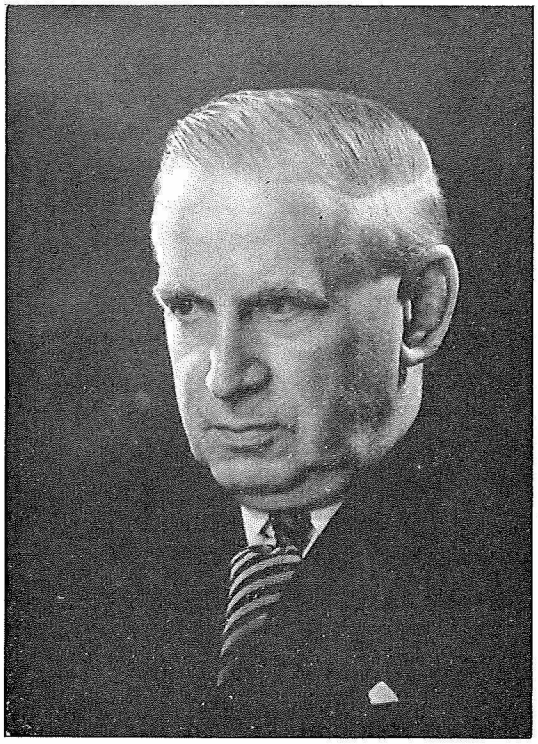
Bulletin nº 150 Mai-Juin 1965

U. R. S. I.

TABLE DES MATIERES — CONTENTS

OBITUARY

Sir Edward Victor Appleton
G. B. E., K. C. B., F. R. S.



All those associated with the affairs of U.R.S.I. will have been shocked at the news of the death of Sir Edward Appleton, at his home in Edinburgh on 21 April 1965. He had attended every General Assembly of U.R.S.I. from the second, which was held in Washington in 1927, to the meeting in London in 1960. He was President of the Union from 1934 to 1952, and from the latter years he had been an Honorary President.

Sir Edward Victor Appleton was born in Bradford, England on 6 September 1892, and received his scientific education at St. John's College, Cambridge where he graduated in Physics in 1914. After military service during the first World War, he returned to Cambridge in 1919, becoming assistant demonstrator in Experimental Physics under Lord Rutherford. Here he conducted research on thermionic valves, atmospherics and the fading of wireless signals, which were just coming into use for the broadcasting of sound programmes.

In December 1924, Appleton provided the first direct experimental proof of the reflection of radio waves from a conducting ionised layer in the atmosphere, thereby confirming the theoretical speculations of Heaviside and Kennelly, after whom this conducting layer, now known as the E-region, was named. Shortly afterwards, systematic measurements demonstrated the existence of a second reflecting region which was appropriately termed the Appleton layer, and is now known as the F-region. This was the beginning of what has become an intensive world-wide study of the ionosphere with which, over the past forty years, both Appleton and U.R.S.I. have been closely associated. As Chairman of the Commission on Atmospheric Disturbances (1928-1946), and of the Commissions on Radio Wave Propagation (1946-1948) and on Ionospheric Radio (1948-1954), he led the promotion and development of U.R.S.I.'s international work in these fields of scientific research.

Both during and following his period of office as President of U.R.S.I. from 1934-1952, Professor, and later Sir Edward Appleton was a notable exponent of this international research in his Presidential addresses and lectures to the General Assemblies of the Union in Australia, the United States of America and in various European countries. He was very active in encouraging the long-term study of ionospheric conditions and their dependence on the eleven-year sunspot cycle.

For the Second International Polar Year of 1932-1933 he was not only chairman of the Sub-Commission which organized U.R.S.I.'s participation therein; but he was leader of the British group which set up the ionospheric recording station at Tromso in Norway where, for the first time, the properties of the ionosphere within Arctic Regions were explored by radio wave technique.

Twenty five years later, as chairman of the U.R.S.I. Committee for the International Geophysical Year of 1957-1958, he was again instrumental in sponsoring international collaboration in a more advanced investigation of conditions in the ionosphere. In the event, this period proved to be of the greatest significance in the history of radio wave propagation, since the prevailing solar activity was the highest recorded during the previous 200 years of systematic observations. With all this experience and direct interest in conditions in the upper atmosphere, it was natural to find that Appleton was President of the Joint I.C.S.U. Commission on the Ionosphere from 1948 to 1957.

Much of this international research work under the auspices of U.R.S.I., was carried out while Appleton held the chairs of Wheatstone Professor of Experimental Physics at King's College, London University during 1924-1936, and later Jacksonian Professor of Natural Philosophy at the University of Cambridge from 1936 to 1939. For the next ten years (1939-1949), including the critical and stormous period of the second World War, he was the head (as Secretary) of the British Department of Scientific and Industrial Research. In this post, he was responsible for many laboratories and industrial research organisations covering a very wide field of science and technology. For his public services during this period, he was honoured with a knighthood (K. C. B.) in 1941, and appointed a Knight Grand Commander of the Order of the British Empire (G. B. E.) in 1946. World recognition of his outstanding scientific work was given by the award to him in 1947 of the Nobel Prize for Physics.

Having demonstrated his unusual administrative ability, combined with penetrating scientific insight and a natural shrewdness in practical matters, Sir Edward Appleton was appointed in 1949 Principal and Vice-Chancellor of Edinburgh University, a post he held with conspicuous success until his untimely death. Here as in his former posts he proved to be an inspiration, guide and wise consellor to all those with whom he came in contact in various walks of life. In particular, many of the students who graduated under him, and others who came from overseas to do post-graduate work with him, are to be found today in leading positions throughout the world. He is acknowledged by them all to have been the greatest pioneer of international scientific

radio research. The International Scientific Radio Union (U.R.S.I.) is greatly indebted to the work and achievements of its former President.

10 May 1965.

R. L. SMITH-ROSE.

XIVth GENERAL ASSEMBLY

Proceedings of the XIVth General Assembly. — Vol. XIII

Errata

Part I :

p. 144 : line 17 *read* « about 2 or 3 ns » *instead of* « *about* 2 or 3 μ s ».

Part II :

p. 167 : lines 7 and 14 (Resolutions) *read* « n° 6 » *instead* of « n° 1 »
line 16 read « n° 7 » instead of « n° 6 ».

Publications

Nous signalons que l'U.R.S.I. a publié les ouvrages ci-après relatifs à la XIV^{e} Assemblée Générale qui s'est tenue à Tokyo en septembre 1963 :

Comptes rendus de la XIV^{e} Assemblée générale (Vol. XIII) :

Fas. I. — Commission I — Mesures et Etalons Radioélectriques ($ 5.00).

Fas. II. — Commission II — Radioélectricité et Troposphère ($ 6.00).

Fas. III. — Commission III — Ionosphère ($ 10.00).

Fas. IV. — Commission IV — Magnétosphère ($ 5.50).

Fas. V. — Commission V — Radioastronomie ($ 7.00).

Fas. VI. — Commission VI — Ondes et Circuits Radioélectriques ($ 11.00).

Fas. VII. — Commission VII — Radioélectronique ($ 6.00).

Fas. VIII. — Administration et activités diverses ($ 4.00).

Ces ouvrages sont en vente au Secrétariat Général de l'U.R.S.I.

Progress in Radio Science 1960-1963 :

Vol. I. — Radio Standards and Measurements, rédigé par R. W. BEATTY (50 s.).

Vol. II. — Radio and Troposphere, rédigé par F. DU CASTEL (90 s.).

Vol. III. — The Ionosphere, rédigé par G. M. BROWN (70 s.).

Vol. IV. — Radio Noise of Terrestrial Origin, rédigé par F. HORNER (55 s.).

Vol. VII. — Radioelectronics, rédigé par E. R. BURGESS (60 s.).

Vol. VIII. — Space Radio Science, rédigé par K. MAEDA et S. SILVER (75 s.).

Sous presse :

Vol. V. — Radioastronomy.

Vol. VI. — Radio Waves and Circuits.

Ces volumes sont en vente chez Elsevier Publishing Company, Jan van Galenstraat 335, Amsterdam W, Pays-Bas.

Publications

U.R.S.I. has published the following works relevant to the XIVth General Assembly, Tokyo, September 1963 :

Proceedings of the XIVth General Assembly (Vol. XIII) :

Part I. — Commission I — Radio Standards and Measurements ($ 5.00).

Part II. — Commission II — Radio and Troposphere ($ 6.00).

Part III. — Commission III — Ionosphere ($ 10.00).

Part IV. — Commission IV — Magnetosphere ($ 5.50)

Part V. — Commission V — Radioastronomy ($ 7.00).

Part VI. — Commission VI — Radio Waves and Circuits ($ 11.00).

Part VII. — Commission VII — Radioelectronics ($ 6.00).

Part VIII. — Administration and miscellaneous ($ 4.00).

These publications are on sale at the U.R.S.I. General Secretariat.

Progress in Radio Science 1960-1963.

Vol. I. — Radio Standards and Measurements, edited by R. W. BEATTY (50 s.).

Vol. II. — Radio and Troposphere, edited by F. DU CASTEL (90 s.).

Vol. III. — The Ionosphere, edited by G. M. BROWN (70 s.).

Vol. IV. — Radio Noise of Terrestrial Origin, edited by F. HORNER (55 s.).

Vol. VII. — Radioelectronics, edited by E. R. BURGESS (60 s.).

Vol. VIII. — Space Radio Science, edited by K. MAEDA and S. SILVER (75 s.).

In the press :

Vol. V. — Radioastronomy.

Vol. VI. — Radio Waves and Circuits.

These volumes are on sale at Elsevier Publishing Company, Jan van Galenstraat 335, Amsterdam W, The Netherlands.

XV[e] ASSEMBLÉE GÉNÉRALE

Rapports des Comités Nationaux à l'Assemblée Générale

(see English text p. 13)

Préambule

Le Bureau de l'U.R.S.I., au cours de sa dernière réunion (mars 1965) a invité le Secrétaire Général à envoyer aux Comités Nationaux des informations générales sur la présentation et la teneur des Rapports d'activités qui seront soumis à la prochaine Assemblée Générale de l'Union.

Il convient avant tout de souligner l'importance de ces Rapports qui serviront de base aux Présidents des Commissions pour rédiger leurs rapports introductifs ; ceux-ci donneront en effet un résumé succinct des progrès intervenus dans le domaine des Commissions respectives au cours des trois années précédant l'Assemblée Générale.

Par ailleurs, il convient de rappeler que le but principal des séances scientifiques organisées pendant l'Assemblée Générale est de faire le point et de discuter des développements intervenus dans certains sujets choisis, et d'établir les programmes de recherches pour l'avenir.

Teneur

Les Règles pour la présentation des Rapports des Comités Nationaux sont publiées aux pages 25 et 26 des Statuts et Règlements de l'U.R.S.I. Au cours de sa dernière réunion, le Bureau a apporté quelques légères modifications à ces Règles, après avoir consulté le Comité de Coordination. Le nouveau texte conformément auquel seront établis les rapports d'activités pour la prochaine Assemblée Générale sera soumis au Comité Exécutif ; il figure à l'Annexe I.

Publication — Distribution

Les Rapports des Comités Nationaux, rédigés selon les règles figurant à l'Annexe I, seront publiés dans les Comptes Rendus de l'Assemblée Générale.

Les Comités Nationaux qui désireraient voir leurs rapports distribués à l'ouverture de l'Assemblée Générale, sont invités à fournir au Comité Organisateur Allemand un nombre suffisant d'exemplaires.

Dans le cas où certains Comités Nationaux, dont les rapports dépasseraient les 3500 mots, souhaiteraient publier ces rapports soit en un volume séparé, soit dans une revue scientifique, ils sont priés

(i) d'envoyer au Secrétaire Général de l'U.R.S.I. un résumé ou une table des matières de ces rapports avec indication de l'éditeur ou de la revue,

(ii) de fournir au Secrétaire Général de l'U.R.S.I. deux exemplaires soit du volume, soit de la revue,

(iii) de fournir 50 exemplaires des rapports pour distribution gratuite suivant les arrangements qu'ils auront pris avec le Secrétaire Général de l'U.R.S.I.

Rapports des comités nationaux

1. Les Rapports d'activité des Comités Nationaux doivent parvenir au Secrétaire Général *en trois exemplaires, au moins trois mois avant l'Assemblée Générale.*

2. Pour en faciliter la distribution, ces rapports doivent être divisés en parties correspondant aux diverses Commissions ou aux Comités de l'U.R.S.I.

3. Les Comités Nationaux sont invités à rédiger leurs Rapports sous la forme ci-après :

(*a*) une courte description des recherches effectuées depuis l'établissement du dernier rapport sur les différents sujets du domaine de la Commission, et plus particulièrement des recherches effectuées sur les sujets figurant au programme de l'Assemblée Générale,

(*b*) une liste des références se rapportant à ces sujets.

4. Les *textes* décrivant des recherches doivent être subdivisés en parties se rapportant aux divers sujets étudiés. Etant donné que, généralement, les sujets ont été complètement développés dans les contributions scientifiques de base qui seront mentionnées dans les références, il n'est pas nécessaire d'inclure trop de détails dans les Rapports. Chacune des parties devrait *a*) caractériser complètement la période écoulée, *b*) mentionner clairement les progrès réalisés, les nouvelles réalisations et celles qui présentent un intérêt exceptionnel, *c*) être brèves.

5. Les *références* doivent également être groupées par sujet, sous des titres correspondant à ceux des différentes parties (voir 4).

6. Les Comités Nationaux sont priés d'éviter d'inclure dans leur description des recherches effectuées (voir 3 (*a*)) des résumés étendus d'articles, publiés ou non.

7. Etant donné que les bibliographies générales sont suffisamment couvertes par *Science Abstracts*, par le *Bulletin Signalétique* et par des listes de références publiées dans des périodiques particuliers à la radioélectricité, les Comités Nationaux sont priés d'éviter les doubles emplois avec ces sources existantes.

Les Rapports devraient être des comptes rendus complets, mais aussi concis que possible, des progrès réalisés, avec les références essentielles. Pour chacune des Commissions ou Comités, ils ne doivent pas dépasser les 3500 mots.

8. Les Comités Nationaux sont invités à établir leurs Rapports dans l'une des langues officielles de l'U.R.S.I.

9. Les Rapports des Comités Nationaux établis conformément aux règles ci-dessus seront publiés dans les Comptes Rendus de l'Assemblée Générale.

10. Les Rapports administratifs, ou ceux relatifs à l'activité générale des Comités Nationaux, sont publiés dans le *Bulletin d'Information*. Ils ne sont ni reproduits ni distribués aux Assemblées Générales.

XVth GENERAL ASSEMBLY

National Committee Reports to the General Assembly

Preamble

At the last meeting of the Board of Officers (March, 1965), the Secretary General of U.R.S.I. has been instructed to circulate to National Committees general information on the presentation and contents of Progress Reports to be submitted to the forthcoming General Assembly by National Committees.

First of all the importance of such reports has to be stressed. They will be used by the Commission Chairmen for the drafting of their introductory report summarising the progress made by their Commission during the three year period preceding the General Assembly.

It should also be recalled that the main aims of scientific sessions held during the General Assembly are to review and discuss the progress made in some selected topics, and to establish research programmes for the future.

Contents of the Progress Reports

Rules for the presentation of National Committee Reports are published in U.R.S.I. Statutes and Bylaws, pp. 25-26. They have been slightly altered by the last meeting of the Board of Officers after consultation of the Co-ordinating Committee. The new text to be used for the establishment of Progress Reports for the forthcoming General Assembly will be submitted to the Executive Committee : it is given in Appendix I.

Publication — Distribution

National Committee Reports, when fulfilling the rules given in Appendix I, will be published in the Proceedings of the General Assembly.

