Bulletin nº 174 Mars 1970

U. R. S. I.

TABLE DES MATIÈRES — CONTENTS

UNION RADIO-SCIENTIFIQUE INTERNATIONALE

Statuts

(adoptés à la XVI[e] Assemblée générale, Ottawa, août 1969)

Buts

Art. 1. — L'Union Radio-Scientifique Internationale a pour but de stimuler et de coordonner, à l'échelle internationale, les études dans le domaine de la radioélectricité scientifique et, plus particulièrement :

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

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

Membres

Art. 2. — Les Membres de l'Union sont les Comités dont les demandes d'admission ont été acceptées au cours d'une Assemblée générale ordinaire.

Art. 3. — Un Comité Membre est créé, dans un territoire donné, par l'Académie des Sciences ou le Conseil de la Recherche, ou bien par une institution ou association d'institutions analogue.

Art. 4. — L'Union peut admettre comme Membre tout Comité qui, dans un territoire donné, développe une activité dans le domaine de la radioélectricité scientifique et est membre du Conseil International des Unions Scientifiques.

Art. 5. — Dans leurs territoires respectifs, les Comités Membres ont les mêmes buts que l'Union; entière liberté leur est laissée quand à leur organisation interne.

Art. 6. — Chaque Comité Membre désigne un Représentant au Conseil (voir Art. 17) et un Membre officiel au sein de chacune des Commissions (voir Art. 26). Un même Membre officiel peut représenter son Comité au sein de deux ou plusieurs Commissions. Les membres du Bureau ne peuvent pas représenter un Comité Membre au Conseil.

ART. 7. — Lors de leur adhésion à l'Union, les Comités Membres choisissent la Catégorie dans laquelle ils se proposent d'être classés. Le nombre des unités de contribution annuelle dues à l'Union ainsi que le nombre de voix qui leur est attribué au sein du Conseil sont déterminés par la Catégorie choisie et sont spécifiés ci-dessous :

Catégorie	1	2	3	4	5	6
Nombre de voix	1	2	3	4	5	6
Nombre d'unités de contribution	1	2	4	8	16	32

Le montant de l'unité de contribution est fixé par le Conseil.

ART. 8. — Les Comités Membres peuvent passer à une Catégorie supérieure au début de l'année financière. Ils peuvent passer à une Catégorie inférieure soit au cours d'une Assemblée générale ordinaire, soit dans la période de trois mois qui suit la fin de l'Assemblée. Tout transfert d'une catégorie à une autre entre en vigueur au début de l'année financière suivante.

ART. 9. — A moins d'une décision contraire du Conseil, tout Comité Membre qui n'a pas versé sa contribution annuelle à deux reprises est considéré comme cessant de faire partie de l'Union.

ART. 10. — Les Comités Membres peuvent quitter l'Union en signifiant leur intention par écrit au Secrétaire général. En cas de démission, ils sont tenus de payer leur contribution annuelle pour l'année en cours.

ART. 11. — Les Comités Membres qui quittent l'Union, ou qui sont considérés comme ayant cessé d'en faire partie en vertu de l'Art. 9, perdent tous droits à l'actif de l'Union.

ART. 12. — En cas de dissolution de l'Union, le Conseil dispose des avoirs de l'Union; ceux-ci ne seront pas répartis entre les Membres.

ADMINISTRATION ET ORGANISATION

Le Bureau

ART. 13. — La direction des affaires de l'Union et l'organisation de ses activités sont confiées au Bureau qui agit en conformité avec les résolutions et les lignes de conduite générale formulées par le Conseil.

ART. 14. — Le Bureau est composé du Président, du Président sortant, de quatre Vice-Présidents et du Secrétaire général. Le Président peut inviter les Présidents d'honneur à assister aux séances du Bureau à titre consultatif.

ART. 15. — Le Bureau se réunit au cours et dans l'intervalle des Assemblées générales, à l'initiative du Président ou de deux de ses membres.

ART. 16. — Dans l'intervalle des Assemblées générales, le Bureau, agissant au nom de l'Union, est autorisé à prendre des décisions sur les affaires urgentes à condition que ces décisions ne soient pas en contradiction avec les résolutions et les lignes de conduite générale formulées par le Conseil. Les décisions ainsi prises sont reconsidérées lors de l'Assemblée générale ordinaire suivante.

Le Conseil

ART. 17. — Le Conseil est composé du Président de l'Union et des Représentants des Comités Membres. Chaque Comité Membre ayant rempli ses obligations statutaires désigne un Représentant au Conseil de l'Union.

ART. 18. — Le Conseil se réunit pendant les Assemblées générales de l'Union pour examiner les points figurant à l'ordre du jour cité à l'Art. 60 ou 67.

ART. 19. — Dans le cas où le Représentant d'un Comité Membre serait empêché d'assister à une séance du Conseil, le Comité qu'il représente, ou la Délégation de ce Comité, peut désigner un suppléant pour cette séance. Cette désignation doit être signifiée au Président ou au Secrétaire général avant le début de la séance.

ART. 20. — Dans le cas où un Comité Membre ne pourrait envoyer aucun délégué à l'Assemblée générale, il peut adresser son vote par écrit au Président sur toutes questions figurant à l'ordre du jour, qui est diffusé conformément à l'Art. 60. Pour être valable, ce vote doit être reçu avant le dépouillement du scrutin.

ART. 21. — Le Président invite les membres du Bureau et, lorsque les délibérations portent sur des questions scientifiques, les Présidents des Commissions intéressées à assister aux séances du Conseil à titre consultatif. Il peut inviter les Présidents d'honneur au même titre.

Les Commissions scientifiques

ART. 22. — La réalisation des buts de l'Union dans les différents domaines de la radioélectricité scientifique incombe aux Commissions scientifiques, qui sont établies par le Conseil. Les Comités scientifiques sont établis par le Conseil pour étudier les questions présentant un intérêt commun à plusieurs Commissions.

ART. 23. — Les Commissions ont pour fonctions

a) de se tenir au courant des progrès réalisés dans la mise en œuvre des buts définis à l'Art. 1;

b) d'assurer la présentation et la discussion d'exposés relatant ces progrès au cours des Assemblées générales ordinaires;

c) de préparer les programmes de travail, résolutions et recommandations à soumettre au Conseil en conformité avec l'Art. 25;

d) de former des Groupes de travail pour l'étude de sujets scientifiques déterminés;

e) d'organiser, dans l'intervalle des Assemblées générales, les colloques scientifiques ainsi que les réunions des Groupes de travail qui ont reçu l'approbation du Bureau.

ART. 24. — Les Commissions se réunissent pendant les Assemblées générales ordinaires. Dans des circonstances particulières et avec l'approbation du Bureau, les Présidents des Commissions peuvent convoquer des réunions de leur Commission en tout autre moment.

ART. 25 :

a) Pour toutes questions se rapportant à l'administration de l'Union ou ayant des implications financières, les Commissions présentent leurs vues et opinions au Conseil sous forme de recommandations.

b) Pour toutes questions ressortissant à leurs mandats respectifs, et ne tombant pas sous *a*) ci-dessus, les Commissions peuvent adopter des résolutions. Celles-ci sont présentées au Conseil pour information.

ART. 26. — Chaque Commission est composée d'un Président, d'un Vice-Président et des Membres officiels désignés par les Comités Membres, à raison d'un Membre officiel par Comité Membre.

ART. 27. — Dans le cas où un Membre officiel serait empêché d'assister à une séance de sa Commission, il peut soit désigner un suppléant parmi les membres de sa délégation, soit adresser son vote par écrit au Président de la Commission, sur toute question à l'ordre du jour. Dans la deuxième éventualité, ce vote, pour être valable, doit être reçu avant le dépouillement du scrutin.

ART. 28. — La mise en œuvre des programmes recommandés par les Commissions ou les Comités scientifiques incombe aux Comités Membres qui acceptent d'y prendre part.

ART. 29. — Chaque Groupe de travail formé en vertu de l'Art. 23*d*) est dissous à la fin de l'Assemblée générale ordinaire qui suit celle de sa création. Le Groupe de travail dont la tâche n'est pas terminée au moment de l'Assemblée générale peut être reconstitué par la Commission-mère.

ART. 30. — Les Présidents et les Membres des Groupes de travail sont désignés par le Président de la Commission-mère après consultation des Membres officiels, si besoin par correspondance.

ART. 31. — Chaque Groupe de travail prépare un rapport d'activité comprenant ses conclusions et recommandations; la date de présentation de ce rapport est fixée par le Président de la Commission-mère.

Le Comité de Coordination

ART. 32. — Le Comité de Coordination est composé des Présidents des Commissions et des Comités scientifiques, et des membres du Bureau. Dans le cas où le Président d'une Commission serait empêché d'assister à une réunion du Comité de Coordination, il peut se faire représenter par le Vice-Président de sa Commission.

ART. 33. — Le Comité de Coordination a pour tâche

a) de coordonner les activités scientifiques des Commissions, particulièrement dans les domaines où l'action conjointe de deux ou plusieurs Commissions paraît souhaitable,

b) de préparer le programme scientifique des Assemblées générales.

ART. 34. — Le Comité de Coordination se réunit au moins un an avant chaque Assemblée générale ordinaire pour en établir le programme scientifique. Le Président convoque des réunions du Comité de Coordination pendant l'Assemblée générale.

Divers

ART. 35. — Le Président de l'Union préside les séances du Bureau, du Conseil et du Comité de Coordination. En cas d'absence ou d'empêchement, il est remplacé par le Président sortant.

ART. 36. — Le Bureau désigne l'un des Vice-Présidents comme Trésorier de l'Union. Le Trésorier gère les fonds de l'Union en conformité avec les directives du Conseil. Il est tenu de déléguer au Secrétaire général les pouvoirs nécessaires à la conduite des affaires financières courantes.

ART. 37. — Le Secrétaire général assure la gestion des affaires de l'Union et l'organisation de ses activités en conformité avec les directives du Bureau. Il est chargé, en particulier, de la mise en œuvre des résolutions adoptées au cours des Assemblées générales, du maintien des relations avec les Comités Membres, les Commissions et autres organes de l'Union, ainsi que des publications de l'Union.

ART. 38. — Tous les actes qui engagent l'Union et ont été approuvés par le Bureau sont signés par deux membres du Bureau dont l'un doit être soit le Président soit le Secrétaire général.

ART. 39. — Le Bureau peut donner pouvoir à l'un de ses membres pour ester en justice.

ELECTIONS

ART. 40. — L'admission officielle de nouveaux Comités Membres par le Conseil ne peut s'effectuer qu'au cours d'une Assemblée générale ordinaire. L'admission provisoire de ces Comités, sans droit de vote, peut être autorisée par le Bureau à partie de la date de paiement de la première contribution annuelle à l'Union.

