existing programmes in such a way as to maximize their effectiveness, to minimize unintentional or undesirable overlap, and to recommend new compilation programmes when necessary;

(*c*) to encourage the support of needed work by appropriate private, governmental, and intergovernmental agencies; and to encourage needed experimental work;

(*d*) to encourage the use of nomenclature, symbols, and constants advocated by responsible Unions; and, when desirable, uniform editorial policy and procedures for presentation of information;

(*e*) on a worldwide basis, (i) to stimulate wider distribution of compilations of high quality; (ii) to maintain and distribute a

directory of continuing data compilation projects and related publications; and (iii) to encourage adequate indexing of the substances and properties covered by all such compendia;

(*f*) to encourage and coordinate research on new methods for the preparation and dissemination of critically evaluated tables generally expressed in numerical form.

Discussions took place between representatives of ICSU and UNESCO concerning the establishment of a Committee to consider the Feasibility of a World Science Information System. These resulted in a proposal to hold a meeting in January 1967 of a preliminary Working Party to consider if such a System was feasible and to prepare a set of guide-lines for the Committee.

ICSU Abstracting Board

The Abstracting Board (IAB) carried out a survey of the activities of the ICSU Scientific Unions, Special and Scientific Committees and Commissions in the field of scientific information, and a study of major journals in Physics and in Chemistry.

The IAB Executive Committee and full Board meetings were held in July. Proposals were made to include Geophysics and Astronomy in the scope of the Board.

Promotion of Sciences

In addition to the activities mentioned above, the General Assemblies of the International Unions of Crystallography, Mathematics, Pure and Applied Biophysics, Radio Science and Theoretical and Applied Mechanics and the many congresses, conferences and symposia were of prime importance in promoting international collaboration throughout the world in these fields.

ICSU-UNESCO Co-ordinating Committee

The ICSU-UNESCO Co-ordinating Committee met in January and June. At the January meeting the representatives of the Council reported on the Survey made among leading scientists in various disciplines concerning the need for regional and other international scientific Research Centres, and in particular concerning the possibility of creating a European Centre for Molecular Biology. At the July meeting, in addition to discussions of the

IBP and international studies in Geophysics, the Council agreed to assist UNESCO by providing names of experts for certain posts, and also by providing details of visits of scientific experts to developing countries in order that the UNESCO programme relating to the popularization of science could be extended at a minimum cost.

ORGANISATION MÉTÉOROLOGIQUE MONDIALE

(See English text p. 67)

C'est avec plaisir que nous reproduisons l'article paru dans le *Bulletin de l'OMM*, Vol. XVI, n° 2, avril 1967. Cet article montre clairement l'aide que peut apporter l'URSI — particulièrement les Commissions II et III — aux nombreuses activités de l'Organisation météorologique mondiale.

* * *

La quinzième Assemblée générale de l'Union radio scientifique internationale (URSI) du CIUS s'est tenue à Munich du 5 au 15 septembre 1966. Sept cent cinquante délégués et observateurs représentant trente pays y ont participé. L'OMM était représentée par le professeur W. Dieminger, directeur de l'Institut Max Planck d'aéronomie à Lindau. Quarante séances de discussions scientifiques ont été réservées à l'examen des progrès accomplis au cours des trois années écoulées dans les domaines suivants : mesures et normes en radioélectricité, radio et troposphère, ionosphère magnétosphère, radioastronomie, ondes et circuits radio, radioélectronique et bruits radioélectriques d'origine terrestre. Ces discussions ont été complétées par des visites de laboratoires scientifiques et d'installations radio-scientifiques et commerciales.

Les questions auxquelles l'OMM s'intéresse en premier lieu ont été considérées principalement par la Commission II qui était chargée d'étudier les rapports existant entre les propriétés de la troposphère et la propagation des ondes décimétriques et métriques. Dans le domaine de la *radiométéorologie et radioclimatologie*, l'utilisation de réfractomètres à microondes, attachés à des véhicules lâchés dans l'atmosphère, a considérablement amélioré notre compréhension de la structure fine de la troposphère. Les propriétés météorologiques du conduit d'évaporation au-dessus des zones maritimes et son influence sur la propagation des ondes radio ont été étudiées avec succès. Les variations de l'indice de

réfraction et du spectre de turbulence qui se manifestent d'une couche à la suivante ont été étudiées au moyen de ballons captifs jusqu'à 500 mètres et au moyen d'aéronefs jusqu'à 5000 mètres. L'analyse du spectre des variations a montré que, dans le cas d'une atmosphère mélangée dont la courbe de température s'écarte peu de l'adiabatique, la loi des 5/3 de Kolmogorow-Heisenberg se trouve satisfaite.