National Committees wishing to have their reports distributed at the opening of the General Assembly are invited to provide the German General Arrangements Committee with the necessary number of copies.

Some National Committees whose reports exceed 3500 words each might wish to publish such reports in a separate volume or in a scientific journal ; in such case they should :

(i) send to the Secretary General of U.R.S.I. a summary or a table of contents of the reports with reference to the publisher or the journal,

(ii) provide the Secretary General of U.R.S.I. with two copies of each volume or journal,

(iii) provide 50 copies for free distribution according to arrangements with the Secretary General of U.R.S.I.

Appendix I

National Committee Reports

1. National Committee Progress Reports should reach the Secretary General, *in triplicate, at least three months before the General Assembly.*

2. To facilitate distribution, such reports should be subdivided into separate parts corresponding to each U.R.S.I. Commission or outstanding Committee.

3. National Committees are invited to draft their reports in the following form :

(*a*) a brief description of researches accomplished on the various topics in the field of the Commissions since the writing of the last report, with special consideration of the topics selected for discussion during the General Assembly,

(*b*) a list of references concerned with these topics.

4. *Texts* describing researches should be subdivided into sections related to the various topics investigated. Since in general the subjects are fully developed in the basic scientific contributions which should be mentioned in the references, it is not necessary to include too much detail in the reports. These sections should (*a*) characterize completely the past period, (*b*) clearly mention the progress achieved, the new developments and those having exceptional interest (*c*) be brief.

5. References should also be grouped by topic, under titles corresponding to those of the various sections (see 4).

6. National Committees are asked in their description of researches carried out (see 3 (*a*)) to avoid inclusion of extensive summaries of individual papers published or not.

7. Due to the fact that general bibliographies are well covered by the *Science Abstracts*, the *Bulletin Signalétique*, and by reference lists published in radio periodicals, National Committees are asked to avoid duplication of these existing sources.

The reports should endeavour to be readible accounts of progress as brief as possible with only the essential references. They should for each Commission or Committee not exceed 3500 words.

8. National Committees are required to draft their reports in one of the official languages of U.R.S.I.

9. National Committee Reports fulfilling the above mentioned conditions are published in the Proceedings of the General Assembly.

10. Administrative Reports, or Reports on the general activity of National Committees, are published in the *Information Bulletin*. They are not reproduced nor distributed at General Assemblies.

Publications scientifiques

(see English text p. 19)

Instructions pour les auteurs

Les présentes directives destinées aux auteurs de communications à inclure dans les publications scientifiques de l'U.R.S.I. (Progress in Radio Science, Comptes Rendus de réunions scientifiques, Rapports Spéciaux) remplacent les « Instructions pour la publication des Monographies de l'U.R.S.I. » reproduites pp. 21-23 des Statuts et Règlements.

Ces instructions ont été adoptées par le Comité de Coordination en mars 1965.

* * *

1. Seules seront acceptées les communications originales rédigées en langue française ou en langue anglaise.

2. Deux exemplaires des manuscrits doivent être envoyés au Secrétaire Général de l'U.R.S.I. à la date fixée.

3. Ces exemplaires seront dactylographiés (sur papier fort pour un exemplaire au moins) sur une face de la feuille seulement, avec double interligne (y compris les résumés et références) et une marge convenable.

4. Un espace suffisant sera réservé pour les *expressions mathématiques* qui seront soigneusement dactylographiées ou manuscrites de façon très lisible.

5. Les *symboles* utilisés seront clairement expliqués et d'usage scientifique courant.

6. *Résumés.* — Chaque manuscrit sera précédé d'un résumé dont la longueur ne dépassera pas 300 mots. Le titre, le nom de l'auteur et son titre, et le résumé seront reproduits sur une feuille séparée. Le résumé doit être un aperçu concis mais complet des parties essentielles de la communication, cela étant donné que ces résumés sont fréquemment reproduits mot à mot dans des revues de comptes rendus analytiques.

7. *Références.* — Quel que soit le système utilisé, il doit être suivi de façon uniforme pour tout le manuscrit. Le système suivant a les préférences de l'éditeur :

pour les périodiques : T. KUWANA et R. N. ADAMS, *Anal. Rad. Acta*, 20 (1959), 51. (Auteur — virgule — titre abrégé du périodique suivant les règles normales — virgule — numéro du volume — année entre parenthèses — numéro de la page — point final).

pour les livres : B. JIRGENSONS, Antennes Radioélectriques, Edition Universelle, Paris, 1958, p. 656 (Auteur — virgule — titre du livre — virgule — année — virgule — numéro de la ou des pages p. ou pp. — point final).

Dans les listes alphabétiques, les initiales du premier auteur seront données après son nom.

Il convient de s'assurer que chaque numéro de référence dans le texte ait une mention correspondante dans la liste des références et vice versa.

Les titres des revues seront abrégés dans la mesure du possible.

Les références citées, mais non pas mentionnées dans le texte, seront énumérées séparément sous letitre « Références supplémentaires.»

8. *Tables et figures.* — Le matériel convenant pour une telle présentation sera présenté sous forme de table dactylographiée sur une feuille séparée. Les tables seront numérotées dans l'ordre de leur citation dans le texte et chaque table aura un titre. Les en-têtes des colonnes seront courts et facilement compréhensibles ; des explications complémentaires peuvent être données sous forme de notes.

Les dessins et diagrammes (figures linéaires) ne doivent contenir aucun texte sauf de brèves indications telles que figure 1, etc. Les dimensions totales ne doivent pas être inférieures à 9 × 12 cm (3″ ½ × 4″ ½) et ne doivent pas dépasser 16 × 25 cm (6″ ½ × 10″).

Les photographies auront une bonne intensité et de bons contrastes ; elles seront présentées sur papier glacé et ne dépasseront pas 21,5 × 28 cm (8″ ½ × 11″).

Les textes accompagnant les figures seront présentés sur une feuille séparée. L'emplacement des figures et des tableaux sera indiqué dans la marge du texte.

9. *Droits d'auteur.* — La firme d'édition acquiert les droits d'auteur des publications en toutes langues, sauf pour celles en langue russe. Toutefois les auteurs de communications présentées à une réunion ou à un symposium pourront les publier dans un journal scientifique sous réserve :

a) de demander l'autorisation au Secrétaire Général de l'U.R.S.I. ;

b) de mentionner la publication de l'U.R.S.I. dans laquelle la communication a été publiée.

Les illustrations, tables et diagrammes doivent être fournis exempts de tout droit d'auteur.

Les auteurs de communications prendront les dispositions voulues pour exonérer la firme d'édition de toute réclamation introduite par un tiers au sujet de la violation du droit d'auteur causée par la publication de manuscrits. Les auteurs sont invités à obtenir les autorisations usuelles pour la citation de passages extraits d'un livre pour lequel un droit d'auteur existe.

Instructions pour les publications scientifiques de l'U.R.S.I.

Les directives ci-après, adoptées par le Comité de Coordination, mars 1965, remplacent les directives générales contenues dans les

« Instructions pour la publication des monographies de l'U.R.S.I. », reproduites dans les Statuts et Règlements de l'U.R.S.I., pp. 21-23.

* * *

1. Les publications scientifiques de l'U.R.S.I. comprennent :

(i) les « Progress in Radio Science » édités après chaque Assemblée Générale. Ces rapports ne doivent contenir que les aperçus généraux (review papers) sollicités par les Présidents des Commissions intéressées et les comptes rendus des discussions en découlant, si cela est estimé utile.

(ii) les comptes rendus des réunions scientifiques organisées soit par l'U.R.S.I., soit par une de ses Commissions ou par un de ses Comités ; seules les communications présentées par les auteurs seront publiées.

(iii) les Rapports Spéciaux traitant de sujets bien définis ; ces Rapports proposés par une Commission ou un Comité de l'U.R.S.I. doivent avoir l'accord de l'Assemblée Générale.

2. Toute Commission ou tout Comité ayant l'intention d'éditer une publication scientifique doit désigner, de commun accord avec le Secrétaire Général de l'U.R.S.I., un Rédacteur Scientifique qui sera chargé de réunir les documents, de rédiger les textes nécessaires et de mettre en ordre le manuscrit définitif qu'il transmettra au Secrétaire Général de l'U.R.S.I. pour publication.

3. Le Comité de Rédaction de l'U.R.S.I. est constitué par le Bureau, délégation pour les affaires courantes étant donnée au Secrétaire Général qui agira comme Rédacteur en Chef et se tiendra en contact étroit avec les Rédacteurs Scientifiques.

4. Seules les communications originales peuvent être incluses dans les publications scientifiques.

5. Seules les deux langues officielles (français et anglais) de l'U.R.S.I. seront utilisées.

6. Les manuscrits présentés pour publication seront conformes aux « Directives pour les Auteurs ».

7. La correction des épreuves se fera de commun accord entre le Rédacteur Scientifique et le Secrétaire Général de l'U.R.S.I. ou l'éditeur.

U.R.S.I. Scientific Publications

INSTRUCTIONS TO AUTHORS

The following instructions intended to authors of papers to be inserted in U.R.S.I. scientific publications (Progress in Radio Science, Proceedings of Scientific Meetings, Special Reports) replace the « Instructions for the publication of U.R.S.I. Monographs » as published in U.R.S.I. Statutes and Bylaws, pp. 21-23.

The present instructions have been adopted by the Co-ordinating Committee, March 1965.

* * *

1. Only original papers in English or French language will be accepted.

2. Two copies of the manuscripts should be sent to the Secretary General of U.R.S.I. at the date fixed.

3. Such copies should be typewritten (on heavy paper for at least one copy) on one side of page only, double spaced (including abstracts and references) with generous margin.

4. Ample space should be allowed for *mathematical expressions* which should be carefully typed or very plainly written by hand.

5. *Symbols* used should be clearly explained and in accordance with scientific usage.

6. *Abstracts.* — An abstract is required at the beginning of each Manuscript. This abstract will not exceed in length 300 words. Title, author's name, affiliation, and abstract must appear on a separate page. The abstract should be a concise but comprehensive condensation of the essential parts of the paper, since abstracts are frequently quoted verbatim in abstracting journals.

7. *References.* — Whatever system is employed, it should be carried out uniformly throughout the entire manuscript. The following system is preferred by the publisher :

to periodicals : T. KUWANA and R. N. ADAMS, *Anal. Rad. Acta*, 20 (1959), 51 (Author — comma — periodical abbreviated according to standard rules — comma — volume number — year in brackets — page number — full stop).

to books : B. JIRGENSONS, Radio Antennas, General Publisher, New York, 1958, p. 656 (Author — comma — title of book —

comma — publisher — comma — publisher's residence — comma — year — comma — p. or pp. — page number(s) — full stop).

In alphabetical lists, the initials of the first author should be given after his surname.

Be sure that every reference number in the text has its corresponding quotation in the list of references, and vice-versa.

Titles of journals, as far as possible, should be abbreviated.

References listed but not mentioned in the text should be listed under separate heading « Additional References ».

8. *Tables and figures.* — Material suited to tabular form should be arranged as a table and should be typewritten on a separate sheet. Tables must be numbered according to their sequence in the text, and each table should have a title. Column headings should be short and self-explanatory ; more complete explanation may be given in footnotes to the table.

Drawings, diagrams (line-figures) should contain no text except for brief indication such as Fig. 1, etc. The overall dimensions should not be less than 9 × 12 cm (3″ ½ × 4″ ½) nor exceeding 16 × 25 cm (6″ ½ × 10″).

Photographs should have good intensity and contrast ; they should be on glossy prints, no larger than 21.5 × 28 cm (8″ ½ × 11″).

The accompanying text should be submitted on a separate sheet. The place of figures and tables should be clearly indicated in the margin of the text concerned.

9. *Copyrights.* — The publishing firm acquires the sole and exclusive copyright of the publication in all languages throughout the world at the exception of translation in Russian language. Nevertheless, authors of papers submitted to a meeting or a symposium may publish them in a scientific journal under the following conditions :

(*a*) to ask the authorization to the Secretary General of U.R.S.I.,

(*b*) to mention the U.R.S.I. publication in which the paper has been printed.

Illustrations, tables and diagrams should be supplied free of any copyright charges.

The authors of papers will protect the publishing firm against any claim by a third party in connection with infringement of copyright caused by the publication of manuscripts. The authors should obtain the usual permission to quote passages from books for which a copyright exists.

Instructions for U.R.S.I. scientific publications

The following instructions adopted by the Co-ordinating Committee, March 1965, replace the general directives included in « Instructions for the publication of U.R.S.I. Monographs », as published in U.R.S.I. Statutes and Bylaws, pp. 21-23.

* * *

1. U.R.S.I. scientific publications include :

(i) Progress Reports in Radio Science issued after each General Assembly. Those Reports should include only review papers invited by the interested Chairman and Proceedings of issuing discussions, if found suitable.

(ii) Proceedings of scientific meetings organized by U.R.S.I. or by U.R.S.I. Commissions or Committees ; only papers submitted by their author(s) should be published.

(iii) Special Reports on specific topics of general interest ; such reports should be proposed by an U.R.S.I. Commission or Committee and agreed by the General Assembly.

2. Any Commission or Committee intending to publish a scientific publication should appoint, in agreement with the Secretary General of U.R.S.I., a Scientific Editor who will collect the material, draft the necessary texts, edit the final manuscript and forward it for publication to the Secretary General of U.R.S.I.

3. The Editorial Board of U.R.S.I. is constituted by the Board of Officers of U.R.S.I., delegation for routine affairs being given to the Secretary General who will act as U.R.S.I. Editor and keep close contacts with the Scientific Editors.

4. Only original papers should be included in scientific publications.

5. Only the two U.R.S.I. official languages (English and French) should be used.

6. Manuscripts submitted for publication should be presented according to the « Instructions to Authors ».

7. Proof reading will be made in common agreement between the Scientific Editor and the Secretary General of U.R.S.I., or the publisher.

NATIONAL COMMITTEES

Denmark

LETTER FROM THE PRESIDENT

I beg to announce that all responsibilities in connection with Danish ionosphere research hitherto resting with me, have from April 15, 1965 been taken over by my colleague Professor, Dr. Hans Lottrup Knudsen of the Technical University of Denmark.

Medical reasons forced me to resign from this work in the fall of 1963. Professor Jens Lindhard of Arhus University, Physics Department, most kindly saved the situation by taking over at short notice, however, on the condition that his deputyship should be limited to a period of about fifteen months. In the meantime the present solution was found. Professor Lindhard has contributed to the scientific progress of the laboratory, especially by initiating a cooperation between the different groups in Denmark interested in plasma physics.

The present organization has been arranged as follows. The Technical University of Denmark has appointed Professor Knudsen as chief of the Ionosphere Laboratory. This laboratory is divided in three groups, a physics group under Mr. J. Kirstein Olesen, an instrumentation group under Mr. Ove E. Petersen and a small group for cosmic rays, headed by Niels Lund, MSc. The physics group will continue its work on VLF phenomena and ionosphere physics with special regard to arctic conditions. It will carry on the present cooperation with the Danish Meteorological Institute and the U. S. National Bureau of Standard concerning the ionosphere observations in Godhavn and Narssarssuaq in Greenland. The instrumentation group will continue the development and manufacture of instruments intended to be launched by rockets and satellites in connection with the U. S. A.-Norway-Denmark sounding rockets being launched from Andøya in Northern Norway, and in connection with the coming efforts sponsored by the European Space Research Organization, ESRO.

A Space Research Committee set up by the Danish Council of Technical Sciences will continue to supervise those activities at the Ionosphere Laboratory which it supports.

It should be added that Denmark will continue its membership of the International Committee on Space Research, C.O.S.P.A.R., and the International Scientific Radio Union, U.R.S.I. The Danish National Committees are sponsored by the Royal Society of Sciences and the Academy of Technical Sciences, respectively, and presidents are Professor Dr. Einar Andersen, Director of the Geodetic Institute, and myself. The National Committees will sponsor Danish scientific activities but will in the future not assume direct responsibility for such work.