ART. 41. — Les membres du Bureau sont élus par le Conseil au cours de l'Assemblée générale ordinaire. Leur mandat entre en vigueur à l'issue de l'Assemblée qui a prononcé leur élection et prend fin à l'issue de l'Assemblée générale ordinaire suivante.

ART. 42. — Les canditats aux fonctions de membre du Bureau sont présentés par les Comités Membres. Les candidats ne sont éligibles que moyennant les conditions suivantes :

a) soit leur candidature est présentée par au moins deux Comités, soit elle est présentée par un seul Comité et appuyée ultérieurement par au moins un autre Comité;

b) ils doivent confirmer au Secrétaire général qu'ils acceptent de prendre part aux élections.

ART. 43. — La liste définitive des candidats éligibles est établie selon la procédure suivante :

a) Au plus tard six mois avant l'ouverture de l'Assemblée générale ordinaire, le Secrétaire général invite tous les Comités Membres à présenter leurs candidats, à raison d'un candidat à chacun des postes suivants : Président, quatre Vice-Présidents, Secrétaire général.

b) Sur la base de ces propositions, qui doivent lui parvenir au plus tard cinq mois avant l'Assemblée, le Secrétaire général diffuse aux Comités Membres deux listes provisoires indiquant les noms des candidats et les Comités proposants :

Liste A : candidats présentés par au moins deux Comités,

Liste B : candidats présentés par un seul Comité.

c) Tout Comité peut appuyer les candidatures figurant dans la liste B, à raison d'une candidature pour chacun des postes cités en *a*). Notification en est donnée au Secrétaire général au plus tard trois mois avant l'Assemblée.

d) La liste définitive des candidats éligibles est diffusée aux Comités Membres au plus tard deux mois avant l'Assemblée.

ART. 44. — Dans le cas où le Secrétaire général ne serait pas réélu, le Bureau veille à prendre toutes les dispositions utiles pour que les responsabilités soient transférées au nouveau Secrétaire général au plus tard six mois après la fin de l'Assemblée générale.

ART. 45. — Le Président n'est pas rééligible. Les Vice-Présidents peuvent être réélus une fois.

ART. 46. — Après consultation des membres du Bureau et des Comités Membres, le Président peut pourvoir aux vacances intervenant au sein du Bureau. Tout membre ainsi nommé assume ses fonctions jusqu'à la fin de l'Assemblée générale ordinaire suivante; il peut être élu pour le terme suivant même dans le cas où le membre du Bureau qu'il a été appelé à remplacer n'est pas rééligible.

ART. 47. — Le Conseil peut conférer le titre de Président d'honneur à un ancien membre du Bureau ou à un ancien Président de Commission qui a apporté une contribution particulière à la réalisation des buts de l'Union; le nombre des Présidents d'honneur n'excédera pas cinq.

ART. 48. — Les Présidents et les Vice-Présidents des Commissions sont élus par le Conseil sur recommandation des Commissions respectives. Les Présidents entrent en fonction à la fin de l'Assemblée qui a prononcé leur élection et leur mandat expire à la fin de l'Assemblée générale ordinaire suivante. Sauf circonstances exceptionnelles ou abolition de la Commission, les Vice-Présidents succèdent automatiquement aux Présidents.

ART. 49. — Les Présidents de Commission qui sont en même temps Membres officiels au sein de leur propre Commission sont tenus de désigner un autre membre de leur délégation comme Membre officiel pour la durée de l'Assemblée générale.

ART. 50. — Chaque Commission peut élire un secrétaire de langue française et un secrétaire de langue anglaise parmi les délégués présents à l'Assemblée générale.

ART. 51. — Les Présidents des Comités scientifiques sont élus par le Conseil sur recommandation du Bureau.

ART. 52. — Les représentants de l'Union auprès d'autres organisations internationales sont élus par le Conseil sur recommandation du Bureau.

L'ASSEMBLÉE GÉNÉRALE ORDINAIRE

ART. 53. — L'Union se réunit normalement tous les trois ans en Assemblée générale ordinaire. Au cours de l'Assemblée ont lieu :

a) des séances du Conseil, du Comité de Coordination et du Bureau,

b) des séances administratives et des séances scientifiques des Commissions,
c) des séances plénières réunissant tous les délégués désignés par les Comités Membres et les observateurs,
d) des séances des groupes de travail établis par les Commissions.

ART. 54. — A l'Assemblée générale ordinaire assistent :
a) les membres du Bureau,
b) les Présidents et Vice-Présidents des Commissions,
c) les Présidents des Comités scientifiques,
d) les délégations des Comités Membres comprenant chacune le Représentant au Conseil, les Membres officiels des Commissions et des délégués ordinaires,
e) les Présidents d'honneur et anciens Présidents de l'Union,
f) les observateurs invités en vertu des Arts 55 et 56.

ART. 55. — Le Président peut inviter les personnalités suivantes à assister à l'Assemblée générale en qualité d'observateurs :
a) les représentants désignés par des organisations internationales,
b) des scientifiques venant de territoires membres du Conseil International des Unions Scientifiques mais non pas de l'Union, soit de sa propre initiative, soit sur recommandation d'un Président de Commission,
c) des scientifiques ne faisant pas partie d'une délégation, moyennant approbation du Comité Membre intéressé.

ART. 56. — Le Comité Membre du territoire où se tient l'Assemblée générale ordinaire peut inviter des personnalités de ce territoire à assister à l'Assemblée en qualité d'observateurs.

ART. 57. — La date et le lieu de l'Assemblée générale sont communiqués par le Secrétaire général aux Comités Membres au moins six mois avant l'ouverture de l'Assemblée.

ART. 58. — L'ordre du jour des séances du Conseil est établi sur la base des propositions présentées par les Comités Membres, le Bureau, le Comité de Coordination, les Commissions et les Comités scientifiques de l'Union.

ART. 59. — Les questions à inclure à l'ordre du jour du Conseil doivent parvenir au Secrétaire général au moins quatre mois avant l'ouverture de l'Assemblée générale. Toute question présentée ultérieurement n'est prise en considération qu'avec l'assentiment préalable d'au moins la moitié des voix émises par les membres présents à la séance.

ART. 60. — L'ordre du jour des séances du Conseil est préparé par le Secrétaire général et communiqué aux Comités Membres au moins trois mois avant l'ouverture de l'Assemblée.

ART. 61. — Pour chaque Assemblée générale ordinaire, le Secrétaire général prépare :

a) à l'intention du Conseil, un rapport circonstancié sur les affaires de l'Union, y compris un état des recettes et des dépenses, depuis la dernière Assemblée générale ordinaire ainsi qu'un projet de prévisions budgétaires pour le triennat suivant,

b) à l'intention de tous les délégués, un rapport général sur les activités de l'Union depuis la dernière Assemblée générale ordinaire.

ART. 62. — Le Conseil a pleins pouvoirs pour décider de toutes les activités découlant pour l'Union des buts définis à l'Art. 1.

Il a pour attributions particulières :

a) d'examiner les mesures prises par le Bureau depuis l'Assemblée générale ordinaire précédente relativement aux affaires de l'Union;

b) d'élire

(i) les membres du Bureau,

(ii) les Présidents et Vice-Présidents des Commissions,

(iii) les Présidents des Comités scientifiques,

(iv) les représentants de l'Union auprès d'autres organisations internationales;

c) de créer et d'abolir les Commissions et les Comités scientifiques et d'en déterminer les titres et mandats;

d) d'examiner et, si jugé opportun, d'approuver les programmes de travail, résolutions et recommandations présentés par les Commissions et les Comités scientifiques de l'Union;

e) sur proposition du Bureau, d'examiner les demandes d'admission à l'Union et, si jugé opportun, d'accepter ces demandes;

f) de fixer l'année et le lieu de l'Assemblée générale ordinaire suivante;

g) de désigner un Comité des finances chargé :

(i) de préparer un rapport sur les comptes de l'Union depuis la dernière Assemblée générale ordinaire et sur les prévisions budgétaires pour la période allant jusqu'à l'Assemblée générale ordinaire suivante,

(ii) de présenter ses recommandations concernant les finances de l'Union;

h) sur proposition du Comité des finances, d'approuver les comptes et les prévisions budgétaires et de considérer les recommandations formulées par ce Comité;

i) de déterminer le montant de l'unité de contribution définie à l'Art 7;

j) sur proposition du Bureau, d'approuver les amendements aux Statuts;

k) de prendre des décisions sur toutes autres questions touchant les activités de l'Union.

ART. 63. — Les résolutions adoptées par le Conseil et les Commissions au cours de l'Assemblée générale sont présentées pour information à la

séance plénière de clôture de l'Assemblée, à laquelle assistent tous les délégués et observateurs.

ART. 64. — A défaut de prescriptions pertinentes dans les Statuts, le Conseil est autorisé

a) à prendre des décisions sur toutes les questions relatives aux activités de l'Union,

b) à établir des règles pour la conduite des travaux de l'Assemblée générale.

Ces décisions et règles ne peuvent contenir de prescriptions qui seraient en contradiction avec les termes des Statuts.

L'ASSEMBLÉE GÉNÉRALE EXTRAORDINAIRE

ART. 65. — Dans des circonstances particulières et avec approbation de la majorité des voix des Comités Membres, le Président peut convoquer une Assemblée générale extraordinaire. Il est tenu de le faire lorsqu'il en est requis par un tiers au moins des voix de tous les Comités Membres.

ART. 66. — Le Conseil, tel que défini à l'Art. 17, siège au cours de l'Assemblée générale extraordinaire. Le Président peut inviter les membres du Bureau, les Présidents d'honneur et les Présidents des Commissions à assister aux séances à titre consultatif.

ART. 67. — L'ordre du jour, la date et le lieu de l'Assemblée générale extraordinaire sont communiqués aux Comités Membres par le Secrétaire général au moins trois mois avant l'ouverture de l'Assemblée.

PROCÉDURE DE VOTE

ART. 68 :

a) Au sein du Conseil, seuls les Représentants des Comités Membres ont droit de vote. Le nombre des voix attribuées à chacun des Représentants est déterminé par la Catégorie de son Comité, suivant le barème figurant à l'Art. 7.