On a constaté une corrélation très étroite entre la dérive du champ des ondes radioélectriques, mesurée à l'aide de récepteurs espacés, et la composante du vent géostrophique perpendiculaire à la direction de propagation, à l'altitude où les ondes radio se trouvent diffusées.

L'absorption par les gaz de l'atmosphère dans le domaine des ondes millimétriques et centimétriques a été étudiée afin de déterminer les bandes et les fenêtres d'absorption avec une exactitude accrue. Les améliorations apportées aux lasers ont permis d'étendre ces recherches à la partie visible du spectre.

Dans le domaine des applications du radar à la météorologie, on a étudié la réflexion, la diffusion et l'absorption des ondes centimétriques par les précipitations en comparant l'intensité des échos radar à l'intensité des précipitations, mesurée au sol. On a constaté que les échos les plus forts se produisent à haute altitude et que leur intensité est fonction de celle de la convection. L'utilisation de radars Doppler permet de distinguer des gouttelettes de tailles différentes, du fait de leurs vitesses de chute différentes.

L'envoi dans l'atmosphère de réfractomètres attachés à des véhicules, combiné à l'utilisation d'un radar à faisceau vertical a montré que, selon toute probabilité, les *anges* sont provoqués par des discontinuités éphémères de l'indice de réfraction. La variation de l'intensité des *anges* en fonction du temps conduit cependant à penser à un mécanisme assez complexe de réflexions. Des recherches entreprises au moyen d'un radar à double longueur d'onde travaillant sur 8 mm et 3,2 cm semblent indiquer que les réflexions se produisent à la limite de séparation entre l'air très humide qui constitue une bulle de convection et l'air plus sec qui entoure celle-ci.

Du point de vue des applications pratiques, il est maintenant possible de détecter les typhons par radar jusqu'à une distance de 600 km.

Le domaine d'activité de la Commission III (ionosphère) intéresse de plus en plus les météorologistes, et ce à deux égards. On a pu établir une corrélation statistique entre les manifestations de réchauffement de la stratosphère et les phénomènes d'absorption anormale des ondes radio dans la basse ionosphère au cours d'un certain nombre de jours d'hiver. On suppose, pour le moment, que pendant les interruptions partielles du tourbillon de la nuit polaire qui se produisent en hiver, la température de la stratosphère et la densité des électrons dans la basse ionosphère se trouvent augmentées du fait de l'affaissement de l'air. Il est également très probable que les variations anormales dans le temps de la densité des électrons dans la région F ne peuvent s'expliquer que par des modifications profondes de la température et de la composition en gaz neutres de l'ionosphère, en fonction de l'heure, du jour et de la saison. En outre, il est possible qu'une circulation entre les deux hémisphères puisse jouer un certain rôle. Ces deux caractéristiques sont les premières manifestations qu'on ait trouvées jusqu'à maintenant d'effets de couplage entre la météorologie et l'aéronomie.

WORLD METEOROLOGICAL ORGANISATION

It is a pleasure for us to publish the following article issued in *WMO Bulletin*, Vol. XVI, n° 2, April 1967. This article clearly shows the help that URSI, and particularly Commissions II and III, can bring to the numerous activities of the World Meteorological Organization.

* * *

The XVth General Assembly of the International Scientific Radio Union (URSI) of ICSU was held at Munich from 5 to 15 September 1966. It was attended by 750 delegates and observers from 30 countries. WMO was represented by Professor W. Dieminger, director of the Max-Planck Institute for Aeronomy, Lindau. Forty scientific sessions were allocated to the discussion of progress within the past three years in the fields of radio measurements and standards, radio and troposphere, ionosphere, magnetosphere, radio astronomy, radio waves and circuits, radio electronics, and radio noise of terrestrial origin. The discussions were supplemented by visits to scientific laboratories and to scientific and commercial radio installations.

The objects of primary interest to WMO were discussed mainly in Commission II which dealt with the relations between the properties of the troposphere and the propagation of decimetric and metric wavelength. In the field of *Radio meteorology and climatology* the use of airborne microwave refractometers has considerably improved the understanding of the fine structure of the troposphere. The meteorological properties and the influence of radio wave propagation of the maritime evaporation duct have been studied successfully. Stratifications of the refractive index and turbulence spectra have been investigated up to 500 m by captive balloons and up to 5,000 m by aircraft. The analysis of the variance spectra has indicated that with a mixed, almost adiabatically stratified atmosphere the 5/3 law of *Kolmogorow-Heizenberg* is met.

A remarkably high correlation was found between the drift of the field of radio waves as measured by spaced receivers and the

geostrophic wind component perpendicular to the direction of propagation at the height where the radio wave is cattered.