Professor Knudsen has been doing research on electromagnetic theory and antennas. He organized an U.R.S.I. Symposium on these subjects in Copenhagen 1962. He has been relieved from the leadership of the Laboratory of Electromagnetic Theory but expects to return to his laboratory in due time.

May 1965.

Jørgen RYBNER,
Laboratory of Circuit Theory
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Republic of South Africa

ANNUAL REPORTS 1962-1963 AND 1963-1964

The National Institute for Telecommunications Research Council for Scientific and Industrial Research, has issued its Annual Reports 1962-1963 and 1963-1964.

The contents of those reports are as follows :

1962-63

1962-63

Pages

1963-64

Pages

COMMISSIONS

Commission I. — Etalons et Mesures Radioélectriques

SIGNAUX HORAIRES

Le Bureau International de l'Heure donne, dans son *Bulletin Horaire*, Série J, n° 1 (janv.-fév. 1964) des données nouvelles, en particulier sur les émetteurs de signaux horaires et les réajustements de signaux horaires coordonnés.

Entre autres informations, ce Bulletin contient un tableau donnant pour une quarantaine de stations émettrices, les caractéristiques des émissions : indicatif, emplacement, latitude et longitude, durée de transmission et forme des signaux, exactitude des fréquences.

JOINT COMMUNICATION BY CANADIAN AND U. S. COMMISSIONS 1

In keeping with the long-standing recommendation of Commission I, U.R.S.I., encouraging the international intercomparison of radio standards, the National Bureau of Standards and the National Research Council (NRC) of Canada have recently completed an intercomparison of rf (CW) power standards. The intercomparison was performed at frequencies of 300 Mc/s and 1000 Mc/s using a directional coupler-bolometer mount combination as the transfer device. The reference standards in both countries are the dry-load, calorimetric type which, however, differ in design from each other. The maximum uncertainty of the Canadian standard is claimed to be 0.45 % at 1000 Mc/s while that of the U. S. standard is estimated at 0.25 %.

The directional coupler-bolometer mount was furnished by NRC and the comparison was carried out by measuring the coupling ratio, K, of the coupler. The coupling, K, is defined as the ratio of the rf power at the coupler primary output port to the

substituted d-c power in the bolometer mount which was connected to the coupler incident secondary port. The rf power at the coupler primary output was measured with the calorimetric reference standard in each country while the secondary power, as measured by the bolometer mount, was common to measurements in both countries.

The results of the intercomparison are shown below :

A. — *Intercomparison at* 300 *Mc/s*

Coupling Ratio		Percent Difference
NRC (Canada)	NBS (U. S. A.)	NBS-NRC/NBS
87.64	87.54	—0.11

B. — *Intercomparison at* 1000 *Mc/s*

Coupling Ratio		
NRC (Canada)	NBS (U. S. A.)	
101.83	102.07	+0.24

The NBS values given for the coupling ratios are the average of three determinations at each frequency. The maximum deviation from the average was 0.05 % at 300 Mc/s and 0.1 % at 1000 Mc/s. The maximum transfer error, due to impedance mismatch between the coupler and the calorimeters, was estimated to be 0.4 % at 1000 Mc/s. The nominal power level at the coupler primary output port was 100 mw. All correspondence concerning this intercomparison was carried on with Mr. Richard F. Clark of NRC. The investigator at NBS was Mr. P. A. Hudson.

Charles F. PATTENSON, *Chairman*,
Canadian Commission 1

John M. RICHARDSON, *Chairman*,
U. S. Commission 1

Commission III on the Ionosphere

WORLD DATA CENTER C2

The Radio Research Laboratories, Ministry of Posts and Telecommunications, Tokyo, Japan, have issued on December 31, 1964 the « Catalogue of Data in World Data Center C2 for Ionosphere ».

The Catalogue contains lists of data received from 1957 to 1964 and relevant to vertical incidence soundings, electron density profiles, absorption, ionospheric drifts, atmospheric radio noise, whistlers, backscatter, etc.

INDICES D'ACTIVITÉ SOLAIRE POUR LA PROPAGATION IONOSPHÉRIQUE

(Extrait du *Journal des Télécommunications*, Vol. 32, n° 4, avril 1965).

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 (C.C.I.R.), conformément à la Résolution 4, l'avis 371 et le Rapport 246 du C.C.I.R.

Remarque : De nombreux détails sur les indices ionosphériques sont contenus dans une publication récente : *Advances in radio research*, volume 2, éditée par J. A. Saxton (Academic Press, Londres et New York, 1964). Il s'agit de la contribution de C. M. Minnis, intitulée Ionospheric indices, pages 1-36, de l'ouvrage en question.

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
1963	29	30	30	29	29	28	28	27	27	26	23	21
1964	19	18	15	13	11	10	10	10				

● I_{F_2} (indice ionosphérique) :

Mois (année 1964)

1	2	3	4	5	6	7	8	9	10	11	12
0(2)*	6(2)*	20(2)*	14(2)*	1(2)*	—3(1)*	1(1)*	—3(1)*	4(1)*	3(1)*	—3(1)*	—4(1)*

Mois (année 1965)

1	2
7(1)*	5(1)*

(*) Les chiffres entre parenthèses indiquent le nombre de valeurs de foF_2 qui ne sont pas encore parvenues au secrétariat du C.C.I.R. et dont on n'a donc pas tenu compte dans le calcul de l'indice I_{F_2}. Pour plus de détails, voir *Journal des télécommunications* (avril 1964, page 119).

Par rapport aux données contenues dans le Rapport 246 du C.C.I.R., une station de sondages ionosphériques a cessé de fonctionner — celle de Porto Rico (en juin 1963). Les valeurs de I_{F_2} contenant entre parenthèses le chiffre (1) sont donc depuis le mois de juin 1963 les valeurs définitives de l'indice I_{F_2}. En outre, la station de Fairbanks n'a pas fonctionné pendant la période août-octobre 1963. Pour cette période les valeurs définitives de l'indice I_{F_2}, sont celles contenant le chiffre (2) entre parenthèses.

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

Mois	1	2	3	4	5	6	7	8	9	10	11	12
Année												
1964	74	76	75	73	69	69	67	69	70	73	73	78
1965	78	75										

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

PRÉVISIONS POUR LES MOIS A VENIR (1er avril 1965) *** :

● R_{12}

Mois	3	4	5	6	7	8	9
Année							
1965	14	16	17	19	20	22	24

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

Estimation de l'erreur sur les prévisions de R_{12} : ± 10.

● I_{F_2} (****).

Année \ Mois	2	3	4	5	6	7	8
1965	2	0	1	2	4	6	(9)

(****) Renseignements obligeamment fournis par le « Department of Scientific and Industrial Research, Radio Research Station », Slough. La valeur prévue six mois à l'avance est donnée entre parenthèses.

ESTIMATION DE L'ERREUR SUR LES PRÉVISIONS DE I_{F_2} :

Mois (1965)	2	3	4
Maximum	+4	+4,5	+4,5
Minimum	—6,5	—8,5	—9

Mois (1965)	5	6	7	8
Maximum	+4	+3	+3	+2,5
Minimum	—9	—10	—10	—10

SOLAR INDICES FOR IONOSPHERIC PROPAGATION

(Reprint from *Telecommunication Journal*, Vol. 32, n° 4, April 1965).

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 (C.C.I.R.) in accordance with C.C.I.R. Resolution 4, Recommendation 371, and Report 246.

Note : A considerable amount of information on ionospheric indices will be found in an article by C. M. Minnis, entitled Ionospheric indices on pages 1-36 of the recent publication *Advances in radio research*, volume 2, edited by J. A. Saxton (Academic Press, London and New York, 1964).

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
1963	29	30	30	29	29	28	28	27	27	26	23	21
1964	19	18	15	13	11	10	10	10				

● I_{F_2} (ionospheric index) :

Month (year 1964).

1	2	3	4	5	6	7	8	9	10	11	12
0(2)*	6(2)*	20(2)*	14(2)*	1(2)*	—3(1)*	1(1)*	—3(1)*	4(1)*	3(1)*	—3(1)*	—4(2)*

Month (year 1965).

1	2
7(1)*	5(1)*

(*) The figures in brackets represent the number of values of foF_2 which have not yet reached the C.C.I.R. Secretariat, and which have not therefore been taken into account in the calculation of I_{F_2}. For further details, see the *Telecommunication Journal*, April 1964, page 119.

With regard to the data contained in C.C.I.R. Report 246, one ionospheric sounding station has ceased to operate — Puerto Rico (in June 1963). The values of I_{F_2}, that include the figure (1) in brackets are therefore, as from the month of June 1963, definitive values for I_{F_2}. Furthermore the sounding station Fairbanks did not operate during the period August-October 1963. For this period the definitive values of I_{F_2} are those including the figure (2) in brackets.

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

Year \ Month	1	2	3	4	5	6	7	8	9	10	11	12
1964	74	76	75	73	69	69	67	69	70	73	73	78
1965	78	75										

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

FORECASTS FOR THE NEXT FEW MONTHS (1 April, 1965) (***) :

● R_{12}.

Month / Year	3	4	5	6	7	8	9
1965	14	16	17	19	20	22	24

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

Estimated error in forecasts of R_{12} : ± 10.

● I_{F2} (****).

Month / Year	2	3	4	5	6	7	8
1965	2	0	1	2	4	6	(9)

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

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

Estimate of the error in I_{F2} predictions :

Month (1965)	2	3	4
Maximum	+4	+4,5	+4,5
Minimum	—6,5	—8,5	—9

Month (1965)	5	6	7	8
Maximum	+4	+3	+3	+2,5
Minimum	—9	—10	—10	—10

Commission VI on Radio Waves and Circuits

INTERNATIONAL CONFERENCE ON MICROWAVES, CIRCUIT THEORY AND INFORMATION THEORY (I.C.M.C.I.)

TOKYO. SEPTEMBER 1964

About 900 participants attended the I.C.M.C.I. which was sponsored by a resolution of the XIVth General Assembly of U.R.S.I. 370 papers were presented, 203 on microwaves, 71 on circuit theory and 96 on information theory.

General summaries of the papers presented in each discipline are given hereunder.

Microwaves

by Dr I. SOMEYA

(N.T.T. Electrical Communication Theory)

The advances in the fields of optical beam and millimeter waves were presented. Transmission losses of optical beam waveguide of nonconfocal and curved systems consisted of sequences of lenses were calculated and measured. Transmission experiment of millimeter waves on a two-mile loop of helix waveguide with 160 mega bit binary repeaters was done and also unwanted mode, mode conversion and dimentional tolerances were discussed.

The surface wave transmission on a grooved guide composed of two parallel metallic plates with grooves and on a guide of shaped metallic plate were studied and their application for radar system in railway service was discussed.

Many theoretical and experimental studies on various microwave components such as partially filled waveguide, rectangular waveguide loaded with ferrite, filters with resonators of disks having high dielectric constants, delay equalizer with tapered cut-off waveguides, Y-circulators, etc. were presented.

Fabry-Perot interferometer at 169 Gc and resolution interferometer for polarization measurements at 9 Gc were introduced. Various techniques and instrumentations for measurements in microwave, millimeter and sub-millimeter wave were also presented.

Frequency multiplier using varactor diodes, tunnel diode

amplifiers and parametric amplifiers were theoretically studied.

Several significant advances in the fields of both pulsed and CW laser were introduced. A new Neon-Helium pulsed laser has an effective gain of about 0.5 % per cm at 100 Volts and 1 Ampere. Ultra-sonically forced longitudinal or transversal vibration of frequency range 10-90 kc/s applied directly to the ruby rod resulted in modulation of laser oscillation and experimentally the modulation was found to synchronize the usual random output spikes with the ultrasonic frequency.

In order to apply the laser for an optical transmission system, an optical circulator with a heavy flint glass used as a Faraday rotator was experimented and a peak isolation of 25 dB was obtained at 3300 Oe..

A C-band (5.5-6.0 Gc/s) multichannel traveling wave maser (TWM) employing iron-doped rutile in bath temperature of 2.4 K was introduced and the other rutile maser using « cross maser effect » was reported to have 20 Mc/s band-width at 9 Gc/s with the gain of 20 dB. The ruby TWM was applied to measure small changes of spin temperature.

A narrow band coupled-cavity amplifier has recently delivered in excess of 1 Kw CW at 55 Gc/s with a gain greater than 20 dB. Two TWTs which could be used for millimeter waveguide transmission system were introduced. One of them has a new interdigital circuit in it and its output is 1W and the band-width of the gain is 12 Gc/s at 50 Gc/s. The other tube is a ordinary TWT with the helix supported by a berillia rod and its output power and gain are 700 mW and 45 dB respectively.

In the field of gaseous plasma, the self-sustained CW-oscillations based on the negative conductance caused by the Ramsauer-effect were observed at the frequency of about 450 Mc/s. The relation between surface wave propagation constants on a cylindrical plasma column and axial magnetic field strength was discussed and an attempt to use the plasma column as a switch element was presented. On the other hand there were some papers regarding to applications of solid plasmas.

In the field of communication system, microwave equipments which were fully transistorized were introduced and the use of PCM in microwave system was discussed. The results of the experiments of Syncom satellite system were also presented by video tape recorder.

Circuit Theory

by Prof. H. Ozaki
(Oshaka University)

In the session of circuit theory in I.C.M.C.I. in Tokyo, Sept., 1964, subjects on Network Theory, Network Topology, Active Network, Time-Varying Systems, Nonlinear Systems and Circuit Physics were discussed. The number of papers presented was much more than expected, and the conference was successful with heated discussion.

Most papers concerned with the conventional fields of studies, not in new field. There were, however, many papers worthy of attention.

Y. Oono presents unified approach to cascade synthesis. He shows that there exists a passive two-port which has prescrived open-circuit and short-circuit driving-point impedances. « Synthesis of Passive Networks with Prescrived Two-Variable Reactance Function and Matrix » by T. Koga is of great interest in the sense that the synthesis problem concerning two-variable reactance functions and matrices is solved for the general case. This can be applied not only to the synthesis of networks with linearly variable two kinds of elements, but to the synthesis of networks composed of lossless transmission-lines of equal electrical length and lossless lumped elements.

A. Matsumoto and J. Ishii present interesting results on the synthesis of networks with transmission-lines of equal electrical length. Matsumoto treats networks with lossless multiwire lines, while Ishii, in his two papers, the synthesis and the design formulas of transmission-line composite filters and also presents unified approach to the design of narrow band-pass harmonic resonator-filters.

T. Fujisawa presents the design of pass-band Cheby shew band-pass filters on the insertionless basis. This is the extension of his previous results for the low-pass cases. I. Ishizaki and H. Watanabe present a new efficient interative procedure for the approximation of network functions.

« A Study of Linear Systems with Random Elements » by C. A. Andrews and F. M. Reza, and « Prediction of the Response of Linear Systems with Uncertain Parameters » by M. Trbus and

P. H. O'N. Rose treat the problems of physical linear systems in which the values of the parameters of the system are known within some limits of accuracy.

K. Geher, in his paper « The Tolerances of Linear Networks on Systems in the Time, Frequency and Complex Frequency Domains », also treats similar problem. He treats the fundamental properties of change in time domain and frequency domain transmission characteristics.