Toutes les résolutions du Conseil sont adoptées à la majorité simple des voix, exception faite de celles portant modification des Statuts, pour lesquelles la majorité des deux tiers est requise.

b) Au sein des Commissions, chaque Membre officiel présent, ou votant en vertu de l'Art. 27, ou bien son suppléant, a une voix.

c) Au sein du Bureau, du Comité de Coordination et des Comités, chaque membre présent a une voix. Un membre du Bureau qui est rémunéré pour ses services à l'Union n'a pas droit de vote.

d) Au sein du Bureau, du Conseil, du Comité de Coordination, des Commissions et des Comités, les décisions sont prises en tenant compte du nombre des votes positifs et des votes négatifs émis par les membres présents et prenant part au scrutin. En cas d'égalité des voix, la décision appartient au Président. Les votes adressés par écrit en vertu des Arts 20 et 27 ne sont admis que dans les séances du Conseil et des Commissions.

Quorum

Art. 69. — Dans les séances du Bureau et du Conseil, le quorum est atteint par la moitié du nombre des membres. Dans les séances du Comité de Coordination, il est constitué par la moitié du nombre des membres du Bureau et les représentants de la moitié du nombre des Commissions.

Art. 70. — Dans le cas où le quorum ne serait pas atteint par le nombre des membres présents au Conseil, le Président peut convoquer une séance extraordinaire; celle-ci n'aura pas lieu avant expiration d'un délai de 24 heures. Dans ces conditions, si le nombre des membres présents n'est pas inférieur à douze, le quorum sera atteint nonobstant l'Art. 69.

Finances

Art. 71. — Les recettes de l'Union proviennent

a) des contributions annuelles payées par les Comités Membres en vertu de l'Art. 7,

b) de donations et de subsides des Comités Membres,

c) de donations et de subsides provenant d'autres sources et acceptés avec l'assentiment du Conseil.

Art. 72. — Les fonds provenant de donations et de subsides sont utilisés selon les désirs exprimés par les donateurs. Tous les autres fonds sont consacrés à couvrir les dépenses faites par l'Union en vue de la réalisation de ses buts.

Art. 73. — Les dépenses ordinaires de l'Union comprennent :

a) les frais de voyage des membres du Bureau, des Présidents et Vice-Présidents des Commissions et des membres du Secrétariat se déplaçant pour les besoins de l'Union,

b) les frais de rédaction et d'impression des publications de l'Union,

c) les frais d'administration,

d) toutes autres dépenses autorisées par le Conseil.

ART. 74. — Au cours de l'année financière, le Trésorier peut autoriser des dépenses supplémentaires ne dépassant pas le tiers du solde du Fonds pour Cas Spéciaux à la fin de la dernière Assemblée générale ordinaire. Toutes les dépenses excédant ce montant doivent être autorisées par le Bureau.

ART. 75. — L'année financière de l'Union commence le 1er janvier et prend fin le 31 décembre.

DIVERS

ART. 76. — Les langues officielles de l'Union sont le français et l'anglais. Tous les documents administratifs sont publiés dans les deux langues.

ART. 77. — En cas de contestation, le texte français des Statuts fait foi.

INTERNATIONAL UNION OF RADIO SCIENCE

Statutes

(adopted at the XVI General Assembly, Ottawa, August 1969)

OBJECTS

ART. 1. — The object of the International Union of Radio Science (Union Radio-Scientifique Internationale) is to stimulate and to coordinate on an international basis, studies in the field of radio science and, within this field :

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

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

MEMBERS

ART. 2. — The Members of the Union are the Committees whose applications for membership have been accepted at an Ordinary General Assembly.

ART. 3. — A Member Committee is established in a territory by the Academy of Sciences or the Research Council, or by a similar institution or association of institutions.

ART. 4. — The Union can admit to membership a Committee in any territory which is a member of the International Council of Scientific Unions and in which there is an interest in radio science.

ART. 5. — Member Committees, within their respective territories, have the same objects as the Union; they have complete freedom in matters relating to their internal organisation.

ART. 6. — Eeach Member Committee appoints a Representative to the Council (See Art. 17) and one Official Member to each Commission (See Art. 26). The same Official Member can represent his Committee on more than one Commission. A Member of the URSI Board of Officers cannot be appointed as Representative to the Council.

ART. 7. — Each Member Committee is free to choose the Category in which it will adhere to the Union. The number of units of contribution payable annually to the Union by a Member Committee and the number of votes allocated to it in meetings of the Council are determined by the Category chosen and are as follows :

Category	1	2	3	4	5	6
Number of votes	1	2	3	4	5	6
Number of units of contribution	1	2	4	8	16	32

The value of the unit of contribution is fixed by the Council.

ART. 8. — A Member Committee can transfer to a higher Category at the beginning of any financial year. A transfer to a lower Category can be made during an Ordinary General Assembly or during the three-month period after the end of an Assembly. The transfer takes effect from the beginning of the next financial year.

ART. 9. — Unless the Council decides otherwise, a Member Committee which has not paid its annual contribution for two years is considered to have resigned from the Union.

ART. 10. — A Member Committee can resign from the Union by giving notice in writing to the Secretary General. In the event of resignation, the Member Committee is liable to pay its annual contribution for the current year.

ART. 11. — A Member Committee which resigns from the Union, or which is considered as having resigned in accordance with Art. 9, loses all rights to the assets of the Union.

ART. 12. — In the event of the dissolution of the Union, the Council decides on the disposal of the assets of the Union. The assets may not be distributed among the Members.

ADMINISTRATION AND ORGANISATION

Board of Officers

ART. 13. — The direction of the affairs of the Union and the organisation of its work are the responsibilities of the Board of Officers which acts in accordance with the resolutions and general guidance of the Council.

ART. 14. — The Board of Officers comprises the President, the Immediate Past President, four Vice-Presidents and the Secretary General. The President can invite Honorary Presidents to attend meetings of the Board in an advisory capacity.

ART. 15. — The Board of Officers meets during and between General Assemblies at the request of the President or of two of its members.

ART. 16. — During the interval between General Assemblies, the Board of Officers, acting in the name of the Union, can make decisions relating to urgent matters provided that these decisions do not conflict with the resolutions and general guidance of the Council. Decisions made in this way are subject to review at the next Ordinary General Assembly.

Council

ART. 17. — The Council comprises the President of the Union and Representatives of Member Committees. Each Member Committee which has complied with its statutory obligations appoints one Representative to the Council of the Union.

ART. 18. — The Council meets during General Assemblies of the Union to consider the agenda referred to in Art. 60 or 67. Resolutions of the Council are adopted in the name of the Union.

ART. 19. — If the Representative of a Member Committee is unable to be present at a meeting of the Council, the Committee that he represents or the Delegation of this Committee can appoint a substitute for that meeting. Notice of such a substitution must be given to the President or the Secretary General before the beginning of the meeting.

ART. 20. — If a Member Committee is unable to send any delegate to a General Assembly, the Committee can submit its vote in writing to the

President on any item which appears in the agenda circulated in accordance with Art. 60. Such a vote is valid only if it is received before the counting of the votes.

ART. 21. — The President invites the members of the Board of Officers and, when scientific matters are discussed, the appropriate Chairmen of Commissions to attend meetings of the Council in an advisory capacity. He can invite Honorary Presidents in the same capacity.

Scientific Commissions

ART. 22. — The achievement of the objects of the Union within particular parts of the field of radio science is the responsibility of the scientific Commissions which are established by the Council. Scientific Committees of the Union are established by the Council to deal with matters which are of interest to several Commissions.

ART. 23. — The functions of a Commission are

(*a*) to keep under review the progress made in the achievement of the objects referred to in Art. 1;

(*b*) to arrange for the presentation and discussion of surveys of progress during Ordinary General Assemblies;

(*c*) to prepare programmes of work, resolutions and recommendations for submission to the Council in accordance with Art. 25;

(*d*) to form Working Groups for the study of particular scientific subjects;

(*e*) to organise, between General Assemblies, scientific symposia and meetings of Working Groups that have been approved by the Board of Officers.

ART. 24. — The Commissions meet during Ordinary General Assemblies. In special circumstances and with the approval of the Board of Officers, the Chairman of a Commission can convene a meeting of his Commission at any time.

ART. 25 :

(*a*) The opinion of a Commission on any matter which relates to the administration of the Union or which has financial implications is submitted to the Council in the form of a recommendation.

(*b*) A Commission can adopt resolutions on matters within its terms of reference other than those specified in (*a*). Such resolutions are submitted to the Council for information.

ART. 26. — Each Commission comprises a Chairman, a Vice-Chairman and the Official Members; one Official Member is appointed by each of the Member Committees.

ART. 27. — If an Official Member of a Commission is unable to be present at a meeting of the Commission, he may nominate a member of his delegation to represent him, or he may submit his vote on any item in writing to the Chairman of the Commission. In the latter case his vote will be valid only if it is received before the counting of the votes.

ART. 28. — The execution of programmes recommended by the Commissions or the scientific Committees is the responsibility of the Member Committees which agree to participate in them.

ART. 29. — Each Working Group formed in accordance with Art. 23 (*d*) is dissolved at the end of the General Assembly following that of its creation. A Working Group which has not completed its task by the date of the General Assembly can be reconstituted by the parent Commission.

ART. 30. — The Chairman and the members of a Working Group are chosen by the Chairman of the parent Commission after consultation with the Official Members, if necessary by correspondence.

ART. 31. — Each Working Group prepares a report on its work including conclusions and recommendations; the date for the submission of this Report is fixed by the Chairman of the parent Commission.

Coordinating Committee

ART. 32. — The Coordinating Committee comprises the Chairmen of the Commissions and of the scientific Committees, and the members of the Board of Officers. If a Chairman is unable to be present at a meeting of the Coordinating Committee, he can authorise the Vice-Chairman of his Commission to represent him.

ART. 33. — The Coordinating Committee is responsible for

(*a*) the coordination of the scientific activities of the Commissions, especially where joint action by two or more Commissions is desirable;

(*b*) the planning of the scientific programme of General Assemblies.

ART. 34. — The Coordinating Committee meets at least one year before each Ordinary General Assembly to define the scientific programme for the Assembly. The President convenes meetings of the Coordinating Committee during a General Assembly.

Miscellaneous

ART. 35. — The President of the Union presides at meetings of the Board of Officers, the Council and the Coordinating Committee. If he is absent or unable to preside the Immediate Past President presides.

ART. 36. — The Board of Officers nominates one of the Vice-Presidents as Treasurer of the Union. The Treasurer manages the finances of the Union in accordance with the directives issued by the Council. The Treasurer must delegate to the Secretary General the powers necessary to enable him to deal with day-to-day financial matters.

ART. 37. — The Secretary General is responsible for the management of the affairs of the Union and for the organisation of its work under the direction of the Board of Officers. In particular he is responsible for the implementation of Resolutions adopted during General Assemblies, for maintaining contact with the Member Committees, the Commissions and other organs of the Union, and for the publications of the Union.