The absorption of atmospheric gases in the millimetric and centimetric wavelength range has been studied in order to delineate the absorption bands and windows more exactly. The improvement of lasers has made possible an extension of investigations into the visible range.

In the field of *Radar meteorology* the reflection, scattering and absorption of centimetric wavelength by precipitation has been studied by comparing the strength of radar echoes with the intensity of precipitation as measured on the ground. It was found that the maximum intensity is produced at greater altitudes depending on the energy of convection. The use of Doppler radar makes it possible to distinguish, because of the different velocity of falling, droplets of different size.

Combined application of airborne refractometers and vertical radar showed with a high order of probability that *angels* are produced by shortlived discontinuities of the refractive index. The time variation of the intensity of the *angels*, however, points to a rather complex mechanism of reflections. Investigations by a *double wave* radar on 8 mm and 3.2 cm wavelengths suggest that the reflections originate from the interfaces between very moist air in a convection bubble and the drier air surrounding it.

In practical application the detection range of typhoons by radar has been extended to 600 km.

The field of Commission III (*Ionosphere*) is becoming increasingly interesting to meteorologists in two respects. A statistical correlation has been established between the occurrence of stratospheric warmings and the excessive absorption of radio waves in the lower ionosphere on a number of winter days. It is tentatively assumed that during the incomplete breakdowns of the polar night vortex in winter both the temperature of the stratosphere and the electron density in the lower ionosphere are increased by subsiding air. It is very likely also that the anomalous temporal variation of the electron density in the F-region can only be explained by drastic changes of the temperature *and* the neutral gas composition of the ionosphere with the time of day and season. In addition an interhemispheric circulation may play a role. These two features are the first manifestations found up to now of coupling effects between meteorology and aeronomy.

PUBLICATIONS DE L'URSI

URSI PUBLICATIONS

Les communications scientifiques présentées à la XV^e Assemblée Générale de l'URSI et citées ci-après ont été publiées dans *PROGRESS IN RADIO SCIENCE*, 1963-1966 édité par l'URSI.

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The scientific papers submitted at the XVth General Assembly and mentioned hereunder have been published in *PROGRESS IN RADIO SCIENCE*, 1963-1966, issued by URSI.

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Active atomic frequency standards, M. E. ZHABOTINSKI.
Progress in the distribution of standard time and frequency, 1963 through 1966, J. M. RICHARDSON.
World-wide coordination of UT and AT, C. EGIDI.
Narrow band time signals on myriametric waves, C. EGIDI.
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Radio measurements and standards at frequencies up to 1 G Hz — A progress review of measurements of power, impedence and attenuation, 1963 to 1966, I. A. HARRIS.

Remarks for the XVth URSI General Assembly session on progress at $f \leqslant 1$ G Hz, M. C. SELBY.

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Report on progress, 1963-1966, in the development of radio standards and measurements methods above 1 G Hz, S. OKAMURA.

Microwave standards and measurements in the USA, 1963-1966, R. W. BEATTY.

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Progress in measurement of electromagnetic properties of materials 1963 to mid 1966, H. E. BUSSEY.

Measurement of the characteristics of optical and quasi-optical waveguides, R. G. FELLERS.

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Turbulence and structure of the troposphere derived from propagation measurements, L. FEHLHABER and J. GROSSKOPF.

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Linear circuit theory.

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BIBLIOGRAPHY

Commission III.

— Diffusive equilibrium in the topside equatorial ionosphere, H. RISHBETH, T. E. Van ZANDT and R. B. NORTON, *Annales de Géophysique*, T. 22, n° 4, Oct.-déc. 1966.

— Ionospheric temperature and composition measurements of the magnetic equator, D. T. FARLEY, *Annales de Géophysique*, T. 22, n° 3, Juil.-sept. 1966.

— Ionospheric E-Region irregularities produced by non-linear coupling of unstable plasma waves, J. P. DOUGHERTY and D. R. FARLEY, *Jour. Geoph. Res.*, Vol. 72, n° 3, Febr. 1967.

Commission V.

— Solar observation at 8.6, 4.3 and 3.2 millimeter waves with a 4.88 meter diameter telescope, K. TAKAHASI, *Jour. Rad. Res. Lab.*, Vol. 13, n° 70, Nov. 1966.

* * *

International Electrotechnical Commission.

— Publication 151-10 — First edition — Measurements of the electrical properties of electronic tubes and valves. Part 10 : Methods of Measurement of Audiofrequency Output Power and Distorsion.

— Publication 215-1 — First edition — Safety requirements for radio transmitting equipment. Part 1 : Requirements.

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