As to network topology, we had a number of contributions of interest. Among them there were some papers worthy of notice : « Properties of Lossy Communication Nets » by W. Mayeda and M. E. Van Valkenburg introduces source and sink terminal capacity matrices and their properties. « Optimum Distribution of Switching Centers in a Communication Network and Some Related Problems » by S. L. Hakimi treats the problem to find the distribution of switching centers such that the total length of wire is a minimum. « Approximate Formulas for Alternate Route Communication Networks » by M. Nagafune, S. T. Ling, Y. Tezuka, Y. Kasahara develops approximate formulas for the analysis of alternate route communication nets. Of another interest are a series of papers on the problem of n-port network, which has two subjects ; one is how to synthesize n-port network with $(n + 1)$ nodes with as small number of steps as possible, the other is the problem of realization of n-port with more than $(n + 1)$ nodes. The former is treated in « Synthesis of Resistive N-port Networks with $(n + 1)$ Nodes » by Y. Yasuda, T. Kasami and H. Ozaki, where the amount of steps necessary for constructing an n-port G-graph with $(n + 1)$ nodes within 2-isomorphism is reported to increase at most in proportion to N^5. The latter is considered in « Topological Characterization of n-Port Network Realization » (C5-1) by W. H. Kim, « On the Synthesis of n-Port with $(n + 2)$ Nodes » (C5-3) by H. Watanabe, and « Realization of Short Circuit Admittance Matrices of Order n with more than $(n + 1)$ Nodes, » (5-4) by I. T. Frish and K. R. Swaminathan. (C5-1) presents topological characterization of the realizability of immittance matrices of multiport network, whose results are extended to the synthesis of an n-port with more $(n + 1)$ nodes, (5-3) investigates the synthesis problem for n-port with $(n + 2)$ nodes, giving conditions for the realization of conductive n-port with $(n + 2)$ nodes. (C5-4) represents a reformulation of the

n-port realization problem and derives a « Powerful » set of necessary condition for realizability with (n + 2) nodes. Of another interest is « A System of Programs for Topological Synthesis of Networks » by M. Iri, which propose a method for constructing a graph which has a given matrix as the cut-set (or loop) matrix. The method can be applied both to the oriented and to the non-oriented graphs.

In the last decade, there can be seen a trend in the network theory from passive to active, from time constant to time varying and from linear to nonlinear. In this meeting many papers concerning the fields described above were presented. Some are as follows :

M. Saito and K. Hikino treat the relation between the sensitivity and the gain in resistance networks with or without one negative resistance and show that there exists an upper limit for sensitivity to a negative resistance in resistance network if the gain is prescribed. J. B. Cruz and W. R. Perkins introduce sensitivity matrix for the systems with several input and several output, and treat the parameter variation problem for the system.

E. S. Kuh treats general time-varying networks which contain time-varying resistors, inductors and capacitors. His method draw a special tree for a general circuit to include the maximum number of capacitances and the minimum number of inductances and set up the circuit equations, then compute the energy stored in the circuit and its time variable. Using the stability criterion of Liapunou, sufficient conditions for stability are shown. I. W. Sandberg treats frequency domain stability criterions for networks containing linear time-varying elements and an arbitrary finite number of linear time varying capacitors.

Information Theory

by Prof. H. Takahashi
(Tokyo University)

Information Theory Part on the I.C.M.C.I. consisted of 17 sub-sessions, covering such diversified subjects as : channel capacity, signal detection, coding, models of communication, filtering, noise, variable channels, signal processing, pattern recognition, learning, automata and sensory devices.

W. S. Peterson of Chiao Tung University, Taiwan, and E. Prange of Air Force Cambridge Res. Lab. discussed some symmetry properties of Bose-Chaudhuri-Hocquenghem codes and quadratic residue codes, from wich they obtained an identity which is useful for obtaining weight distribution of these codes. A number of papers dealing with algebraic theories of error-correcting codes have been read.

C. L. Weber of University of California at Los Angeles discussed optimal signals for coherent channels and gave an optimal set of n + 2 points in a space of n dimensions.

D. Slepian of Bell Tel. Lab. introduced a new coding and decoding system called permutation modulation, in which each code is obtained by a permutation of a single sequence of real numbers. The code is easy to decode, has a constant power, and has a near-fashion, optimum performance.

S. Deutsch of Polytech. Inst. of Brooklyn proposed a scheme of narrow band television in which scanning is done in a quasirandom to eliminate flicker at a frame rate as low as 2.5 cps.

In the session on pattern recognition, Iijima of the Electrotech. Lab., Tokyo, gave a basic theory of normalization of patterns with respect to brightness, contrast, magnitude and tilt, which will be useful for a certain type of pattern recognizers. H. Enomoto et. al. of Kokusai Denshin-Denwa Co., gave a basic procedure for finding the sequence of dichotomies. K. S. Fu and C. H. Chu of Purdue University talked about an adaptive pattern recognition system composed of a receptor and a categorizer, where feedback is introduced in both of these elements separately.

C. Y. Lee of Bell Tel. Lab. gave a proof for the possibility of constructing a cellular universal Turing machine using von Neumann's 29-state cells.

T. Sakai and H. Nishio of Kyoto Univ. talked about group-theoretical method for an approximate realization of Boolean functions. E. Wong of Univ. of California reported on an iterative process for deciding the linear separability of any Boolean function, and to find its realization when possible.

L. J. Foyel of General Dynamics and Astronautics Co. talked about an evolutionary predictor, which improves itself by the principle of mutation and selection. It was able to predict whether the next integer is a prime with a score of 78 per cent when shown a sequence of bits representing the primeness of successive in tegers.

T. Tamiti and K. Inadomi of Kyushu Univ. discussed about the automatic production of table of rules for mechanical translation by supplying the machine with correct bilingual pairs of sentences.

All the papers presented at the I.C.M.C.I. are published in three volumes which are available at the price of 7 dollars at the : Institute of Electrical Communication Engineers of Japan, 1-8 Jujimicho, Chiyodaku. Tokyo.

ANTENNES

Nous attirons l'attention des membres de la Commission VI sur la monographie technique éditée par le Centre Technique de l'U.E.R. « Tours et mâts d'antennes en ondes métriques » par F. D. Bolt (B.B.C.) avec la collaboration de A. M. Beresford (I.T.A.), R. Busi (R.A.I.), A. Delobel (O.R.T.F.), H. Kreutztraeger (N.D.R.).

Cet ouvrage est en vente au Centre Technique de l'U.E.R., 32, avenue Lancaster, Bruxelles 18, Belgique.

Commission VII. — Radioelectronics

WAVES IN PLASMA

Radio Science has published in Vol. 69 D, n° 4, April 1965, the following papers on waves in plasma :

Dispersion of waves in a cold magneto-plasma from hydromagnetic to whistler frequencies — H. G. Booker and R. B. Dyce.

Study on the guiding mechanism of whistler radio waves — S. Adachi.

Electromagnetic waves along an infinitely long and thin conducting wire in a magneto-ionic medium — Y. Mushiake.

Use of the phase-integral method to determine the reflection properties of a stratified ionosphere — C. Altman.

E-mode propagation in a plane-stratified plasma — P. Hirsch and J. Shmoys.

Radiation from an infinite axial slot on a circular cylinder clad with magnetoplasma — Ph. de Marchin and G. Tyras.

Index of refraction surfaces for plasma waves — T. Yeh and M. H. Cohen.

Impedance of a short dipole in a compressible plasma — K. G. BALMAIN.

Waves circulating around a rigid cylindrical obstacle in a compressible plasma — S. R. SESHADRI.

Harmonic currents excited by an electromagnetic wave in a plasma — L. WETZEL and TING-WEI TANG.

Excitation of acoustic waves in plasmas — W. A. SAXTON.

Wave interaction in oxygen magneto plasmas — K. V. NARASINGA RAO.

INTERNATIONAL URSIGRAM AND WORLD DAYS SERVICE

Report on activities in 1964

(To Meeting of IUWDS Steering Comittee, Madrid, March 1965)

The attached report covers most of the activities carried out under the auspices of the I.U.W.D.S. during 1964.

The first part is a report on activities directly connected with the I.Q.S.Y. program. The second part covers other I.U.W.D.S. activities carried on in particular cooperation with C.O.S.P.A.R., I.A.U., and other groups and scientists.

A. H. Shapley, *Chairman*;
L. D. de Feiter, *Secretary*;
J. V. Lincoln, *Depuly Secretary*.

February 23, 1965.

I.Q.S.Y. World Days Program

Description and Status as of February 1965

The World Days program provides the framework for coordination of many aspects of the scientific work in and among the various I.Q.S.Y. disciplines. The details of these discipline programs call for special observational effort on certain days during I.Q.S.Y. or for special treatment of the results of observations. Such days are known as « World Days ». The necessary interdisciplinary coordination includes the assembling and distribution of key information on solar and geophysical phenomena on an immediate as well as a deliberate time schedule as an aid to the conduct of observations and interpretation of results.

The program is arranged by a permanent inter-union body of I.C.S.U., the International Ursigram and World Days Service (I.U.W.D.S.) which is a permanent service of U.R.S.I. in association with I.A.U. and I.U.G.G. The I.Q.S.Y. program repre-

sents an intensification of effort and involves a larger number of participants compared with programs along similar lines which have been conducted continuously beginning with the I.G.Y.; some of the activities have been conducted by U.R.S.I. for many decades. The I.U.W.D.S. adheres to the I.C.S.U. Federation of Astronomical and Geophysical Services (F.A.G.S.) and receives support for some of its coordination activities and some of its publications from the U.N.E.S.C.O. subventions for F.A.G.S. The remainder and the heavy operational expense is borne by participating and cooperating institutions throughout the world.

Advance Planning Activities.

In mid-1963, the I.U.W.D.S. issued the International Geophysical Calendar for the I.Q.S.Y. years, 1964 and 1965. On the Calendar are marked selected days and intervals for various kinds of observations which cannot be carried on continuously but must be done by samples. Thus three days each month are designated « Regular World Days », one of which has first priority. Ionospheric drift observations, for example, are concentrated on these days. Each Wednesday is marked as a « Regular Geophysical Day », when extra meteorological balloon soundings and rockets are scheduled. During « World Geophysical Intervals », a two week period each season, programs in meteorology, aeronomy and ionosphere are intensified. « Quarterly World Days», one every three months, are coordinating rocket studies of ionospheric properties. The details of these and other program recommendations are printed on the reverse side of the Calendar, many thousands of copies of which have been distributed to I.Q.S.Y. participants. The Calendar has been published in many scientific journals reaching the solar-geophysical community and the I.Q.S.Y. Secretariat has issued a large-size two-colors edition.

Also marked on the Calendar are the days of solar eclipses, and the I.Q.S.Y. Instruction Manual includes maps of the eclipse tracks and other eclipse information needed for general planning purposes. Days with unusual meteor activity are shown on the Calendar both as a guide for meteor observers and to alert ionospheric observers in case ionization produced by meteors may account for unusual effects in other experiments.

The selection of days and intervals for the Calendar is made by I.U.W.D.S. in consultation with spokesmen for the various scien-

tific disciplines. Similar calendars have been issued annually beginning with the I.G.Y.

Timely Activities.

For many purposes, the worldwide and inter-disciplinary coordination of geophysical work should be concentrated into times when solar or geophysical conditions are unusual. These cannot, obviously, be anticipated long enough in advance to be included in the Calendar, but must be identified on a more current schedule. For this purpose there has been organized a system for rapid collection of key observations and rapid distribution of the necessary information to solar and geophysical stations. This system, coordinated by the I.U.W.D.S., involves regional collection and distribution centers with good telegraphic communication channels between regions. Details of the workings of these communication channels for the exchange of timely scientific information appear in I.Q.S.Y. and I.U.W.D.S. publications. The system is in operation every day and some of the Regional Warning Centers are active 24 hours a day.

The main output of this close following of solar and geophysical conditions are the *Alerts*, short plain language messages distributed to I.Q.S.Y. stations to advise them in their current work. Various types of Alerts are issued : magnetic storm, cosmic events, solar flare, solar activity, solar calm and geomagnetic calm. The plans provide for regional alerts to be issued to nearby stations as soon as possible after an event has occurred and also for worldwide or geo-alerts issued by one of the Regional Warning Centers which has been designated as the I.Q.S.Y.-I.U.W.D.S. World Warning Agency. These geo-alerts are issued once daily (if indicated) and are given worldwide distribution through W.M.O. channels and are widely broadcast. They have the effect of a World Day, and I.Q.Q.Y. stations are recommended to carry out certain special activities, depending on their particular program. The Alerts also serve as general advice to I.Q.S.Y. Scientists and influence the I.Q.S.Y. programs in many ways. An innovation for the I.Q.S.Y. are alerts of unusual stratospheric warming, a service provided by and for the I.Q.S.Y. meteorological program channeled through the World Days system.

Some of the Alerts are essentially predictions of geophysical events. An Alert of solar activity at the same time calls attention

to activity on the sun in the preceding hours and the possibility of continued activity in the coming hours. An Alert stating « magnetic storm expected » is issued whenever the forecasters have reason to expect a disturbance to begin in the next 24 hours. Distributed by airmail to some 150 interested I.Q.S.Y. scientists are weekly forecasts of the general level of solar activity, provided through arrangements made by the I.Q.S.Y. Reporter for Solar Activity.

Selected current observations of solar activity, geomagnetism and other geophysical phenomena are collected by telegram from some 100 cooperating observatories throughout the world to provide the basis for the solar-geophysical alerts — and for making practical forecasts for radio propagation conditions, which is the primary purpose of most of the Regional Warning Centers. Summaries of these current data are interchanged among the regions daily or oftener, and are made available to the many I.Q.S.Y. stations who need to keep close track of solar and geophysical conditions and events. These messages, sometimes called U.R.S.I.-grams, have been circulated by U.R.S.I. since the early days of radio science. Efforts have been made for the I.Q.S.Y. to drastically speed up the exchange of information on very outstanding solar flares, should they occur, with a goal of getting notifications to certain cosmic ray workers in different parts of the world within one hour of the start of the flare. For this project several solar radio observatories have installed special alarm devices to warn the observer of a large sudden increase in solar radio emission.

The communication arrangements for the I.U.W.D.S.-I.Q.S.Y. program involve ordinary commercial and government teletype, telephone or radio channels. Message delays tend to be reduced because the channels are used so continually. There are four Regional Warning Centers and six associate Centers, operated at national expense mostly by government telecommunications laboratories. The W.M.O. cooperates in providing its channels for distribution of the worldwide alerts. For the I.Q.S.Y. program, each participating country has named an individual to serve as National Warning Contact to make arrangements with the appropriate Regional Warning Center for I.Q.S.Y. stations to receive Alerts and the other current information they need. The work is coordinated by the I.U.W.D.S. through timely circular letters and information in *I.Q.S.Y. Notes*.

Relrospective Activities.

The World Days Program provides some « after the fact » coordination of the I.Q.S.Y. program, in the form of the designation of intervals for intensive scientific study and in the preparation of daily records of actual solar and geophysical conditions and events.

Many of the I.Q.S.Y. scientific programs provide for special data analysis or exchange for a few intervals which are selected retrospectively as ones of special scientific interest. For I.Q.S.Y. the main types of Retrospective World Intervals are magnetic-ionospheric storms, solar-geophysical quiet conditions, and any major events of the kind which involve large variations of incident cosmic rays. Each year, about five intervals, which may total 15 to 45 days, are selected some weeks or months later after a review of data readily available. As a result of these selections, the data for these periods should flow to the World Data Centers more promptly and in greater detail. The I.Q.S.Y. Committee has announced its intentions to arrange for special scientific symposia to be held to discuss what is learned from detailed study of solar-geophysical associations in these intervals. In addition, intervals are being selected to cover brief, unusual events in ionospheric absorption and geomagnetic micropulsations, both for special purposes of data exchange and also to provide a better chance to find simultaneous effects in other solar and geophysical data.