ART. 38. — All documents that are formally binding on the Union and that have been approved by the Board of Officers are signed by two members of the Board, one of whom must be the President or the Secretary General.

ART. 39. — The Board of Officers can nominate one of its members to act for the Union in legal proceedings.

ELECTIONS

ART. 40. — The formal admission of new Member Committees by the Council takes place only at an Ordinary General Assembly. Provisional membership, without voting rights, can be authorized by the Board of Officers from the date of payment of the first annual contribution to the Union.

ART. 41. — The Members of the Board of Officers are elected by the Council during an Ordinary General Assembly. Each member holds office from the end of the Assembly at which he is elected until the end of the next Ordinary General Assembly.

ART. 42. — Candidates for membership of the Board of Officers are nominated by the Member Committees. A candidate is not eligible for election unless :

(*a*) either he has been nominated by two or more Committees, or he has been nominated by one Committee and has later been supported by at least one other Committee;

(*b*) he has confirmed to the Secretary General that he is willing to stand for election.

ART. 43. — The final list of eligible candidates is prepared in accordance with the following procedure :

(*a*) Not later than six months before the beginning of an Ordinary General Assembly, the Secretary General invites every Member Committee

to nominate one candidate for each of the following offices : President, four Vice-Presidents, Secretary General.

(*b*) On the basis of the nominations he receives not later than five months before the Assembly, the Secretary General sends to Member Committees two provisional lists showing the names of the candidates and the Committees which nominated them :

List A, candidates nominated by two or more Committees;

List B, candidates nominated by one Committee only.

(*c*) Any Committee can support one of the candidates in List B for each of the offices mentioned in (*a*) by notifying the Secretary General not later than three months before the Assembly.

(*d*) The final list of eligible candidates is sent to Member Committees not later than two months before the Assembly.

ART. 44. — If the Secretary General is not reelected, the Board of Officers is responsible for making all the necessary arrangements for the transfer of responsibilities from the outgoing to the incoming Secretary General within a period not exceeding six months after the end of the General Assembly.

ART. 45. — The President can not be elected for a second term, but the Vice-Presidents can be reelected for a second term.

ART. 46. — A vacancy which occurs in the Board of Officers can be filled by the President after consultation with the Board of Officers and the Member Committees. An Officer appointed in this way holds office until the end of the next Ordinary General Assembly; he can then be elected to the Board even if the Officer whom he replaced was not eligible for reelection.

ART. 47. — The Council can confer the title of Honorary President on not more than five former members of the Board of Officers or former Chairmen of Commissions who have made notable contributions to the achievement of the objects of the Union.

ART. 48. — The Chairmen and Vice-Chairmen of Commissions are elected by the Council on the recommendation of the respective Commissions. Each Chairman assumes his responsibilities at the end of the Assembly at which he is elected and serves until the end of the next Ordinary General Assembly. Except in unusual circumstances, the Vice-Chairman succeeds automatically as Chairman unless his Commission has been abolished.

ART. 49. — A Chairman of Commission who is also an Official Member for the same Commission must nominate another member of his Delegation to act as Official Member during a General Assembly.

ART. 50. — Each Commission may elect one French-speaking and one English-speaking Secretary from the delegates present at a General Assembly.

ART. 51. — The Chairmen of Scientific Committees are elected by the Council on the recommendation of the Board of Officers.

ART. 52. — The representatives of the Union on other international bodies are elected by the Council on the recommendation of the Board of Officers.

ORDINARY GENERAL ASSEMBLY

ART. 53. — The Union holds an Ordinary General Assembly normally at intervals of three years. At each Ordinary General Assembly there are:

(*a*) Meetings of the Council, the Coordinating Committee, and the Board of Officers,

(*b*) Business and Scientific Meetings of the Commissions,

(*c*) Plenary Meetings attended by all Delegates appointed by Member Committees and Observers,

(*d*) Meetings of Working Groups established by the Commissions.

ART. 54. — The Ordinary General Assembly is attended by

(*a*) Members of the Board of Officers,

(*b*) Chairmen and Vice-Chairmen of Commissions,

(*c*) Chairmen of scientific Committees,

(*d*) Delegations of Member Committees each of which comprises the Council Representative, Official Members of Commissions, and Ordinary Delegates,

(*e*) Honorary and Past Presidents,

(*f*) Observers invited in accordance with Arts 55 and 56.

ART. 55. — The President of the Union can invite the following persons to attend a General Assembly as Observers :

(*a*) Representatives nominated by international organisations;

(*b*) Scientists from territories that are members of the International Council of Scientific Unions but are not members of the Union, either on his own initiative or on the recommendation of the Chairman of a Commission;

(*c*) Scientists who are not members of a Delegation, with the approval of the appropriate Member Committee.

ART. 56. — The Member Committee in the territory of which an Ordinary General Assembly is to be held can invite individuals from the same territory to attend the Assembly as Observers.

ART. 57. — The date and place of the General Assembly are communicated by the Secretary General to Member Committees not less than six months before the beginning of the Assembly.

ART. 58. — The agenda for the meetings of the Council are based on the proposals submitted by the Member Committees, the Board of Officers, the Coordinating Committee, the scientific Commissions and Committees of the Union.

ART. 59. — Items for inclusion in the agenda for the meetings of the Council must be received by the Secretary General not later than four months before the beginning of the General Assembly. Items received after this date can be added to the agenda only if approval is given by at least half of the votes of those present at the meeting.

ART. 60. — The Secretary General prepares the agenda for the meetings of the Council and communicates them to Member Committees not less than three months before the beginning of the Assembly.

ART. 61. — For each Ordinary General Assembly, the Secretary General prepares

(*a*) for the Council, a detailed report on the affairs of the Union, including the accounts of income and expenditure since the previous Ordinary General Assembly, and the budgetary estimates for the three years following the Assembly;

(*b*) for all Delegates, a general report on the activities of the Union since the previous Ordinary General Assembly.

ART. 62. — The Council has full power to make decisions on any activity of the Union relating to the objects defined in Art. 1.

In particular it has the following powers and obligations :

(*a*) to review the direction of the affairs of the Union by the Board of Officers since the previous Ordinary General Assembly;

(*b*) to elect

(i) the members of the Board of Officers,

(ii) the Chairmen and Vice-Chairmen of Commissions,

(iii) the Chairmen of scientific Committees,

(iv) the representatives of the Union on other international bodies;

(*c*) to create and abolish Commissions and scientific Committees and to decide the titles and the terms of reference of these bodies;

(*d*) to consider and, if thought fit, to approve programmes of work, resolutions and recommendations submitted by the Commissions and scientific Committees of the Union;

(*e*) on the proposal of the Board of Officers, to examine and, if thought fit, to accept applications for membership of the Union;

(*f*) to decide the year and place of the next Ordinary General Assembly;
(*g*) to appoint a Finance Committee charged with
  (i) the preparation of a report on the accounts for the period since the last Ordinary General Assembly and the budget for the period until the next Ordinary General Assembly,
  (ii) the submission of recommendations concerning the finances of the Union;
(*h*) to approve the accounts and the budget, on the proposal of the Finance Committee, and to consider recommendations made by the Committee;
(*i*) to decide the unit of contribution defined in Art. 7;
(*j*) on the proposal of the Board of Officers, to approve proposed amendments to the Statutes;
(*k*) to take action on any other matter affecting the activities of the Union.

ART. 63. — Resolutions adopted by the Council and the Commissions during a General Assembly are submitted to the closing plenary meeting of all delegates and observers for information only.

ART. 64. — In the absence of any relevant provisions in the Statutes, the Council is authorised
(*a*) to make decisions on all matters relating to the activities of the Union,
(*b*) to make rules for the conduct of the work of the General Assembly.

These decisions and rules must not contain provisions contrary to the terms of the Statutes.

EXTRAORDINARY GENERAL ASSEMBLY

ART. 65. — In special circumstances and with the approval of the majority of the votes of the Member Committees, the President can convene an Extroardinary General Assembly. He must do so on receipt of a request supported by at least one third of the votes of all Member Committees.

ART. 66. — At an Extraordinary General Assembly there are meetings of the Council as defined in Art. 17, to which the President can invite members of the Board of Officers, Honorary Presidents and Chairmen of Commissions in an advisory capacity.

ART. 67. — The agenda, the date and the place of an Extraordinary General Assembly are communicated to the Member Committees by the Secretary General not less than three months before the beginning of the Assembly.

Voting Procedure

Art. 68 :

(*a*) In meetings of the Council, only the Representatives of Member Committees can vote. The number of votes allocated to each Representative is determined by the Category of his Committee in accordance with the schedule given in Art. 7.

Resolutions of the Council are adopted by a simple majority of votes, with the exception of those relating to modifications of the Statutes for which a two-thirds majority is required.

(*b*) In meetings of Commissions, each Official Member present, or voting in accordance with Art. 27, or his representative, has one vote.

(*c*) In meetings of the Board of Officers, the Coordinating Committee and Committees, each member present has one vote. A member of the Board of Officers who receives remuneration for his services to the Union has no vote.

(*d*) In meetings of the Board of Officers, the Council, the Coordinating Committee, Commissions and Committees, decisions are based on the affirmative and negative votes of those present and taking part in the vote. In the case of equal numbers of affirmative and negative votes, the Chairman of the meeting decides. Votes submitted in writing in accordance with Arts 20 and 27 are admissible only in meetings of the Council and of the Commissions.

Quorum

Art. 69. — In meetings of the Board of Officers and of the Council, half the membership constitutes a quorum. In meetings of the Coordinating Committee, half the members of the Board and the representatives of half the number of the Commissions constitute a quorum.

Art. 70. — If the members present at a meeting of the Council do not constitute a quorum, the President can convene an extraordinary meeting timed to begin not less than 24 hours later. Under these circumstances twelve members will constitute a quorum notwithstanding Art. 69.

Finances

Art. 71. — The income of the Union is derived from

(*a*) annual contributions received from Member Committees in accordance

with Art. 7,

(*b*) donations and grants made by Member Committees,

(*c*) donations and grants from other sources accepted with the consent of the Council.

ART. 72. — Funds derived from donations and grants are used in accordance with the wishes expressed by the donors. All other funds are used to meet the expenses of the Union incurred in accordance with its objects.

ART. 73. — The ordinary expenses of the Union include

(*a*) expenses relating to travel, on business of the Union, of the Officers of the Union, Chairmen and Vice-Chairmen of Commissions, and members of the Secretariat,

(*b*) the cost of editing and printing the publications of the Union,

(*c*) administrative expenses,

(*d*) other expenses authorised by the Council.