The I.U.W.D.S. has also attempted to provide a summary record of solar and geophysical occurrences as a guide to the interpretation of the results of geophysical experiments. The Calendar Record is such a chronology and includes both the key daily indices and the highlights of the events reported from all disciplines. This record is published in preliminary and abbreviated form in *I.Q.S.Y. Notes* within two months. A final Calendar Record for the I.Q.S.Y. is planned for publication in 1966 in *Annals of the I.Q.S.Y.* on the same general arrangement as the I.G.Y. Calendar Record, *Annals of the I.G.Y.*, Vol. 16.

Highlights of first 15 *months of World Days Program.*

Some statistics and typical examples will illustrate the actual conduct of the World Days Program. The International Geo-

physical Calendar for 1965, the second year of I.Q.S.Y., is shown in Figure 1. In addition to the final program recommendations, the Calendar is used for ad hoc arrangements among institutions. The amount and detail of geophysical observations in existence tends to be larger for days marked on the Calendar.

The I.Q.S.Y. period has proved to be one of relatively low solar activity, in fact solar minimum is estimated to have been passed in the third quarter of 1964. However, there has been an unexpected number of active solar region, including solar flares, for the low part of the solar cycle, and rather fewer days without sunspots than in recent solar minima, 1954, 1944, 1933, etc. Thus there has been considerable need for solar activity alerts. In the 15 months from October 1, 1963 (when the I.Q.S.Y. trial period started), solar activity worldwide geo-alerts were issued on 46 days in all, 11 of them during an exeptional resurgence of activity which extended into October 1963. On the other hand, solar calm geo-alerts have been posted on 24 days in these 15 months. The regional centers have also been active in issuing alerts for regional distribution, especially of individual solar flares and other solar phenomena.

Alerts of geomagnetic storms have been issued as appropriate. Geo-alerts have been issued on 43 days in the past 15 months, in 27 cases saying a storm was expected, in 16 cases that a storm was in progress. Since storms usually last several days, only 22 separate disturbed periods were involved. Of the 13 periods when disturbance was predicted, about half were reasonably successful. The amount and severity of disturbance during 1964 proved to be considerably less than in corresponding years at previous solar minima. Magnetic calm alerts were issued on 9 different days.

The alerts of stratospheric warmings covered a significant but not explosive warming situation in the northern hemisphere in March 1964. A southern hemisphere warm center was similarly followed for two weeks in September. « Regional » alerts with more limited distribution but with greater detail covered these and several weaker centers of stratospheric warming in the preceeding 4-8 weeks. Three meteorological analysis centers cooperated in providing the alerts with one of these serving to choose the world-wide alerts. Much valuable experience was gained in the 1964 seasons and it is believed the alerts have stimulated some increased observational and analysis efforts. Certainly they

have called widespread attention to the existence and importance of these high stratospheric phenomena.

The current data interchange has proceeded according to plan, with more contributing observatories and more recipient institutions than in the years immediately preceeding the I.Q.S.Y. The volume of data involved is, of course, less than during the I.G.Y. because there are fewer solar events to report. There are daily interchanges among regional centers and also daily consultations by telegram on the declarations of Alerts. The distribution of the geo-alerts through W.M.O. communication channels is effective for most parts of the world.

The weekly forecasts of solar activity were started in October 1963. The forecasts are supplied by solar experts in France, U. S. A. and Australia. They are assembled by telegram and issued in air letters to 150 requesting I.Q.S.Y. scientists through the I.U.W.D.S.-I.Q.S.Y. World Warning Agency. The forecasts are for the succeeding four week period ; they are aimed particularly at anticipating periods of solar calm. While this project has been undertaken as an experiment, the interest on the part of geophysicists has been more than expected.

The prompt publication of a chronology of solar and geophysical conditions and events was not orginally envisaged in the I.Q.S.Y. program. The Abbreviated Calendar Record which has appeared in *I.Q.S.Y. Notes*, Nos. 7, 8, 9, etc. may prove to fill a need for immediate inter-disciplinary information for solar-geophysical studies. It brings together in one place data often scattered in many publications, some coming out after some delay. Figure 2 reproduces a sample page.

The first selections of I.Q.S.Y. Retrospective World Intervals were published in *I.Q.S.Y.Notes*, No. 10 in November, 1964. The period March 27 to April 3, 1964, was picked because it started with a very quiet period, more geophysical than solar, and then included a geomagnetic-ionospheric-auroral disturbance which early reports indicated had several interesting features. Some additional intervals of interest were also identified. At the same time, five Retrospective World Intervals for 1963 were announced.

Conclusion.

The activities described here constitute the advance, the day-to-day, and the after-the-fact coordination of many I.Q.S.Y. obser-

vations and some aspects of data-exchange and the analysis of I.Q.S.Y. programs. It is a scientific service provided by I.C.S.U. through the I.U.W.D.S. to the community of solar and geophysical scientists who are represented for the present international cooperative effort by the I.Q.S.Y. Committee and its Reporters for the scientific disciplines. Details of the World Days program are published in I.Q.S.Y. Instruction Manual No. 1 and supplementary information appears in most issues of *I.Q.S.Y. Notes*.

A. H. SHAPLEY,
Reporter.

Other Activities under I.U.W.D.S. Auspices

I. *SPACEWARN Messages.* — The I.U.W.D.S. continued to operate the SPACEWARM system for rapid interchange of information of general scientific interest regarding artificial earth satellites and space probes. This activity is done by I.U.W.D.S. on behalf of C.O.S.P.A.R.; the I.U.W.D.S. Chairman serves as C.O.S.P.A.R. correspondent for SPACEWARN for C.O.S.P.A.R. Working Group 3 on data and publications and the head of the I.U.W.D.S. World Warning Agency is also a member of that Working Group.

The same general communication arrangements are used for SPACEWARN messages as for the Solar-Geophysical data interchange. Although in some cases the Satellite Regional Warning Centers, the coordination of the work is accomplished through National SPACEWARN Contacts analogous to the National Warning Contact of the I.G.Y. and I.Q.S.Y. programs.

During 1964, there were processed through the SPACEWARN network a total of 87 launching announcements of satellites and space probes and several hundred coded messages with orbital data. A number of special messages in connection with particular satellite experiments were also carried.

During 1964 the I.U.W.D.S. took on an important additional responsibility with respect to its cooperation with C.O.S.P.A.R. Beginning June 1, 1964, the international designation of all satellites and space probes has been assigned by the I.U.W.D.S. World Warning Agency on behalf of C.O.S.P.A.R. These assignments have been included in the launching announcement telegram,

otherwise in a special telegram. These designations by the I.U.W.D.S. World Warning Agency are confirmed in a written circular distributed about every six weeks to the Satellite Regional Warning Centers and to the National SPACEWARN Contacts. These timely bulletins also include, at the request of C.O.S.P.A.R., a list of satellites with continuous transmission of radio signals and the necessary particulars. Other requests like C.O.S.P.A.R. on I.U.W.D.S. include the coordination of international unified codes for telegraph communication of orbital information and similar tasks.

II. *ASTROGRAM Messages.* — During 1964, arrangements were completed such that the basic I.U.W.D.S. communication network would begin, as of January 1965, the handling of the astronomical telegrams of the I.A.U. announcing the discovery of comets, new astronomical objects, etc. These announcements are issued by the Smithsonian Astrophysical Observatory designated for this purpose by I.A.U. Commission 6 and are distributed on a subscription basis to Astronomical Observatories throughout the world. Special arrangements have been made for the sending of these telegrams to the I.U.W.D.S. Regional Warning Centers who thereupon serve the observatories in their region. The previous arrangements by I.A.U. for this work expired at the end of 1964 and the new arrangements have started successfully, with 4 ASTROGRAM messages handled in January 1965.

III. *Calendar Records.* — Arrangements have been completed with the I.Q.S.Y. Committee for the publication of the Calendar Records for the years 1960-1963 as a single volume of the new series of *I.Q.S.Y. Annals.* While all of the material for these years has been assembled and much of the compilation has been completed, the arrangements for publication were made only at the very end of 1964 and the final work on the manuscript is now being done. As decided earlier by the I.U.W.D.S. Steering Committee, the general approach and format will be similar to that of the Calendar Records for the I.G.Y. and I.C.G.-1959, published in *I.G.Y. Annals*, Volume XVI.

IV. *Miscellaneous.* — Skeleton arrangements have been established for various special alerting purposes in preparation for the anticipated occurrences of outstanding flare-type of events as solar activity increases in the coming years. An arrangement

is in effect with four solar radio observatories for especially quick response to the occurrence of every outstanding solar flares. The hope is to get this information within one hour to a few especially interested laboratories whose observing program (balloon, satellite, etc.) would be aided by prompt knowledge of the occurrence of such a flare. A similar kind of request has come from a group of lunar observers desiring to search for events of the bombardment of the moon's surface by energetic particles associated with solar flares. A request has also come for speedier notification of occurrence of solar flares from scientists conducting experiments on geophysical satellites. In a couple of instances in 1964 the system was tried out for flare-events almost meeting the necessary criteria ; the full value and practicality of such plans will not, of course, be tested until some really outstanding flares occur as solar activity increases in the coming years.

International Geophysical Calendar 1965

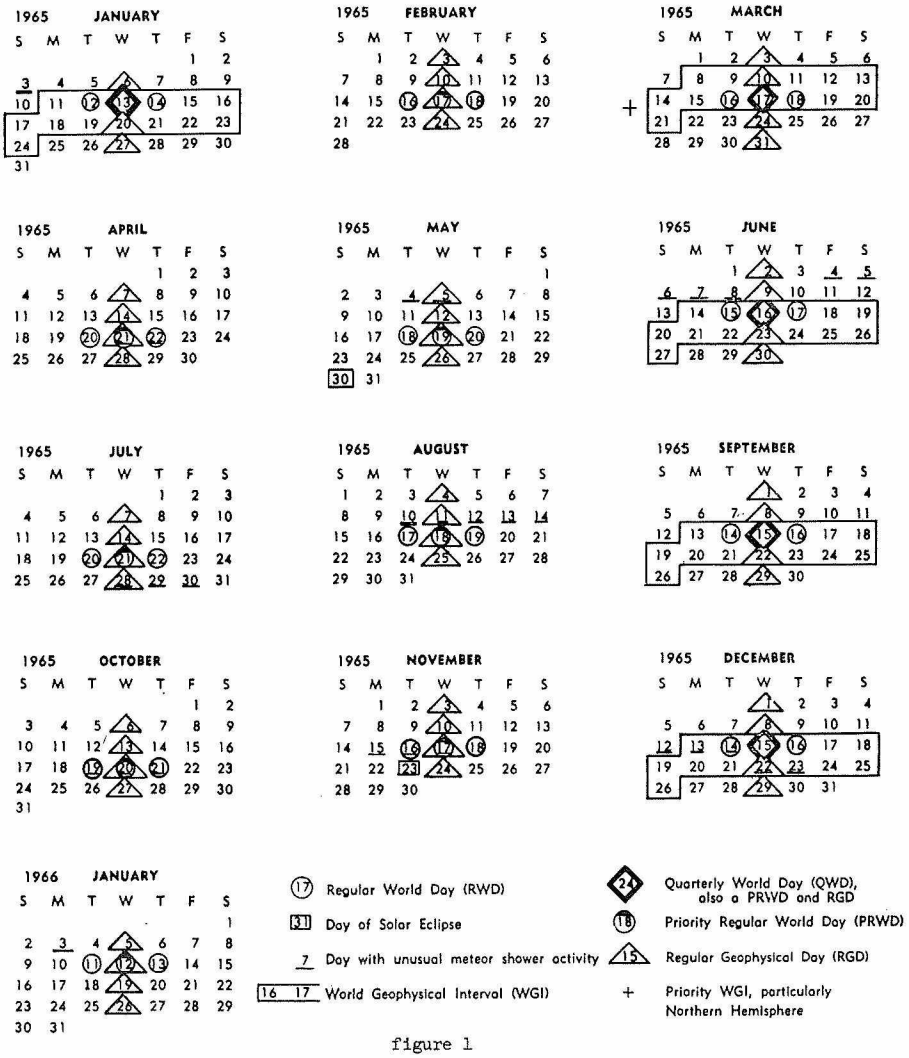

figure 1

Abbreviated Calendar Record

1964 July	10 cm Flux S	10 cm Flux S_a	Sun-spot No.	Geo-mag. Ap	CMP of Region Number	Highlights
1	67	70	7	4		Solar : very small spot in R-7383 ; *minor event* : H. alpha (R-7384) 1330 ; disappearances of filaments in R-7383 and at S50E01. Geophysical : magnetically quiet, especially after 2100.
2	67	69	0	3		Solar : no spots but radio spot int. 3 at N18 E limb, and east limb prominence activity. Geophysical : magnetically quiet from 0000-1200 Kp 0+ 0+ 0° 0+ followed by slight activity with preliminary sc at 2355 ; noctilucent clouds Scotland.
3	67	70	0	18		Solar : no spots ; rather calm ; no reported optical or radio events. Geophysical : slight moderate magnetic activity all day but only reached Kp 4+ at 2100.
4	68	70	8	8	R-7383 (S02)	Solar : spot in R-7384. Geophysical : slight magnetic activity to 1500, quiet thereafter ; noctilucent clouds Scotland ; ionospheric F-region disturbed most stations.
5	68	70	10	5		Solar : spot in R-7384, radio int. 6 ; *minor event* : H-alpha (R-7384) 1505E. Geophysical : magnetically quiet ; brilliant noctilucent clouds Scotland.
6	68	70	8	5		Solar : spot decreased in R-7384, radio int. 4 ; *minor event* : surge, impt. 1 in R-7384. Geophysical : magnetically quiet ; noctilucent clouds Scotland.

1964 July	10 cm Flux S	10 cm Flux S_a	Sun-spot No.	Geo-mag. Ap	CMP of Region Number	Highlights
7	67	69	7	18		Solar : no spots but radio int. 6 in R-7384 ; faint spot in R-7383 ; *minor events* : H-alpha (R-7384) 0838E, 1105E, 1145 and 1422 ; 15-41 MHz, int 1+, type III, 1420 ; surges in R-7384. Geophysical : increase in magnetic activity, especially after 1200 to near storm level ; part of a recurrent sequence ; aurora ; observed at northern U. S. A.
8	68	70	0	21		Solar : no spots but radio int. 4 in R.-7384. Geophysical : slight-to-moderate magnetic activity continues, mostly Kp 4's ; homogeneous auroral arc, occasionally rayed arc or band, at $\varnothing = 64^{\circ}$-65° in W. Atlantic from 0200-0400 ; ionospheric F-region very disturbed most stations and absorption widespread at high latitudes.
9	67	69	0	16	R-7384(2) (N32)	Solar : no spots ; *minor events* : H-alpha (R-7384)0137, 1058 and 2119. Geophysical : decrease in magnetic activity, but Kp 40 from 0000 to 0300 and 4+ from 2100 to 2400 ; auroral homogeneous arc and rayed arc from 0310-0419 in W. Atlantic, position uncertain ; noctilucent clouds Denmark, none Scotland ; ionospheric absorption event South Pole 1434 ; ionospheric F-region disturbed, some absorption at high latitudes — N. America and Iceland.
10	67	69	0	13		Solar : no spots ; *minor event* : surge (R-7389) impt. 1, 1350. Geophysical : magnetic activity subsides to quiet after 1500 ; aurora observed northern U. S. A. ; noctilucent clouds Denmark, none Scotland ; ionospheric F-region disturbed, some absorption at high latitudes — Europe.

FIGURE 2 *(suite)*.

INTER-UNION COMMISSIONS

I.U.C.A.F.

Letter to radio astronomers

(Doc. I.U.C.A.F. 73)

Dear Sir, 15th April, 1965

MEMBERS OF I.A.U. COMMISSION 40 — RADIO ASTRONOMERS

On the 1st January, 1965, the revised provision of the Radio Regulations of the International Telecommunication Union (I.T.U.) came into force. Radio Astronomy is now a recognized radio service which is authorized to operate in a number of frequency bands and can now expect to receive, in certain of these frequency bands, much less interference from other types of radio service than was formerly the case. This letter is to inform you of the situation, and to tell you what must be done by you to secure maximum benefit from the new frequency allocations.