ART. 74. — In any financial year the Treasurer may authorise additional expenditure not exceeding one third of the balance in the Special Needs Fund at the end of the preceding Ordinary General Assembly. Expenditure in excess of this amount must be authorised by the Board of Officers.

ART. 75. — The financial year of the Union begins on 1 January and ends on 31 December.

MISCELLANEOUS

ART. 76. — The official languages of the Union are French and English. All administrative documents are issued in both languages.

ART. 77. — In any question relating to the interpretation of these Statutes, the French text is regarded as authoritative.

THE PLASMAPAUSE AND THE SOLAR WIND

Appleton Memorial Lecture

XVI URSI GENERAL ASSEMBLY, OTTAWA, CANADA, AUGUST 1969

BY W. I. AXFORD

University of California, San Diego

One of the most interesting features of the distribution of low energy plasma in the magnetosphere is the plasmapause. This is a rather sharply-defined boundary separating regions of high ($\sim 10^2$ - 10^4 cm^{-3}) and low

($\sim$1 - 10 cm^{-3}) plasma density, and having a doughnut-shaped cross-section which is determined by the geomagnetic field. In this talk I will review the history and describe the general features of the plasmapause, and also mention briefly a related phenomenon which had been treated theoretically in some detail but which has been observed only fleetingly, namely the polar wind.

In the late 1950's it was known, chiefly as a result of the work of the Stanford group, that the electron density in the outer magnetosphere was substantially lower than might have been expected from considerations of diffusive equilibrium [1]. The first clear indication of the existence of the plasmapause appears to have come from the Lunik plasma experiments carried out by Gringauz and his colleagues [2]. A sharp decrease in the plasma density at a certain location was noticed on two of the three flights. However, this work was scarcely known in the United States until after 1963.

In 1961 Dungey [3] published his model of an open magnetosphere and noted that one of its consequences would be "a mixing of the interplanetary plasma into the outer atmosphere, which will upset the equilibrium under gravity which would exist in the absence of such flow. The whistler data suggests that the plasma is being lost far out." At the same time Hines and I [4] were working on convective motions in the magnetosphere, (also involved in Dungey's work), and noted that in any reasonable model there would be a region of more or less co-rotational motion outside of which the convection could carry plasma right to the magnetopause. We found that the region of closed flow would have a bulge, on the afternoon side of the magnetosphere, which might or might not consist of a separate eddy depending on the form assumed for the convection pattern. At the time we identified this boundary with the low latitude edge of the auroral zone (i.e. the inner edge of the plasma sheet in modern terms).

Carpenter discovered the plasmapause independently from data accumulated between 1957 and 1961 [5]. His work was first published as a Stanford Electronics Laboratory report which was, in effect, his Ph. D. thesis. In the thesis Carpenter specifically identified the inner boundary of convection with the plasmapause, and suggested that heating of the outer magnetosphere during magnetic storms might produce the observed density discontinuity. (This last point is somewhat reminiscent of Cole's point of view [6].) Hines and I could see no objection to this suggestion, but were concerned about the fact that the plasmapause is sometimes seen at $L = 2.5$, which is too close for the inner edge of the auroral zone. The resolution of this difficulty was due to Kennel and Peschek, who, in a paper given at the AGU meeting in 1966, showed that it is possible to

have an inner boundary to the electron flux which does not necessarily correspond to the inner boundary of convection. This work is described in an abstract and also in a recent review by Kennel [7]. In effect it tells us why there should be a gap between the inner edge of the plasma sheet and the plasmapause.

If one puts all these ideas together, substituting Dungey's loss process for Carpenter's heating mechanism, one obtains what is essentially the present view of the plasmapause. It became clear that Carpenter's suggestion was correct when he discovered the afternoon bulge in the plasmapause and the inverse correlation between its size and geomagnetic activity [8]. Brice and Nishida put all these ideas together in their papers published in 1966-67 [9]. These papers contained a number of perceptive comments, and Brice in particular made the point that the shape of the plasmapause tells us something about the nature of the time constant for filling up geomagnetic flux tubes.

Nishida discussed the loss of plasma along open field lines, and suggested that an evaporative mechanism, similar to that which causes the loss of atomic hydrogen from the Earth's upper atmosphere, might be involved. Bauer and Dessler and Michel made the same suggestion in different contexts [10]. In fact something more than the traditional evaporation is involved as pointed out later by Banks, Holzer and myself in our work on the polar wind [11]. (By evaporation I mean a process which depends on the details of the particle distribution function, with escape being due to a final collision at the base of the ionosphere which gives a particle sufficient energy to cause it to be ejected from the Earth's gravitational field [12].) The polar wind involves bulk properties of the medium rather than details of the distribution function; these properties include the electric fields, partial pressure gradients, and so on. Note that the polar wind also operates on closed field lines, and serves to replenish flux tubes which have become evacuated whenever the convection system recedes from the plasmapause. Since the replenishment time is quite long it is evident that one can expect to see evidence of more than one plasmapause at a time, and this seems to be the case.

The tendency for the plasmapause bulge to become unlocked and to co-rotate with the magnetosphere was, I believe, first specifically predicted by Brice. The observations which confirm this prediction have been described at several meetings by Carpenter, but have only recently been submitted for publication [13]. Carpenter has also described, in conversation, occasions on which dense regions of plasma could be detected beyond the plasmapause, apparently corresponding to the debris from a

shrinking plasma sphere being carried out towards the magnetopause. Presumably it is on these occasions that Freeman has made observations of relatively dense cold plasma moving at high speed towards the front of the magnetosphere [14]. Freeman appears to have found that the plasma is unusually cold in these circumstances, but this would not be surprising in view of the large expansion which would have taken place if the plasma which is observed at $L = 6.6$, in fact originated at say $L = 3$.

If the plasmapause is produced in the manner described above, then there are clearly a number of other effects which one might expect to be associated with it. There is some evidence that the inner edge of newly injected ring current particles is roughly coincident with the plasmapause, although there has been no systematic investigation of this point. An association between the F-region troughs and the region just outside the plasmapause seems to have been established [15]. Note though that Gringauz and Bezrukikh [16] were, for some time at least, of the opinion that the plasmapause was absent at low altitudes. The association between the plasmapause and middle latitude red auroral arcs has been discussed for some time, but it is not clear where the suggestion that there is such an association first appeared in literature. Something of this nature is probably implicit in Cole's work on the ring current and red arcs, but the only explicit reference I can find at present is in my own review of convection. Bowman [17] and Burnell and Rycroft have presented observational results which appear to confirm that such an association exists [18]. It seems that the red arc should be associated with the plasmapause itself, rather than the region outside, in which case the observation by Schield and Frank of an isolated spike of soft electrons at the position of the plamapause is of some interest [19].

As far as the polar wind is concerned, the only direct observations that have been made to date are limited [20] and cannot be said to have demonstrated that a high speed outflow of plasma from the polar ionospheres is a generally occurring phenomenon. The existence of the plasmapause and the peculiar nature of the topside ionosphere at high geomagnetic latitudes can at best be considered as only indirect evidence that there is a polar wind. The problem is an important one from the point of view not only of magnetospheric physics, but also of geochemistry, since the terrestrial helium budget appears to be governed by the loss of helium ions into space via the polar wind. It is to be hoped that this challenge to experimentalists will be taken up as soon as possible.

REFERENCES

1. R. A. HELLIWELL. — Exospheric electron density variations deduced from whistler data. *Ann. Geophys.*, **17**, 76, 1961.
   D. L. CARPENTER. — New experimental evidence of the effect of magnetic storms on the magnetosphere. *J. Geophys. Res.*, **67**, 135, 1962.
   R. L. SMITH. — Properties of the outer ionosphere deduced from nose whistlers. *J. Geophys. Res.*, **66**, 3709, 1961.
2. GRINGAUZ, K. I., V. V. BEZRUKIKH, V. D. OZEROV and R. Ye. RYPCHINSKY. — A study of interplanetary ionized gas, energetic electrons, and corpuscular solar emission, using three electrode charged-particle traps set up on the second Soviet cosmic rocket Luna II. *Dokl Akad Nauk USSR*, **131**, 1301, 1960 (English translation : *Soviet Phys. Doklady*, **5**, 361, 1960.
   GRINGAUZ, K. I., B. G. KURT, V. I. MOROZ and I. S. SHKLOVSKY. — Results of observations of charged particles observed up to 100,000 km with the aid of charged particle traps on Soviet space probes, *Astron. Zhur.*, **37**, 716, 1960 (English translation : *Soviet Astron. AJ*, **4**, 680, 1961).
   GRINGAUZ, K. I. — Some results of experiments carried out by means of charged particle collectors carried by Soviet space rockets, *Space Research*, **2**, 539, 1961.
   BEZRUKIKH, V. V. and K. I. GRINGAUZ. — The outer region of the earth's ionosphere (from 2,000 to 200,000 km), Transactions of the all union conference on space physics held in Moscow, June 10-16, 1965 (*Space Research*, edited by G. A. SKURIDIN *et al.*, NASA Technical Translation TTF-389, May, 1966).

   For a complete list of Russian papers see Gringauz, K. I., Low energy plasma in the earth's magnetosphere, *Rev. Geophys.*, **7**, 339, 1969.
3. DUNGEY, J. W. — Interplanetary magnetic field and the auroral zones, *Phys. Rev. Letters*, **6**, 47, 1961.
4. AXFORD, W. I. and C. O. HINES. — A unifying theory of high latitude geophysical phenomena and geomagnetic storms, *Can. J. Phys.*, **39**, 1433, 1961.
   Additional references can be found in Axford, W. I., Magnetospheric convection, *Rev. Geophys.*, **7**, 421, 1969.
5. CARPENTER, D. L. — The magnetosphere during magnetic storms; a whistler analysis, Stanford Electronics Laboratories Technical Report, 12, SEL-62-059, June, 1962.
6. COLE, K. D. — Stable red arcs : sinks for energy of D_{st} main phase. *J. Geophys. Res.*, **70**, 1689, 1965.
   COLE, K. D. — Paper submitted to *J. Geophys. Res.*, 1969.
7. PETSCHEK, H. E. and C. F. KENNEL. — Tail flow, auroral precipitation and ring currents. *Trans. Am. Geophys. Union*, **47**, 137, 1966.
   KENNEL, C. F. — Consequences of a magnetospheric plasma, *Rev. Geophys.*, **7**, 379, 1969.
8. CARPENTER, D. L. — Whistler studies of the plasmapause in the magnetosphere, 1. Temporal variations in the position of the knee and some evidence on plasma motions near the knee. *J. Geophys. Res.*, **71**, 693, 1966.
9. NISHIDA, A. — Formation of a plasma-pause, or magnetospheric plasma knee, by combined action of magnetospheric convection and plasma escape from the tail. *J. Geophys. Res.*, **71**, 5669, 1966.
   BRICE, N. — Bulk motion of the magnetosphere. *J. Geophys. Res.*, **72**, 5193, 1967.
10. BAUER, S. J. — The structure of the topside ionosphere, in Electron density profiles in the ionosphere and exosphere. J. Frihagen, ed., 270 North Holland Publishing Company, 1966.
    DESSLER, A. J. and F. C. MICHEL. — Plasma in the geomagnetic tail. *J. Geophys. Res.*, **71**, 1421, 1966.
11. AXFORD, W. I. — The polar wind and the terrestrial helium budget. *J. Geophys. Res.*, **73**, 7855, 1968.
    BANKS, P. M. and T. E. HOLZER. — The polar wind. *J. Geophys. Res.*, **73**, 6846, 1968.
    BANKS, P. M. and T. E. HOLZER. — Reply to Discussion of letter by Peter M. Banks and Thomas E. Holzer, The Polar Wind by A. J. Dessler and P. A. Cloutier, *J. Geophys. Res.*, **74**, 3734. 1969.