The allocations and associated conditions of operation are contained in two volumes published by the I.T.U. in Geneva, namely :

Radio Regulations, Geneva 1959, and

Final Acts of the Extraordinary Administrative Radio Conference, Geneva, 1963.

and these should be consulted for full particulars. Relevant extracts, including a Table of the frequency bands in which the radio astronomy service is authorized to operate, are given in Appendices I-IV to this letter.

While the question of the bands in which the radio astronomy service may operate is quite clear, the question of protection to radio astronomy observations is rather involved because of the very low energy of the intercepted emissions. Because of this, the Administrations of Members of the I.T.U. are prepared to afford protection to the radio astronomy service from services in other bands only to the extent that such services are afforded protection from each other. However, these Administrations

also unanimously recommended that, pending further consideration of the question by a future I.T.U. Administrative Radio Conference, they should afford all practicable protection to the frequencies allocated to radio astronomy on a shared basis with other services.

It is an essential pre-requisite, in the avoidance of harmful interference from other types of radio service, that particulars of all radio astronomy stations, containing the full information specified in Section F of Annex 12 (see Appendix II) and in Section 9 of Annex 13 (see Appendix III) to the Final Acts of the E.A.R.C. Geneva 1963, should be notified to the International Frequency Registration Board (I.F.R.B.) through the Administration of the country in which the station is situated, for publication in the I.T.U. International Frequency List. In this way formal recognition is given to the activities of the station and these activities become known to the Administrations of all Members of the Union. It is very important that this information should be compiled and forwarded to your national Administration, for submission to the I.F.R.B., as soon as possible. If the observations made by a radio astronomy station are carried out in a number of frequency bands, separate notices in respect of the station, giving the centre frequency of each of the observed bands, should be supplied. (Appendix IV shows a sample of the information provided for one of the frequencies in use at Jodrell Bank, United Kingdom.) Separate notices of this kind should be sent in respect of other bands within those allocated to the radio astronomy service which, although not at present in use, are expected to be used for observations in a foreseeable future.

Interfering signals may originate in the same country in which the radio observatory is situated, or in another country. In either case, the interference should be brought to the notice of the national Administration (i. e. of the country in which the observatory is located) requesting that the matter be taken up either with the appropriate authority in the same country or with the Administration of the foreign country having jurisdiction over the interfering station, as the case may be. Should negotiations between Administrations fail to secure the elimination of the interference, the I.F.R.B. may be requested to intervene in accordance with the provisions of Article 15 of the Radio Regulations.

In the consideration of complaints of harmful interference, the I.F.R.B. can only act on information, recorded in its Master

Register in respect of the station suffering interference, and published in the I.T.U. International Frequency List.

You are therefore asked :

(i) to send to your national Administration, for submission to the I.F.R.B., the complete particulars of the frequencies and the scope of the observations in your observatory, either in current use or expected to be in use in a foreseeable future ; and

(ii) to send copies of this submission to the Secretary-General of I.U.C.A.F.

Normally the information which you compile with a view to its eventual submission to the I.F.R.B., should relate only to frequencies in bands allocated to the radio astronomy service. The I.U.C.A.F. is, however, anxious to keep in touch will all observational work, and it would be helpful if you would submit to this committee, any extra information on observations on other frequencies, both those in progress and those planned for the near future. It should perhaps be mentioned, in this connection that, although freedom from interference could not be claimed in respect of such frequencies, their use can also be notified to the I.F.R.B. and included in the International Frequency List, provided that an undertaking is given that the equipment used for the carrying out of the observations on these frequencies (i. e. in frequency bands which are not allocated to the radio astronomy service) will not give rise to any interference to the services to which the bands are allocated, which presumably should not present any problems.

You will see that the early registration of radio astronomy stations is of very great importance, and we hope that this can be carried out during the next two months. We too would like to have full information in respect of these stations as soon as possible. Future activities should be notified as they arise.

We look forward to your co-operation in this important matter, and to our receiving copies of the information you supply to the International Frequency Registration Board, I.T.U., Geneva, Switzerland.

Yours faithfully,

F. G. Smith,
Chairman

R. L. Smith-Rose,
Secretary-General

Enclosures Appendices I, II, III and IV.

Frequencies allocated to Radio Astronomy in the
« Final Acts of the Extraordinary Administrative Radio Conference »
Geneva, 1963

No.	Frequency Band Mc/s	Allocations in REGION shown		
		1	2	3
1	Standard Frequency Bands : 2.5, 5, 10, 15, 20, 25	Recommendation No. 31 Footnote 204		
2	37.25-38.25	Secondary service with Fixed and Mobile as Primaries		
3	73.0-74.6	—	Exclusive with footnote reservation, 253 A and B	—
4	79.75-80.25	Footnote 261	—	Footnote 261
5	150.05-153	Footnote 286 A improves position of protection in United Kingdom (Modified Footnote 286)	—	—
6	322-329 Deuterium Line	Footnote 310		

No.	Frequency Band Mc/s	Allocations in REGION shown		
		1	2	3
7	404-410	406-410 Modified Footnote 317	404-410 Modified Footnote 317	406-410 Modified Footnote 317
8	606-614	606-614 (African Broadcasting area exclusive) Modified Footnote 332	608-614 exclusive until after 1 January 1974 Modified Footnote 332	610-614 Modified Footnote 332
9	1400-1427 (Hydrogen Line)	Exclusive world-wide allocation with no reservations		
10	1664.4-1668.4 (OH line)	Secondary allocation : with Meteorological Aids and Meteorological Satellites as Primary in all Regions. (*Footnote* 353A : In view of the successful detection of two spectral lines in the region of 1665/Mc/s and 1667 Mc/s by astronomers, administrations are urged to give all practicable protection to the band 1664.4-1668.4 Mc/s for future research in radio astronomy)		
11	1660-1690 3165-3195 4800-4810 5800-5815 8680-8700	Footnote 354		

No.	Frequency Band Mc/s	Allocations in REGION shown		
		1	2	3
12	2690-2700	Exclusive world-wide allocation, with reservations in some countries. Footnote 363, 364A, 364B, 365		
13	4990-5000	Primary : with fixed and mobile also as primaries : Footnote 365 modified	Exclusive with Footnote 383 A (Cuba)	Primary : with fixed and mobile also as primaries. Footnote 365 modified.
14 15 16 17	G *c/s* 10.68-10.7 15.35-15.4 19.3-19.4 31.3-31.5	Exclusive world-wide allocations with some reservations (See Footnotes 405 A and B, 409 C, 409 D and 412 A)		
18	33.0-33.4	Primary with Radionavigation also Primary	No allocation for R. A. except in Cuba and India Footnote 412 F	
19	33.4-34	Footnote 412 G		
20	36.5-37.5	Footnote 412 E		

APPENDIX II

Extract from Annex 12 Section F of the
Final Acts of the E.A.R.C. Geneva 1963

Basic Characteristics to be furnished in Notices relating to Frequencies to be received by Radio Astronomy Stations

(See form reproduced in Appendix III)

Column 1. *Name and location of the station* :

(*a*) indicate the letters « R. A. ».

(*b*) Indicate the name by which the station is known or the name of the locality in which it is situated or both.

(*c*) Indicate the country in which the station is located. (Symbols from the Preface to the International Frequency List should be used.)

Column 2. *Geographical position* :

Indicate the geographical co-ordinates (in degrees and minutes) of the station site.

Column 3. *Observed frequency* :

Indicate the centre of the frequency band observed in kc/s up to 30 000 kc/s inclusive, and in Mc/s above 30 000 kc/s.

Column 4. *Bandwidth* :

Indicate the width of the frequency band observed by the station.

Column 5. *Antenna characteristics* :

Indicate the antenna type and dimensions, effective area and angular coverage in azimuth and elevation.

Column 6. *Maximum hours of reception.*

Indicate in G.M.T. the maximum hours of reception of the frequency band shown in column 3.

Column 7. *Noise temperature.*

Indicate the overall receiving system noise temperature (°K).

Column 8. *Class of Observations* :

Indicate the class (A or B) of observations to be taken on the frequency band shown in Column 3.

Class A observations are those in which the sensitivity of the equipment is not a primary factor.

Class B observations are those of such a nature that they can be made only with advanced low-noise receivers using the best techniques.

Column 9. *Operating administration or company* :

Indicate the identity of the operating administration or company and the postal and telegraphic addresses of the administration to which communication should be sent on urgent matters regarding interference and questions referring to the technical operation of stations (See Article 15).

APPENDIX III

9. — *Radio astronomy stations*

Names of the countries notifying the stations in alphabetical order of country symbols.

Names of stations in alphabetical order.

Name by which the station is known or the name of the locality in which is it situated	Geographical co-ordinates (in degrees and minutes) of the station	Centre of the frequency band observed (Mc/s or Gc/s)	Width of the frequency band observed	Antenna characteristics	Maximum hours of reception (G.M.T.)	Noise temperature (°K)	Class of observation	Operating administration or company	Remarks
									Any special additional characteristics of the station including : 1) altitude in metres above sea level, 2) main particulars of antenna, 3) scope of observations,
1	2	3	4	5	6	7	8	9	10

Appendix IV

Radio Astronomy Station

1.	*Name and Location.*	R. A. Jodrell Bank. United Kingdom.
2.	*Position.*	long. 2°18′4 W. lat. 53°14′2 N. Elevation 70 m.
3.	*Centre of Band.*	408 Mc/s.
4.	*Bandwidth.*	4 Mc/s.
5.	*Antenna.*	Mark I 250ft steerable paraboloid and Mark II 125 × 85ft steerable paraboloid.
6.	*Hours of reception.*	24 hours.
7.	*Noise Temperature.*	50°K.
8.	*Class.*	B.
9.	*Administration.*	The Director, Nuffield Radio Astronomy Laboratories, University of Manchester, Jodrell Bank, near Macclesfield, Cheshire.

Notes. — 1. The two receiving antennas may be used either separately or together as an interferometer.

2. The Mark I antenna may also be used as an interferometer with an antenna at Wardle. (Separate notification is given of this station.)

Radio Frequencies for Space Research

by R. L. Smith-Rose
Past President U.R.S.I.
Secretary General I.U.C.A.F.

(Paper presented at the C.O.S.P.A.R. meeting in Buenos Aires, May 1965)
Doc. I.U.C.A.F./75

With the object of attaining the maximum efficiency in the use of radio frequencies for all purposes, and the avoidance of mutual interference between the various users, the entire spectrum from 10 kc/s to 40 Gc/s (corresponding to wavelengths from 30 km to 7.5 mm) is subdivided into bands, which are allocated to the different services, by international agreement under the auspices of the International Telecommunication Union (I.T.U.).

Frequency allocations.

The allocation of the various bands of frequencies and the conditions governing their use are embodied in the Radio Regulations drawn up at Geneva in 1959. In order to provide for the new requirements associated with space research and communications and with radio astronomy, these Regulations were subject to a partial revision at an Extraordinary Administrative Radio Conference held at Geneva in 1963 : and on 1st January 1965, the revised provisions of these Regulations came into force.

A general account of the allocation of frequencies for research in Space Science, as distinct from Space Communications, was given at the Florence (1964) meeting of C.O.S.P.A.R., and has since been published in *Information Bulletin.* No. 22, February 1965. For convenience, the relevant part of the new allocation table is reproduced in Appendix I, from which it will be seen that while in some cases, space research is regarded as a primary — and in a few cases an exclusive — user, in several instances the frequency bands assigned to space science are shared with other users of the spectrum.

Protection of Space Research from Harmful Interference.

At the 1963 meeting, it was unanimously agreed that, pending further consideration at a future Administrative Radio Conference

of the I.T.U., the national administrations of telecommunication services should afford all practicable protection to those frequencies allocated to space research on a basis of sharing with other services.

In order to assist these Administrations in the avoidance of harmful interference and with the object of seeking improved facilities in future revisions of the frequency allocations, it is necessary that certain information as to the use of radio frequencies in space research should be brought to the notice of the International Frequency Registration Board (I.F.R.B.) of the I.T.U. This information relates to both the Earth and Space Stations used in research, and the details required are conveniently presented in tabular form, of which samples are shown in appendices II and III for earth and space stations respectively. While most of the headings shown in these tables are self-explanatory, a detailed explanation of the information required is given in Annex 12, Sections B, C, D and E of the Final Acts of the Extraordinary Administrative Radio Conference, 1963.

Signals which interfere with radio observations associated with space research may originate in any part of the world, and from radio users on land or sea or in the air. Reports of harmful interference with experiments should be brought to the notice of the national administration of the country in which the research is being conducted. Accompanying such reports a request should be made for the matter to be taken up with the appropriate authority in the same country or with the relevant administration in the foreign country having jurisdiction over the station causing the interference. Should negotiations between administrations fail to secure the elimination or a sufficient amelioration of the interference conditions, the matter should be brought to the attention of the I.F.R.B. who may be requested to act in accordance with Article 15 of the Radio Regulations, Geneva 1959.

Information concerning Earth and Space Stations.

In consideration of the complaints of harmful interference, the I.F.R.B. can only act on information recorded in its Master Register in respect of the station or laboratory suffering interference, and published in the I.T.U. International Frequency List. It is thus most important that all space research organizations should send to their national Administrations for submission to the I.F.R.B., complete particulars of the frequencies and scope of

the observations as detailed in the specimen tables reproduced in Appendices II and III.

All participants in Space Research throughout the world are asked to send copies of their submissions to the Secretary-General of the Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science (I.U.C.A.F.). This Inter-Union Commission is anxious to keep in touch with all observation work ; and it would therefore be helpful if research workers in Space Science would submit to this Commission any additional information on observations on other frequencies whether these are in progress or planned for the future. It should however be pointed out that freedom from interference cannot be claimed in respect of such additional frequencies. Indeed the use of these is apt to weaken the case for obtaining improved reception of the frequencies officially allocated according to the details given in Tables II and III ; since interference may be caused to the radio services which are rightfully using the frequency bands allocated to them. By co-operation between scientists engaged in space research, and the coordination of their activities through I.U.C.A.F. we may look forward to a steady improvement in, and extension of, the frequency bands allocated for research purposes as distinct from the rapidly growing services of international communications by means of artificial earth satellites.

APPENDIX I

Frequencies allocated to Space Research in the
« Finals Act of the Extraordinary Administrative Radio Conference »
Geneva, 1963

No.	Frequency Band Mc/s	Allocations in REGION shown		
		1	2	3
1 2 3	10.003-10.005 19.990-20.010 39.986-40002	Modified footnotes 215, 221 and 235 apply		
4 5	15.762-15.768 18.030-18.036	Secondary allocation (Primary in some countries, see F215A). Fixed Services as Primary		
6	30.005-30.010	Primary allocation, with Fixed, Mobile and Space (Satellite identification) also as Primary		
7	136-137	Primary (T & T) (1), with Fixed and Mobile also Primary : F281A (and Recommendation No.7A)	Primary (T & T) and exclusive subject to F281B. F281 (and Recommendation No. 7A)	Primary (T & T) with Fixed and Mobile also Primary : F281A (and Recommendation No.7A)
8	137-138	(1) (T & T) Primary, with Meteorological Satellite, and Space also Primary : various footnotes relate to use of this band for other services in some countries. F281F.		

F = Footnote reference : the I.T.U. document should be consulted for interpretation of the various footnotes.