BANKS, P. M. and HOLZER, T. E. — Features of plasma transport in the upper atmosphere. *J. Geophys. Res.*, **74** : 6304, 1969.
BANKS, P. M. and HOLZER, T. E. — High latitude plasma transport : the polar wind. *J. Geophys. Res.*, **74**, 6317, 1969.
12. MACDONALD, G. J. F. — The escape of helium from the earth's atmosphere. *Rev. Geophys.*, **1**, 305, 1963.
LIWSHITZ, M. and S. F. SINGER. — Thermal escape of neutral hydrogen and its distribution in the earth's thermosphere. *Planetary Space Sci.*, **14**, 541, 1966.
HAYS, P. B. and B. C. LIU. — On the loss of gases from a planetary atmosphere. *Planetary Space Sci.*, **13**, 1185, 1965.
13. CARPENTER, D. L. — Whistler evidence on the dynamic behavior of the dusk bulge in the plasmasphere. *J. Geophys. Res.*, in press.
14. FREEMAN, J. W. — Observation of flow of low-energy ions at synchronous altitude and implications for magnetospheric convection. *J. Geophys. Res.*, **73**, 4151, 1968.
FREEMAN, J. W. and J. J. MAGUIRE. — Gross local-time particle asymmetrics at the synchronous orbit altitude. *J. Geophys. Res.*, **72**, 5257, 1967.
15. RYCROFT, M. J. and J. O. THOMAS. — Imperial College (London), preprint, 1967.
16. BEZRUKIKH, V. V. — Results of measurements of charged particle density on board Electron-2 and Electron-4 within the earth's plasma sheath, submitted to *Kosmich. Issled.*, 1968.
17. BOWMAN, G. G. — Ionization troughs below the F2-layer maximum. *Planetary Space Sci.*, **17**, 777, 1969.
18. BURNELL, J. and M. J. RYCROFT. — On the positions of the mid-latitude ionospheric trough and the plasmapause. *Trans. AGU*, **50**, 648, 1969.
19. SCHIELD, M. and L. A. FRANK. — Electron observations between the inner edge of the plasma sheet and the plasmasphere. *J. Geophys. Res.*, in press, 1970.
20. HOFFMAN, J. H. — Ion composition measurements in the polar region from the Explorer 31 satellite. *Trans. Am. Geophys. Union*, **49**, 253, 1968.

ABSOLUTE CALIBRATION OF SOLAR FLUX DENSITY

Report of Working Group of URSI Commission V

by H. TANAKA (*Convenor*)

At the XVI General Assembly of URSI, Ottawa 1969, Tanaka reported the result of the study which had been made by the Working Group since its start in 1966 (Joint Session of Commissions I/V/VIII on NoiseMeasurement). Before and after this session, the members of the Working Group assembled a number of times and visited Goth Hill where Covington has been making his calibration experiments. After many active discussions, they reached the conclusion that the Working Group be continued until a more definite result had been obtained. This conclusion was accepted by Commission V as Recommendation V.1 (*URSI Inf. Bull.* No 172, p. 80).

At the end of the year 1969, however, the situation has become almost satisfactory, because a further study made at Ottawa has removed much of the discrepancy between Ottawa and Toyokawa which was still significant

at the time of the General Assembly. The latest values of the correction factors which are believed to be most probable are shown in Table 1. The values in this table are slightly different from those in the Preliminary Report (*URSI Inf. Bull.* No 169, p. 30); for Toyokawa 3,750 and 1,000 MHz, the change is due to some further studies, and for HHI 1,500 MHz, the change since April 1968 is simply due to the fact that the possible correction factor has already been applied to the published values. The factor 0.92 for Ottawa 2,800 MHz is the same as that in the Preliminary Report, but 0.95 was believed to be most probable at the time of the Ottawa Assembly.

It has been found that if the correction factors listed in Table 1 are applied to the median values of the monthly mean values for the period between epochs 1967.5 and 1968.5, all the corrected values lie on a smooth spectral curve with a maximum deviation of $\pm$ 1.5 %.

On the occasion of the Ottawa Assembly, the membership of the Working Group was partly revised as follows :
Castelli, J. P., Sagamore Hill, USA;
Covington, A. E., Ottawa, Canada;
Croom, D. L., Slough, England (new member);
Daene, H., HHI, Berlin, East Germany;
Fokker, A. D., Utrecht, Netherlands;
Hagen, J. P., Pennsylvania, USA (new member);
Moltshanov, A. P., Leningrad, USSR;
Mullaly, R. F., Sydney, Australia (after Landecker, T. L.)
Tanaka, H., Toyokawa, Japan (Convenor);
Tlamicha, A., Ondrejov, Czechoslovakia.

The coordination of the future experiments was also decided at Ottawa. Castelli will make a new experiment at 4,995 MHz which will fill the gap in the frequency spectrum; Covington will change one of his standard horns into a conventional pyramidal horn; Croom will make the absolute calibration on a short centimetre wavelength; Daene will build a new horn at 3,000 MHz; and Hagen will make an additional experiment at 2,700 MHz. It is expected that these experiments will further confirm or improve the correction factors in Table 1, and that it will be possible for all the revised yearly values to be connected smoothly with a maximum deviation of $\pm$ 1.5 %.

15 December 1969. H. Tanaka, *Convenor.*

TABLE 1. The most probable correction factors for the selected series of single-frequency solar observations.

Station	Freq. (MHz)	Corr. Fact.	Period	Remarks
Toyokawa	9,400[a]	0.08	1956-	[b]
HHI	9,400[a]	0.77 1.00 1.11	1957-59 Oct. 1961-63 1966-	Gradual change for 1960-61 Gradual change for 1964-65 Latest experiment shows 1.08
SAG/AFCRL	8,800	0.90 0.93	1966-Jan. 1968 Feb. 1968-	
Kislodovsk	6,100	1.16 1.00	1964-67 Sep. 1968-	
Toyokawa	3,750[a]	0.94	1951-	
Ottawa	2,800[a]	0.92	1947-	For 'Series C'
Penticton	2,700[a]	0.92	1964-	
Toyokawa	2,000[a]	1.05	1957-	[b]
HHI	1,500[a]	0.82 1.00	1965-Mar. 1968 Apr. 1968-	
Sydney	1,420[a]	1.03	May 1968-	
Toyokawa	1,000[a]	1.16	1957-	
SAG/AFCRL	606[a]	0.91	1966-	
Prague	536	1.06 1.00	Jun. 1966-Aug. 67 Nov. 1968	

[a] For these series, absolute calibration is possible.
[b] After corrections in *Proc. Res. Inst. Atmospherics*, Nagoya Univ., **11**, 41 (1964).

INTENSITÉS DE CHAMPS ET GAINS D'ANTENNE

ECHELLE DE TEMPS ATOMIQUE

Le Directeur du Bureau International des Poids et Mesures a fait parvenir au Secrétariat de l'Union les remarques suivantes au sujet des résolutions de la Commission I de l'URSI qui ont été portées à son attention.

" La Résolution I.1 sur la mesure des intensités de champ et des gains d'antenne est tout à fait en accord avec notre programme de travail.

" La Recommandation I.4, ainsi que des demandes provenant d'autres laboratoires ou organismes internationaux, fut examinée d'une façon favorable par le Comité International. J'estime que dans un avenir assez proche le Comité International des Poids et Mesures et son Comité Consultatif pour la Définition de la Seconde prendront une part de plus en plus importantes pour ce qui concerne la définition et la mise en œuvre d'une échelle de temps internationale. D'autre part, malgré des difficultés financières évidentes, j'ai bon espoir qu'une solution sera trouvée, afin que le Bureau International de l'Heure et le Bureau International des Poids et Mesures, selon des arrangements qui restent à trouver et à faire adopter, puissent satisfaire d'une façon adéquate les besoins internationaux d'une échelle physique de temps, qui soit acceptée par tous les pays. "

ELECTROMAGNETIC WAVES :

NOMENCLATURE OF FREQUENCY BANDS

In recent years, interest in electromagnetic radiation at frequencies below 3 kHz has grown considerably in connection with, for example, studies of the radiations generated in the magnetosphere and of the Schumann resonances. The frequency range in question extends down to frequencies having periods of several hundred seconds which are sometimes referred to as "quasi-d.c.".

In both verbal and written discussions of the phenomena which occur at these very low frequencies, it is frequently desirable to refer concisely to a broad frequency band without specifying the frequencies precisely. However, no generally accepted nomenclature exists at present and it was for this reason that the XVI General Assembly of URSI (1969) proposed the formation of a Working Group to recommend a nomenclature appropriate to the needs of radio science.

It has been pointed out that the International Telecommunication Union (CCIR, 1967) already has an approved nomenclature for frequencies above 3 kHz and that this system could easily be extended downwards. According to the ITU system, the band of frequencies between 0.3×10^N and 3.0×10^N Hz is known as Band N. Thus, for example, most of the

long-distance short-wave radio communication networks operate in Band 7 (3-30 MHz or 0.3×10^7 - 3.0×10^7 Hz).

The extension of this system down to very low frequencies is shown in Table 1 in which the ranges of frequency and, where appropriate, the periods are specified. It is important to note that the frequency Bands in Table 1 correspond quite well to the main physical phenomena. However these phenomena themselves may be defined or classified or described in some other way. Micropulsations have been classified by IAGA as shown in Table 2 (Jacobs et al, 1964). The subdivisions of Pi2 are due to Troitskaya et al. (1969).