No.	Frequency Band Mc/s	Allocations in REGION shown		
		1	2	3
9	143.6-143.65	Primary, (T & T), shared with other Primary Services.		
10	183.1-184.1	Secondary allocations in accordance with F294 modified		
11	400.05-401	Primary (T & T) shared with Meteorological Aids and Meteorological Satellite (Maintenance telemetering) as Primaries		
12	900-960	F339A Specific portions of the band may be used on a secondary basis		
13	1427-1429	Assigned to Space (Telecommand), not Research		
14	1700-1710	Primary (T & T) with Fixed (Primary) and Mobile (Secondary)	Primary (T & T) exclusive except in Cuba	Primary (T & T), with Fixed and Mobile also Primary
15	2110-2120	F356A may be used for telecommand in deep space research subject to international co-ordination		
16	2290-2300	Primary (T & T in deep space) with Fixed (Primary) and Mobile (Secondary) F356C	Primary (T & T in deep space), exclusive except in Cuba	Primary (T & T in deep space) with Fixed and Mobile also Primary

No.	Frequency Band Mc/s	Allocations in REGION shown		
		1	2	3
17	5250-5255	Secondary service, shared with Radiolocation as Primary		
18	5670-5725	Secondary service (Deep space research), with Radio-location (Primary) and Amateur (Secondary). Primary in some countries (F389A)		
19	8400-8500	Primary, with Fixed and Mobile, also Primary, subject to F394A and D	Primary, exclusive except in Cuba	Primary with Fixed and Mobile also Primary, subject to F394A and D
20 (*a*)	15.15-15.25	No allocation		
20 (*b*)	15.25-15.35	Primary, exclusive, with reservations in F409A and B		
21	31.0-31.3	Secondary (Primary in some countries, F412H), with Fixed and Mobile as Primary		
22	31.5-31.8	Primary, with Fixed and Mobile as Secondary	Primary exclusive except in Cuba	Primary with Fixed and Mobile as Secondary
23	31.8-32.3	Secondary (Primary in some countries, F412B), with Radionavigation as Primary		

APPENDIX II

7. — *Space research earth stations*

Names of the countries notifying the stations in alphabetical order of country symbols.
Names of stations in alphabetical order.

			Transmission			Reception								Remarks
			Telecommand where appripriate			Telemetering		Tracking		Reception of research information				Any special characteristics of the station and scope of research
Name by which the station is known or the name of the locality in which it is situated	Geographical co-ordinates (in degrees and minutes) of the transmitter site	Call sign (identification)	Frequency (Mc/s or Gc/s)	Class of emission, necessary bandwidth and description of transmission	Power (kW)	Frequency (Mc/s or Gc/s)	Class of emission, nenessary bandwidth and description of transmission	Frequency (Mc/s or Gc/s)	Class of emission, necessary bandwidth and description of transmission	Frequency (Mc/s or Gc/s)	Class of emission, necessary bandwidth and description of transmission	Identity of the station(s) with which communication is to be established	Operating administration or company	
1	2	3	4*a*	4*b*	4*c*	5*a*	5*b*	6*a*	6*b*	7*a*	7*b*	8	9	10

8. — *Space research space stations*

Names of the countries notifying the stations in alphabetical order of country symbols.
Names of stations by alphabetical and/or numerical order of designation of station.

Identity of the station		Transmission								Reception		Area of coverage or the name of the locality and country in which the associated receiving station(s) is located	Operating administration or company	Remarks
		Telemetering			Tracking			Transmission of information						
	Call sign (identification)	Frequency (Mc/s or Gc/s)	Class of emission, necessary bandwidth and description of transmission	Power (Watts)	Frequency (Mc/s or Gc/s)	Class of emission, necessary bandwidth and description of transmission	Power (Watts)	Frequency (Mc/s or Gc/s)	Class of emission, necessary bandwith and description of transmission	Power (Watts)	Telecommand where appropriate Frequency (Mc/s or Gc/s)	Class of emission, necessary bandwidth and description of transmission			1. In the case of an earth satellite, orbital information : *a*) angle of inclination of the orbit *b*) period of the object in space *c*) altitude of apogee (km) *d*) altitude of perigee (km) *e*) in the case of a stationary satellite, the mean geographical longitude of the projection of the satellite's position on the surface of the Earth 2. In the case of a space probe general indication of its trajectory 3. Special methods of modulation
1	2	3*a*	3*b*	3*c*	4*a*	4*b*	4*c*	5*a*	5*b*	5*c*	6*a*	6*b*	7	8	

COMITÉ INTERNATIONAL DE GÉOPHYSIQUE

Sixth Meeting of C.I.G., Madrid, 1 April 1965

The President of C.I.G., Professor W. J. G. Beynon, opened the Meeting at 15.30 hours.

Participants : *President* : W. J. G. Beynon.

Vice-Presidents : M. Pomerantz, G. Righini.

Secretary : G. R. Laclavère.

Members : W. L. Godson, V. Laursen, J. Paton, W. Dieminger, S. N. Vernov, G. de Q. Robin, T. Nagata, H. Odishaw, A. H. Shapley, O. M. Ashford.

M. Baker (C.I.G. Secretariat), G. D. Garland (Secretary-General I.U.G.G.), K. N. Federov (I.O.C.), E. M. Fournier d'Albe (U.N.E.S.C.O.), Mrs. V. A. Troitskaya (deputizing for V. V. Beloussov).

The President welcomed the members and observers and said that he had received apologies from V. V. Beloussov, L. V. Berkner, S. Chapman, M. Nicolet and F. Press, who were unable to attend the meeting.

1. — Approval of Agenda.

The Agenda was approved, with a suggestion that the future of C.I.G. be discussed under point 6 or 7.

2. — Minutes of V Meeting of C.I.G.

The Minutes of the meeting were approved.

3. — Publications.

Baker presented a report on publications which had been distributed prior to the meeting.

The President read from a letter sent to him by the Honorary President of C.I.G., Prof. Sydney Chapman, concerning the possibility of publishing two additional volumes in the Annals series : the first relating to Auroral Morphology, had already been accepted and the second, concerned a study of the geomagnetic synoptic programme in association with auroral data. The discipline reporter for geomagnetism, Dr. V. Laursen, strongly supported the second volume. It was suggested that some firm cut-off date should be introduced for the Annals, but it was also thought short-sighted to be too rigid in this respect. The Committee agreed to accept the additional volume and a request was made that these should be prepared as rapidly as possible.

4. — World Data Centres

The Secretary presented the paper on World Data Centres which had been prepared from replies from 20 W.D.C.' s. The representative of W.D.C. A, Dr. H. Odishaw, tabled a Report to C.I.G., Madrid, April 1965, which related to :

I. Final I.G.Y./I.G.C. Catalogue of Data.

II. Revised Guide to World Data Centers.

III. Geophysical Data Interchange 1960-1964.

Dr. Odishaw said that there would be merit in C.I.G. encouraging data flow in all disciplines for the period 1960-1963 inclusive, and the Committee agreed that all geophysical stations which have not yet done so should be encouraged to forward data for the 1960-1963 period to the W.D.C.' s.

With regard to the Guide for the Upper Mantle Committee Disciplines, Dr. Odishaw said that the C.I.G. accepted the recommendations of the U.M.C. (as in the case of I.O.C. for Oceanography and C.O.S.P.A.R., for Space Research) and that the Committee would follow previous policy and issue a supplement to the Guide relating solely to U.M.C. data. There was some discussion on the question of other bodies interested in collection of data in the disciplines covered by the U.M.C., and it was decided to request the U.M.C. to take note of the wishes of other agencies with an interest in this field of geophysics. Particular attention was drawn to the need to consult C.I.G. discipline members for gravimetry and seismology, Messrs. P. Tardi and F. Press.

The Secretary of the Intergovernmental Oceanographic Commission, Dr. K. N. Federov, said that the C.I.G.-W.D.C. Guide Supplement No. 1 concerning the exchange of oceanographic data, was prepared by an I.O.C. working group in co-operation with S.C.O.R. He said that the I.O.C. would keep careful watch on the guide and would suggest modifications as they became necessary. He stated that the Indian Ocean Expedition would end in 1965 and that data from this Expedition were just beginning to flow into data centres. Another international study of the Kuroshio current, was just beginning and this would be as important as the I.I.O.E. Dr. Federov drew attention to the declared national programmes, which are the programmes declared by an I.O.C. member to the Secretariat of the Commission, the resulting data from which should be exchanged in accordance with the provisions of the C.I.G. Guide. A list is being prepared by the I.O.C. Secretariat, beginning with 1960 and this will be sent to the W.D.C.'s in order to check the rate of flow, so that action can be taken to speed up the flow of data where necessary.

Mme V. A. Troitskaya said that the report of W.D.C. B relating to recent work had been submitted to the meeting of the I.Q.S.Y. Committee ; this report only related to I.Q.S.Y. data.

5. — Finances.

The Chairman of the C.I.G. Finance Committee, Mr. A. H. Shapley, presented the Summary Report of C.I.G. Finance Committee to the 6th Meeting, 1 April 1965 (I.Q.S.Y. Assembly III, document 19). Shapley said that the effective funds of C.I.G. were almost zero, and that the rules of C.I.G. both in relation to payment of representatives and also expenses of the Secretariat and of publications, etc., would have to be applied, or a new source of income would have to be found. He stated that the Finance Committee recommended that any new funds obtained for C.I.G. should be accounted for and treated separately from the present ones. He said that the Committee recommended that the accounts for the years 1959 to 1963 should be closed as regards any other claims by C.I.G. on member Unions for the expenditure listed for these years.

The Secretary-General of I.U.G.G., Prof. G. D. Garland, said that the I.U.G.G. was prepared to accept the claim made by C.I.G. for reimbursement, provided that no further claims are

made for the period ending 1963. He suggested that C.I.G. take action to settle the claims on I.A.U. and U.R.S.I. related to travel and subsistence expenses for C.I.G. meetings. Prof. Garland intimated that if the proposals for the 1965 budget were adhered to, then there would be no further claims on the Unions, but if new projects were envisaged, additional money would have to be found ; the Unions would then have to be kept fully informed of any proposals relating to new projects.

The discipline reporter for Glaciology, Dr. G. de Q. Robin, drew the attention of C.I.G. to the fact that the Editor of the Antarctic Volume, Mr. L. M. Forbes, had been promised an honorarium for the work he had done in preparing and editing the volume. It was agreed that there was an obligation to pay this honorarium and Messrs. Robin and Laclavère were requested to resolve the question of its payment.

The representative of W.D.C. A, (Dr. Odishaw) in explanation of the item in the budget for C.I.G. for 1965 — Publication (1964, 1965) of W.D.C. Guides — said that this related to the publication of the W.D.C. Guides, which had been prepared at W.D.C. A, and for the supplementary sections on oceanography and on the U.M.C. disciplines. He said that it was originally thought that the expense for these publications might be borne by the Centre, but it had proved impossible to do this.

Dr. Odishaw requested the Secretariat to provide a detailed explanation of the administration expenses of C.I.G. for the period 1959 to 1963, together with an indication of the work that had been carried out by the C.I.G. Secretariat in this period. He said that he thought such a statement was necessary in order to show that the Committee had been economical with its funds and to emphasize the blamelessness of C.I.G. over this period.

The report of the Finance Committee was approved, and the President thanked the Chairman and the members of the Committee for the hard work they had put into the preparation of the report.

6. — Future of C.I.G.

The President said that at the 10th General Assembly of I.C.S.U. the functions of C.I.G. had been reduced to the completion of the *Annals of the I.G.Y.* and the supervision of the W.D.C.'s. He said that the Annals would be completed during the course

of 1965 and after that the C.I.G. would still have an important role to play in maintaining the efficient functioning of the W.D.C.'s. Under its original constitution there were also other opportunities for C.I.G. to make contributions to international geophysics, particularly in the preliminary discussion and introduction of new international interdisciplinary programmes. He drew attention to the fact that the I.Q.S.Y. Committee would be dissolved in the Summer of 1967 and suggested that it was necessary to have an international body for geophysics in the post-I.Q.S.Y. period.

During the course of the I.Q.S.Y. Meeting, the need for a continuing body in geophysics had been discussed both in open plenary session and by all the disciplinary working groups. The general conclusion on all sides was that either C.I.G. or some similar I.C.S.U. body should continue. There was strong feeling that the title « International Committee for Geophysics » (C.I.G.) was a good title and should be maintained. It was felt that a continuation of the title would also probably facilitate the acquisition of funds by national bodies. It is clear too that data interchange should continue after I.Q.S.Y. and that much of the present W.D.C. structure is desirable and should be continued. Mme Troitskaya said that there was a strong feeling in the U. S. S. R. that observations should be continued on a reduced scale and that all the services participating in I.Q.S.Y. should continue in future years, since it is extremely difficult to start again once a service has been interrupted. The Soviet geophysicists thought an organization to ensure long term cooperation in geophysics was absolutely essential.

The President proposed an interim holding group for C.I.G. consisting of the Bureau, together with the W.D.C. representatives, which would be charged with the consideration of proposals for the constitution of a long-term C.I.G., which would become effective after the dissolution of the I.Q.S.Y. Committee.

It was suggested that this would, in fact differ little from continuing the C.I.G., particularly if no further meetings of C.I.G. were called during the period up to the dissolution of the I.Q.S.Y. Committee. It was generally agreed that a long-term Committee of this sort should have the responsibility, originally given to C.I.G. in its constitution, of discussing proposals for new interdisciplinary programmes in geophysics. Mr. Fournier d'Albe said that in principle, U.N.E.S.C.O. would be willing to support

an international body for planning and co-ordination of research programmes and for the collection and analysis of data in Geophysics. Dr. Federov said that the U.N.E.S.C.O. Office of Oceanography of the I.O.C. would certainly be willing to support the World Data centre mechanism.

The President stated that any long term body should have a regular source of income. A grave weakness of the existing C.I.G. was that it had no source of income whatever but had lived on its capital. He also thought that it was highly desirable for such an International Committee to have a properly established paid Secretariat. The great success of the I.Q.S.Y. administration had proved this point very conclusively.

The Treasurer of I.C.S.U. said that two possible ways of obtaining funds were, (*a*) to appeal to the national members of C.I.G. and (*b*) to appeal to I.C.S.U. He said that although a large number of new I.C.S.U. Committees are being established, it might be possible to obtain grants for 1966 and 1967. He suggested that C.I.G. make a formal request to the I.C.S.U. Executive Committee at its meeting in Munich on 5-7 April, 1965.

The C.I.G. decided to recommend to the Executive Committee of I.C.S.U. that for the present C.I.G. remain in being, and that in the next year or so a plan be prepared for a revised long-term C.I.G., and that this plan be drafted by the present C.I.G. Bureau and W.D.C. representatives acting in consultation with I.C.S.U. and other interested bodies. The Committee agreed to seek a grant from I.C.S.U. to cover the expenses of a meeting of the above planning group in 1966 or 1967.

7. — Election of Officers.

The Secretary read replies from the Presidents and General Secretaries of the International Unions of Geodesy and Geophysics, Astronomy and Pure and Applied Physics. On the question of new Officers for C.I.G. the President reported on the views of the Secretary-General and President of U.R.S.I. U.R.S.I. suggested that the representative of I.A.U. (Professor Righini) should be the new President. Professor Righini, declined this invitation and suggested that this was not the time to change the Officers of the Committee. He suggested that C.I.G. request I.C.S.U. to allow the present officers to continue and to act as an interim body. He recommended that no change be made until the C.I.G. consti-

tution had been revised and firm proposals had been approved for the new C.I.G. This was accepted unanimously.

The Secretary said that he had accepted in 1959 to act as Secretary of C.I.G. as an interim measure, until an alternative had been found. He said that he had endeavoured to resign on several occasions without success, but that he had now firmly decided not to continue. The President stated that Gen. Laclavère had taken over the Secretaryship many years ago at a particularly difficult period and had served the Committee faithfully and well. The President wished to place on record his own personal appreciation of the services which the Secretary had given, not only to this Committee but to the whole field of international geophysical science, and he felt sure that the members of C.I.G. would wish to be associated with this expression of gratitude. He said that he had discussed earlier in the day the question of the resignation of the Secretary, both with Laclavère and the Secretary of the I.Q.S.Y. Committee, Dr. C. M. Minnis, and he proposed that Minnis be invited to act as Secretary of C.I.G., at no cost to the Committee during the interim period.

The President suggested that if a decison was ultimately made to maintain a permanent organization in the post-I.Q.S.Y. period, that this could well be based on the I.Q.S.Y. Office. He asked the Secretary General of the I.U.G.G. if he would be willing to recommend to the Executive Committee of the Union that Minnis become the Secretary of C.I.G. Garland agreed to this. The Committee decided to recommend to the I.C.S.U. Executive Committee that subject to the approval of the I.U.G.G. Executive Committee, Dr. C. M. Minnis be appointed Secretary of C.I.G.

SYMPOSIA

I.A.U.-U.R.S.I. Symposium « Radio Astronomy and the Galactic System»

To the staff of Institutes active in Galactic Radio Astronomy

Dear Colleagues,

In *I.A.U. Information Bulletin*, No. 13, November 1964, it was announced that a symposium on « Radio Astronomy and the Galactic System » would be held in the Netherlands in September 1965. Since then it has appeared desirable to postpone the Symposium to the summer of 1966 : for several of the subjects on the provisional programme it is expected that much more complete observational information will be available in 1966 than at present. Consequently, the dates have now been fixed as follows :

Thursday 25 *to Wednesday* 31 *August* 1966 (inclusive)

These dates just precede the U.R.S.I. General Assembly in Munich, 2-14 September 1966.

The Symposium will be held in the Netherlands ; the exact location will be decided shortly. May we remind you that participation in the Symposium is by invitation only ? Invitations will be sent out at a later date.

Groningen, 23 April 1965.

Hugo VAN WOERDEN,
Sterrenkundig Laboratorium « Kapteyn »
Broerstraat 7
Groningen
Netherlands

CONSEIL INTERNATIONAL DES UNIONS SCIENTIFIQUES

Annuaire du C.I.U.S.

L'Annuaire du C.I.U.S. pour 1965 (138 pages) vient de sortir de presse. Outre le calendrier des réunions projetées par les organisations membres du Conseil pour l'année 1965, il contient une liste des membres du Comité Exécutif du C.I.U.S., celle des membres nationaux et des pays adhérant aux 14 Unions Scientifiques.

L'Annuaire renferme des sections relatives à chacune des Unions ; celles concernant l'U.A.I., l'U.I.S.C., l'U.I.M.T.A., l'U.I.B. et l'U.I.S.C. ont été revisées suite aux Assemblées Générales tenues au cours de 1964.

La section qui est consacrée aux Comités du C.I.U.S. contient des données mises à jour sur la composition du S.C.O.R., du S.C.A.R., du C.O.S.P.A.R., du Comité I.Q.S.Y., de la F.A.G.S. et du nouveau Comité Spécial pour le Programme Biologique International (S.C.I.B.P.). D'autres sections sont consacrées au C.I.G., à l'I.U.C.A.F., à l'I.U.C.I., à l'I.U.C.R.M., à l'I.U.C.S.T.R. et à l'I.U.C.S.T. Les Statuts du C.I.U.S. sont publiés dans l'Annuaire, ainsi que ceux des organismes du Conseil ci-dessus mentionnés.

Les 30 dernières pages fournissent la liste d'adresses des 580 scientifiques dont les noms figurent dans la publication.

L'Annuaire du C.I.U.S. peut être obtenu au prix de $ 1.50 au Secrétariat du C.I.U.S., 2 via Sebenico, Rome, Italie.

I.C.S.U. Year Book

The I.C.S.U. Year Book 1965, pp. 138, has now been published. Besides containing a calendar of the 1965 meetings of the members of the I.C.S.U. family, it lists the members of the I.C.S.U. Executive Committee, the I.C.S.U. National Members and the countries adhering to the 14 International Scientific Unions.

There are sections relating to each of the Unions, and those which concern the I.A.U., I.U.B.S., I.G.U., I.U.T.A.M., I.U.B. and I.U.G.S. have been revised as a result of their General Assemblies held in 1964.

The section devoted to the I.C.S.U. Committees contains up to date information on the composition of S.C.O.R., S.C.A.R., C.O.S.P.A.R., the I.Q.S.Y. Committee, F.A.G.S. and the new Special Committee for the International Biological Programme (S.C.I.B.P.). There are also sections on C.I.G., I.U.C.A.F., I.U.C.I., I.U.C.R.M., I.U.C.S.T.R. and I.U.C.S.T. The statutes of I.C.S.U. are printed along with those of the I.C.S.U. organisms mentioned above.

The last 30 pages are devoted to the addresses of 580 different scientists who are referred to in the publication.

The I.C.S.U. Year Book, price $ 1.50, may be obtained from the I.C.S.U. Secretariat, 2 Via Sebenico, Rome, Italy.

UNION GÉODÉSIQUE ET GÉOPHYSIQUE INTERNATIONALE

Résolutions de la XIII^e Assemblée Générale

BERKELEY, AOUT, 1963

(see English text p. 85)

Le Compte Rendu de la XIII^e Assemblée Générale vient d'être publié ; parmi les résolutions adoptées au cours de cette réunion, nous notons les suivantes :

RÉSOLUTION N° 10.

L'Union Geodésique et Géophysique Internationale,

CONSIDERANT

a) que l'emploi de procédés électromagnétiques pour la mesure des distances est devenu une caractéristique essentielle des opérations de géodésie et de levé, et qu'il est probable que l'avenir verra cet usage s'étendre encore,

b) qu'il y a de fortes objections dans certains pays à l'emploi sans restriction des fréquences normalement utilisées à présent par ces procédés,

c) qu'aucun accord international particulier n'a encore été passé pour l'attribution de fréquences aux mesures électromagnétiques des distances et que les dispositions adoptées sur le plan national sont en général peu satisfaisantes,

d) que des procédés utilisant des fréquences plus élevées que celles qui sont actuellement en usage se développeront probablement dans le futur,

CONSIDERANT en outre qu'il est essentiel pour le bon fonctionnement des méthodes géodésiques de mesure des distances et pour le développement de procédés perfectionnés, que les fréquences appropriées soient à la libre disposition de l'usage international ;

DEMANDE

a) que l'I.C.S.U. invite l'Union Internationale des Télécommunications à prendre les dispositions nécessaires à l'attribution internationale de fréquences appropriées pour la mesure électromagnétique des distances,

b) que ces dispositions assurent l'utilisation, à titre transitoire et avec le minimum de restrictions, des fréquences qui sont actuellement en usage général (1) et prévoient l'attribution à longue échéance des fréquences ci-dessus ou de certaines autres, que l'on destinera exclusivement ou principalement à la mesure des distances

c) que soit allouée une bande adéquate de fréquences dans la région de 36 Mc/s,

d) que la nécessité de ces attributions soit portée à la connaissance des gouvernements des pays membres.

Résolution nº 12.

L'Union Géodésique et Géophysique Internationale,

RECONNAISSANT

a) l'importance de signaux horaires transmis dans la bande de 14 à 100 kc/s,

b) les avantages des signaux horaires continus ;

NOTANT que de tels signaux sont déjà en service dans les Amériques et qu'ils s'y sont avérés très utiles ;

RECOMMANDE que dans cette bande les signaux horaires, de préférence continus, soient étendus et transmis à d'autres régions du globe.

Résolution nº 86.

L'Association Internationale de Géomagnétisme et d'Aéronomie,

PRIE son Comité Exécutif de constituer un Comité pour étudier et discuter avec d'autres groupes dépendant du Conseil Internatio-

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(1) *Note* : les appareils électromagnétiques de mesure de distance utilisent actuellement les fréquences suivantes :

1,2-1,4 Mc/s (usage limité),
2,8-3,2 Mc/s (usage normal),
10,0-10,5 Mc/s (usage normal).

nal des Unions Scientifiques, l'organisation la mieux adaptée au vaste domaine d'étude, en continuelle expansion, que constitue la physique hélioterrestre.

Resolutions adopted by the XIIIth General Assembly,

BERKELEY, AUGUST 1963

The Proceedings of the XIIIth General Assembly have been issued. Among the resolutions adopted at this meeting, we quote the following :

RESOLUTION N° 10.

The International Union of Geodesy and Geophysics,

NOTING

(*a*) That the use of electromagnetic systems for distance measurement has become an essential feature of geodetic and surveying operations throughout the world and that such use is likely to be greatly extended in the future ;

(*b*) That there are strong objections on the part of other interests in certain countries to the unrestricted use of the frequencies at present normally used by these systems ;

(*c*) That no specific international provision has yet been made for the allocation of frequencies for electromagnetic distance measurement and that such provision as has been made nationally by individual countries is generally unsatisfactory ;

(*d*) That systems operating on higher frequencies than those at present in use are likely to be developed in the future ;

RECOGNIZING that it is essential for the satisfactory working of geodetic distance measurement systems and for the development of improved systems that suitable frequencies shall be freely available for international use ;

REQUESTS

(*a*) that the International Council of Scientific Unions approach the International Telecommunications Union to make arrangements

for the international allocation of suitable frequencies for electromagnetic distance measurement ;

(*b*) that such arrangements provide, as an interim measure, for the continued use with the minimum of restriction of the frequencies at present in general use (1), and in the long term for the allocation of these or other suitable frequencies exclusively or primarily for distance measurement ;

c) that an adequate frequency band in the region of 36 Mc/s be allocated in the long term ;

(*d*) that the necessity for such allocation be brought to the notice of governments of member nations.

Resolution nº 12.

The International Union of Geodesy and Geophysics,

RECOGNIZING

(*a*) the importance of time signals transmitted in the band from about 14 to 100 Kc/s, and

(*b*) the advantages of continuous time signals ;

NOTING that such signals are already available in the Americas and that they have proved useful ;

RECOMMENDS to the adhering bodies that they approach the authorities in their countries to ensure that such signals be provided and extended.

Resolution nº 86.

The International Association of Geomagnetism and Aeronomy,

REQUESTS its Executive Committee to appoint a committee to study and discuss with other bodies within the framework of the I.C.S.U. the most appropriate and suitable organization of the broad and rapidly developing field of solar and terrestrial physics.

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(1) *Note* : The electromagnetic systems of distance measurement at present generally available make use of the following radio frequencies :

1.2-1.4 Mc/s (limited use),
2.8-3.2. Mc/s (extensive use),
10.0-10.5 Mc/s (extensive use).

U.N.E.S.C.O.

Publication

Guide mondial des centres de documentation et d'information scientifiques (Documentation et terminologie scientifiques).

Le but de ce répertoire est d'abord d'aider à localiser les centres de documentation dans le domaine des sciences exactes et naturelles. Il ne se propose pas de donner des renseignements sur les centres de documentation technique, qui feront l'objet d'un volume séparé. Lorsque, comme cela arrive fréquemment, un même centre s'occupe à la fois de science et de technologie, le répertoire l'indique brièvement. Certaines des institutions mentionnées ont un champ d'action encore plus vaste qui peut inclure notamment les sciences sociales, humaines, etc. ; cette information n'est fournie que d'une manière très générale. Par contre, en raison de leur importance capitale pour les régions en voie de développement, l'agriculture et la médecine ont été délibérément incluses.

Les renseignements destinés à ce Guide ont été obtenus au moyen d'un questionnaire détaillé envoyé aux Commissions nationales de l'U.N.E.S.C.O., aux centres de documentation et à un choix de personnalités. Le nombre de centres sélectionnés est de 144, représentant 65 pays.

Table des matières.

Liste des centres classés dans l'ordre alphabétique des pays.

Liste des répertoires nationaux et régionaux.

Index : A. Listes alphabétiques des pays :
(i) en anglais,
(ii) en français.
B. Liste alphabétique des centres.
C. Index matières.

Catégorie A.

Nombre approx. de pages : 176.

Date probable de publication : juin 1965.

Prix approx. : $ 2.50 ; 13/- stg. ; 9 F (broché),
$ 4.00 ; 20/- stg. ; 14 F (relié).

Bilingue anglais-français.

World Guide to Science Information and Documentation Services (Documentation and terminology of science).

This publication is intended to provide guidance in locating services or documentation and information of the natural sciences. It is not planned to give information on documentation centres for technology, which are to be dealt with in a separate volume. However, when science and technology are covered by the same institution, this is indicated. Some of the institutions listed cover an even wider range of subjects, extending to the social sciences, humanities, etc. This type of information is indicated only in a general manner. However, agriculture and medicine are included, because of their paramount importance for the developing countries.

Information for the Guide was obtained by means of a detailed questionnaire sent to U.N.E.S.C.O. National Commissions, to documentation centres, and to selected individuals. The Guide lists 144 centres in 65 countries. The amount of information provided in the replies to the questionnaire varied widely, and this is reflected in the entries.

Table of contents :

List of centres arranged in alphabetical order of countries.

List of national and regional directories.

Indexes : A. Alphabetical lists of countries :
(i) in English,
(ii) in French.
B. Alphabetical list of centres.
C. Subject index.

Category A.

Approx. No. of pages : 176.

Approx. publication date : June 1965.

Approx. price : Paper — $ 2.50 ; 13/- ; 9F,
Cloth — $ 4.00 ; 20/- ; 14 F.

Bilingual English/French.

BIBLIOGRAPHIE

Commission Electrotechnique Internationale

Publication 86-3 : *Première édition.* — Piles électriques. 3e partie : Organes de connexion.

Publication 92-3 : *Deuxième édition.* — Installations électriques à bord des navires. 3e partie : Câbles (construction, essais, installations).

Publication 183 : *Première édition.* — Guide au choix des câbles de haute tension.

Publication 166 : *Première édition.* — Condensateurs fixes au papier métallisé pour courant continu.

Publication 169-1 : *Première édition.* — Connecteurs pour fréquences radioélectriques. Première partie : Règles générales et méthodes de mesure.

Publication 179 : *Première édition.* — Sonomètres de précision.

Publication 199 : *Première édition.* — Dimensions de batteries d'accumulateurs au plomb pour scooteurs.

Publication 201 : *Première édition.* — Sources d'alimentation des appareils portatifs de prospection de matières radio-actives.

Ces publications sont en vente au Bureau Central de la C.E.I., 1, rue de Varembé, Genève, Suisse.

Roumanie

L'Institut de Documentation Technique de Bucarest (Cosmonautilor, 27-29, Bucuresti) publie depuis cette année le « *Bulletin Analytique de la Littérature Technique Roumaine* ».

Cette publication a également une édition anglaise et une édition russe.

BIBLIOGRAPHY

International Electrotechnical Commission

Publication 86-3 : *First edition.* — Primary cells and batteries. Part 3 : Terminals.

Publication 92-3 : *Second edition.* — Electrical installations in ships. Part 3 : Cables (Construction, testing and installations).

Publication 183 : *First edition.* — Guide to the selection of high-voltage cables.

Publication 166 : *First edition.* — Fixed metallized paper dielectric capacitors for direct current.

Publication 169-1 : *First edition.* — Radio-frequency connectors. Part 1 : General requirements and measuring methods.

Publication 179 : *First edition.* — Precision sound level meters.

Publication 199 : *First edition.* — Dimensions of lead-acid motor scooter batteries.

Publication 201 : *First edition.* — Power sources for portable prospecting equipment for radio-active materials.

These publications are on sale at the Central Office of the I.E.C., 1, rue de Varembé, Geneva, Switzerland.

Rumania

The Technical Documentation Institute of Bucarest (Cosmonautilor, 27-29, Bucuresti) is publishing since 1965 the « *Abstracting Bulletin of Rumanian Technical Literature* ».

This Bulletin has also an issue in French and in Russian language.

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