TABLE 1. Nomenclature of Frequency Bands below 3 kHz.

Band No.	Freq. (Hz)	Period (sec)	Principal Phenomena
3	3,000-300		Whistlers
2	300-30		
1	30-3	0.033-0.33	Principal modes of Schumann resonances
0	3-0.3	0.33-3.3	Waves guided by Earth's magnetic field. Pearls Pcl
—1	0.3-0.03	3.33-33.3	Transition band Micropulsations Pc2, Pc3, Pil
—2	0.03-0.003	33.3-333	Oscillations involving the magnetospheric cavity Micropulsations Pc4, Pc5, Pi2

TABLE 2. Classification of Micropulsations

Type of Pulsation	Period (sec)
Regular oscillations	
Pcl	0.2-5
Pc2	5-10
Pc3	10-50
Pc4	50-150
Pc5	150-600
Irregular oscillations	
Pil	1-40
Pi2	40-150
Ptl	20-60
Pt2	60-100
Pt3	100-150
Pt4	$>$ 150

REFERENCES

CCIR. — Documents of the XI Plenary Assembly, Oslo 1966, Vol. 1, p. 295, 1967.
JACOBS *et al.* — *J. Geophys. Res.*, **69**, 180, 1964.
TROITSKAYA, V. A. *et al.* — *Annals of the IQSY*, Vol. 5, p. 439, 1969.
URSI. — *URSI Information Bulletin*, No. 172, p. 45 (french), p. 84 (english), (Rec. VIII.2), 1969.

NOTE BY SECRETARY GENERAL

The above document has been sent to the Official Members of URSI Commissions VIII and IV and also to IUGG and IAGA for their comments on the suggested nomenclature.

The opinions of others interested in research in the lowest frequency bands will be welcome and should be sent to Secretary General, URSI, Place Emile Danco 7, 1180, Brussels, Belgium.

It would be appreciated if replies could be received before 31 May 1970 after which date it is intended to review the views that have been expressed.

URSI-STP COMMITTEE

DOC. URSI-STP (3)

Minutes of Second Meeting : August 1969

The second meeting of the URSI-STP Committee was held during the XVI General Assembly of URSI in Ottawa, in three sessions on 18, 20, and 28 August 1969. The following members of the Committee and its Working Groups were present :

Prof. W. J. G. Beynon (*Chairman*);
Prof. H. G. Booker;
Prof. S. A. Bowhill
Mr. G. M. Brown *(Secretary)*
Prof. J. W. Dungey
Prof. R. A. Helliwell
Prof. C. O. Hines
Prof. A. Kimpara
Dr. J. W. King
Dr. Ya. I. Likhter

Dr. W. Pfister
Mr. W. R. Piggott
Prof. K. Rawer
Prof. R. Rivault
Mr. A. H. Shapley
Dr. A. Spizzichino
Dr. K. Sprenger
Dr. J. D. Whitehead.

and the following attended by invitation :

Dr. B. Beckmann
Dr. J. S. Belrose
Dr. K. Bibl
Dr. L. Bossy
Dr. I. A. Bourne
Dr. D. L. Carpenter
Dr. F. du Castel
Dr. J. H. Craven
Dr. C. G. McCue
Dr. H. Deane
Father E. Galdon
Prof. J. A. Gledhill
Mr. J. W. Herbstreit
Dr. M. Karabin
Dr. P. Kaufmann
Dr. G. A. M. King
Miss J. V. Lincoln
Dr. H. G. Möller
Dr. T. Muth
Dr. J. K. Olesen
Dr. L. Petrie
Dr. G. M. Pillet
Dr. K. R. Ramanathan
Dr. E. Scalise
Dr. C. F. Sechrist
Dr. J. Taubenheim.

1. — IUCSTP Projects

Outline reports were presented on the activities of IUCSTP Working Groups associated with the following projects of interest to URSI: Project 1 (Monitoring of solar-terrestrial phenomena), Project 4 (Characteristics of the magnetosphere), Project 5 (Conjugate point experiments), Project 6 (Electric fields in the magnetosphere), Project 10 (Dynamics of the upper atmosphere), Project 11 (ion chemistry of the D and E regions), Project 12 (Sudden ionospheric disturbances).

In connection with Project 10 it was noted that, although the IUCSTP Working Group was concerned with the general subject of drifts, it was not giving direct consideration to the question of the *interpretation* of radio observations, since this falls within the terms of reference of the URSI-STP Working Group on Ionospheric Drifts.

It was pointed out that the subject of Project 11 was one which had never been investigated previously in any organized way. Full reports on the activities of the Working Group, together with numerous detailed recommendations, have been published in *STP Notes* Nos 4 and 5.

Arrangements are now well in hand under Project 12 for the acquisition of satellite X-ray data, necessary for the fulfilment of this programme. A time resolution of 6 sec. has been specified for ionospheric measurements in order to cope with the fast rise-times of some SIDs. Well over 200 workers are now participating in the SID project.

The Committee was asked to express its views on a proposal that a 13th IUCSTP Working Group be established, devoted to the Polar Ionosphere. After discussion it was concluded that there did not appear to be a strong case for establishing such a group, since it would overlap the projects concerned with the magnetosphere, and since separation of the polar aspects of magnetospheric studies would be undesirable. It was felt that the topic could be handled within the existing Working Groups of IUCSTP, and consequently the Committee was *not* in favour of the proposal.

On a general issue it was agreed that there was a need to inform people who are new to the field what can be achieved by relatively simple experiments. All workers cannot be involved in the big programmes, and it is necessary to stress the value of intensive simple-type measurements which serve to back up the detailed experiments now being efficiently organized by IUCSTP.

2. — CCIR Matters

Follow-up papers have been prepared to supplement the original URSI responses to CCIR questions, and appreciation of the consideration given by URSI to these matters has been expressed by CCIR. The Committee wishes to place on record its thanks to all those concerned, with particular reference to the services of Mr. W. R. Piggott. It was agreed that the Working Groups established to consider the CCIR questions at the last Assembly should now be dissolved.

Since the CCIR and URSI Assemblies are now out of phase, it was agreed that any questions which arise at the next CCIR Assembly should be referred by Dr. Minnis to the Chairman of the relevant URSI Commission.

3. — Working Group on Ionosphere

3.1. — Ionosonde Network.

The Chairman summarized the developments that had led to the meeting of those responsible for the operation of vertical sounding stations which had been held, under the auspices of the URSI-STP Committee, in London in January 1969 during the First General Meeting of IUCSTP. A detailed report on this meeting, which covered representatives from about 70 ionosonde stations, together with other supporting material, has been prepared by Mr. A. H. Shapley and Mr. W. R. Piggott and is being distributed to all stations through WDC-A. The first part of this report, covering the London meeting, is published as Appendix I to these Minutes.

After a full discussion of the various problems associated with the ionospheric vertical incidence soundings network, it was appreciated that these were of such a magnitude that it was becoming increasingly difficult for them to be dealt with by the Vertical Incidence Consultant, Mr. Piggott, alone. It was agreed to establish a small group known as the Ionospheric Network Advisory Group (INAG), under the Chairmanship of Mr. Piggott, to give advice to stations and administrations. The final membership of this Group was to be agreed by the Chairman; details are given in *URSI Information Bulletin* No 173, p. 32, 1969. The Group would constitute an authoritative body to which stations could address their problems, and to which administrations should refer when questions arise concerning the continuance or closure of stations, and the deployment or redeployment of equipment and personnel. It was also felt very desirable that the Group establish a direct contact with stations through the circulation of a Station Information Bulletin which might be distributed through the mechanism already in operation for the flow of data from stations to WDCs. In this way, relevant material from such publications as the *URSI Information Bulletin*, *STP Notes* and *IAGA News*, together with other communications from the Advisory Group, could reach the stations more speedily and effectively than when transmitted via the Member Committees of URSI.

It was agreed to refer the question of the revision of the "accuracy rules" in ionogram scalings (mentioned in Section 2 (c) of Appendix I) to the INAG. A majority of stations is opposed to a change unless it is deemed very necessary.

Workers who have comments on the proposed spread-F parameter (Rec. 12 in Section 3.3, Appendix I) are invited to submit them directly

to Mr. W. R. Piggott. It was agreed that there were dangers and serious inaccuracies in using ionosondes to monitor ionospheric absorption (Rec. 15), but in view of the absence of any abosrption network at the present time, carefully controlled data have a distinct value.

The need for personal visits to ionosonde stations of experts capable of giving advice, checking scaling procedures etc. was again emphasised. It was learned that the Australian network of 13 stations now employed a full-time member of staff to circulate in this way. In order to help organizations with a small number of stations, UNESCO has agreed to finance two tours of an expert, each to cover the stations in an area of continental size. It was agreed that this offer should be accepted, and that the Chairman should make the neccessary arrangements with UNESCO through Dr. Fournier d'Albe.

The question of a follow-up meeting to the London meeting was discussed. A suggestion that there should be regular meetings of station administrators, at 18-month intervals to discuss the scientific needs regarding operation and location, was regarded as unrealistic. While the London meeting had proved very useful, it was doubtful whether regular meetings of this sort would be supported so well. It was finally agreed that the Chairman would seek the opinion of network operators on the need for another meeting.

3.2. — International Reference Ionosphere.

Prof. Rawer presented a progress report, outlining the problems being tackled. Separate coordinators have been designated according to techniques and/or topics (eg. incoherent scatter, probes, ion composition, etc.). Following a long discussion in Ottawa, it had been agreed to adopt estimates of electron temperatures from incoherent scatter measurements rather than from probe measurements. The main group concerned with the IRI would meet again in Leningrad in May 1970, ant it was thought that a Commission III symposium on the topic might ultimately be proposed.

3.3. — Absorption.

It was agreed that Dr. J. Taubenheim schould be appointed URSI-STP Consultant on Absorption methods A1, A2 and A3, in succession to Prof. Rawer and Dr. Reid, and that he should also become a member of the Working Group on Ionosphere.

A proposal that a further Working Group be established on "D-region Synoptic Monitoring" was discussed. Since the absorption network has

decreased rather than increased, there is a need for new simple absorption measurements by those concerned with propagation problems. Moreover, method A1 does not really provide the right kind of data for aeronomists. It was felt that those involved in the compilation of the IRI would have to assess the value of the different methods available for D-region monitoring, and that therefore it might be best to await the results before deciding on the need for a Working Group. The Chairman agreed to discuss the matter with the Absorption Consultant and make a decision.

3.4. — Publications.

Progress on the *Absorption Manual* continues, but a few papers are still outstanding. It will cover all the methods, A1, A2, A3 and A4, and it was also proposed to include a note on a new technique whereby absorption measurements can be made by comparing records of ordinary and extraordinary signal-strength from satellites.

The manuscript for the revised *Atlas of Ionograms* is complete, but a certain amount of editing remains to be done. It is hoped to publish it within a few months.

A meeting was to be arranged to discuss the preparation of a new edition of the *URSI Handbook of Ionogram Interpretation and Reduction* (Piggott and Rawer) which is now out of print. It was possible that this would be published by WDC-A.

4. — Working Group on Ionospheric Drifts

The Working Group has engaged in considerable exchange of correspondence relating both to methods of reduction and to routine operation of stations. A great deal of work has been carried out by a variety of workers on the comparison of analysis methods for the D1 (spaced antenna) technique. Whereas it was generally thought a few years ago that the "full correlation" analysis war far superior to the "similar fade" method, it is clear that this is no longer the position. The effects of antenna spacing are now recognized to be of importance. With the use of phase measurements together with amplitude measurements, there is some suggestion that the effects of travelling disturbances can be separated from the neutral atmosphere movements.

The collection of drift data on a routine basis is now very limited throughout most of the world. Workers appear to be more interested in carrying

out specific experiments designed to establish the physical significance of the data and the parameters derived from them.

It was agreed that it would be very desirable for the Working Group on Drifts to hold a meeting at the time of the COSPAR and IUCSTP meetings in Leningrad in May 1970, if a sufficient number of members is present. This would provide a valuable opportunity for an exchange of views with the USSR workers in drifts, a branch of research into which considerable effort is being put in the USSR.

5. — Working Group on Synoptic Whistlers

It was reported that the originally constituted group had not met since the URSI General Assembly in Tokyo, although in practice there are informal groups operating in most monitoring programmes. It was agreed that there is a need for a group to monitor whistler work, but that consideration should be given to a revised membership with a smaller number of active participants. The initial membership of this new Working Group is given in Appendix II; others will be added as interest is expressed. The following topics are suggested for the Working Group programme :

(*a*) Study of the feasibility of worldwide monitoring of the location of the plasmapause;
(*b*) Spaced-station studies of magnetospheric convection and of electron density;
(*c*) Determination of preferred locations and schedules for monitoring magnetospheric electron density;
(*d*) Development of methods of data reduction and exchange.

6. — Working Group on Radio Science Data Centres

All four WDCs have contributed to the Guide for Data Exchange. Following a recommendation at the previous URSI-STP Committee meeting, the SID Data Centre in the UK will shortly be moved to Slough where the Ionosphere Data Centre is situated. It is understood that the SID and Ionosphere Data Centres are also now together in the USSR; these Centres have always been collocated in the USA.

7. — Working Group on Digital Data Pre-processing

Two meetings of this Working Group were held in Ottawa, at which it was agreed that digital data pre-processing had many advantages relating to the saving of man-power, the provision of real-time data, storage and compression of data, remote control and operation, and accuracy and reliability of data. In view of the large quantities of data involved, digitization in a very early stage of the evaluation is required in at least the following areas of research : absorption, drifts and winds, phase measurements.

The Committee endorsed the following Recommendation of the Working Group :

Considering the rapidly increasing needs and capabilities for digital data recording,

it is recommended that

(i) A permanent Working Group be maintained to give guidance to users of new methods and to help make exchange and mutual use of digital data possible;
(ii) Digital data be recorded in the form of records with standard record gaps;
(iii) Every record should be preceded by a preface (identifier) which if possible should contain : year, day (month), time and programme.

The initial membership of the new Working Group is given in Appendix II.

8. — Matters referred from Commission III

In considering ionospheric work to be undertaken in the pediod between General Assemblies, Commission III had proposed that the URSI-STP Committee consider the following actions :

(*a*) Appoint a Consultant for Incoherent Scatter Studies;
(*b*) Appoint a Consultant on Problems Related to Sporadic-E Ionization;
(*c*) Include the relevant URSI-STP Consultant in the Commission III steering committees which will organize Symposia on the following proposed topics
(i) Incoherent scatter studies of the ionosphere;
(ii) Physics of the dynamo region (1);

(1) The title of this symposium has since been changed to Physics of the E Region with Particular Emphasis on Sporadic E.

(iii) Measurements of movements of ionized and neutral parts of the atmosphere above 120 km.

After discussion, (*a*) and (*c*) were agreed. M. Petit was appointed Consultant for Incoherent Scatter Studies, and a member of the Working Group on Ionosphere. There was some divergence of opinion concerning the need for (*b*), and it was left as a matter of discussion between the Chairman of the Committee and the Chairman of Commission III.

Geoffrey M. Brown,
Secretary, URSI-STP Committee

28 January 1970.

APPENDIX I

Summary of Meeting on the Vertical Incidence Soundings Network convened by the URSI-STP Committee, 30 January 1969

compiled by W. R. PIGGOTT and A. H. SHAPLEY

1. — INTRODUCTION

A special meeting on problems connected with the ionospheric vertical soundings network was held on 30 January, 1969 at the Royal Society, London, during the First General Meeting of the Inter-Union Commission on Solar-Terrestrial Physics. The meeting was called by the URSI-STP Committee Chairman, Professor W. J. G. Beynon, in consequence of discussions and resolutions of the URSI-STP Committee at its meeting at Brussels, September 1968 (see *URSI Information Bulletin* No 169, pp. 48-59, particularly p. 51).

The attendance was : W. J. G. Beynon (UK), Chairman; G. M. Brown (UK), Secretary; W. R. Piggott, J. W. King (UK); J. Turner, Z. R. Jeffrey (Australia); K. Rawer, W. Dieminger, B. Beckmann (GFR); N. V. Pushkov, V. V. Migulin (USSR); A. H. Shapley, J. W. Wright, K. Bibl, S. A. Bowhill, T. N. Douthit, C. F. Power, N. Brice, H. Carlson (USA); L. E. Petrie, (Canada); J. K. Olesen (Denmark); V. Padula-Pintos, O. Schneider (Argentina); G. M. Pillet (France); P. Triska (Czechoslovakia); J. Taubenheim

(GDR); C. M. Minnis (URSI). In addition, written comments especially for this meeting were available from : R. Lindquist, W. Stoffregen (Sweden); R. G. Rastogi (India); A. A. Giesecke (Peru); R. Halley (France).

Much preparatory work was done in the days immediately preceding the meeting by a sub-group of IUCSTP Working Group 1 on Monitoring of Solar-Terrestrial Phenomena. This sub-Group under W. R. Piggott held five half-day meetings. It discussed general problems as weel as many matters of details which could not be treated at the meeting. The meeting used the work and conclusions of the IUCSTP WG1 sub-group as the point of departure.

The following section covers the general results of the meeting and the recommendations which represent the consensus of the discussions. The more detailed points covered in the preliminary meetings are treated in Section 3, under the responsibility of the URSI-STP Vertical Soundings Consultant, W. R. Piggott, and IUCSTP Working Group 1.

2. — Discussion

Professor Beynon summarized the objective of the meeting as given by the URSI-STP Committee's Brussels meeting : "...a meeting of those responsible for the operation of vertical sounding stations to discuss the whole problem of an optimum network, morale and general maintenance of standards at the stations. The distribution of stations would have to be examined in relation to the IUCSTP programmes". He referred to the preparatory document prepared by the Vertical Soundings Consultant, W. R. Piggott, which had received wide circulation and had been available in advance of the meeting.

Mr. Piggott summarized the conclusions of the preceding sub-group meetings, which discussed the question of the size of the network in great detail. The consensus was that a network of roughly the present size will be required at least for the period of the IASY and that stations already operating ought to be maintained for this period. This was consistent with the views collected in the preparatory enquiries made by the V.I. Consultant. The sub-group remarked on several kinds of emphasis which ought to be placed at various kinds of stations. However the performance of the network ought to be improved by internationally stimulated actions such as visits by experts, by "feed-back" to stations on research and other use of their data, or by other encouragement and guidance. He observed that there

was an anomaly in that the use of vertical soundings data had steeply increased in the last few years while the size of the networks and overall quality had decreased. The sub-group recommended that URSI should not make negative recommendations but rather take a series of constructive yet realistic steps.

Professor Bowhill reported on a sample poll, taken in his IUCSTP Working Group 11 of scientists who actively use ionograms, on the level of vertical soundings activity which is desirable in connection with the ion chemistry of D and E layers. The results were three votes for maintenance at least at present level; no votes for a reduction of not more than 10 % below the present level; six votes for a network of 30-40 "key" stations with carefully chosen locations and upgraded capabilities.

Dr. King said the consensus in his IUCSTP Working Group 12 (Sudden Ionospheric Disturbances) was that the network size was satisfactory as long as particular attention was paid to rocket-launching sites. He saw no real problem except that the quality must be improved.

It was reported that IUCSTP Working Group 5 (Conjugate Point Experiments) had adopted a resolution endorsing the need both for vertical soundings at conjugate pairs of stations and for the network as a whole to deal with problems of non-conjugacy.

Professor Rawer pointed out that the network was becoming more important as a support to other ground-based and space work as compared with its earlier role in "primary science". Professor Bowhill called attention to URSI-STP Resolution 5 (Brussels 1968), which inter alia recommended the need for the network to be flexible so as to meet changing needs. Professor Dieminger and other stressed the need for more high-accuracy stations, and Dr. Bibl felt that the present number of stations should be maintained. Professor Rawer described a hypothetical realistically-distributed 30-station network and said that those concerned with geophysical studies would not be satisfied with such a network. Mr. Wright pointed out that most stations (e.g. 29 of the 37 more or less associated with USA) would be likely to continue for local or other reasons, even if the justification of being part of a network were withdrawn. Mr. Petrie and Mr. Shapley said international recommendations would have some weight in local decisions about the conduct of vertical soundings work. However, Mr. Petrie said three of the five Canadian stations are justified by their support of other work — rocket experiments and partial reflection observing programmes — and enquired "What are the STP requirements ?" The Chairman said that this was the central question, which has not yet had a clear answer. Dr. Bibl pointed out some probably major gaps in our description or

understanding of the ionosphere wich still remain and which vertical soundings can help to fill. Dr. Pushkov said our objective should be to get existing stations to work properly for IASY. Professor Rawer stressed the need to modernize the old-fashioned methods of data handling currently in use.

The Chairman said there was a clear consensus of this quite broadly representative meeting :

(*a*) The existing network ought to be maintained at about its present size, but steps should be taken for improvement of performance; chief among these are visits by experts to stations, and an even more active URSI mechanism for guidance to stations, including the provision of comments, on request, regarding planned opening or closing of stations.

(*b*) Some stations should be strongly encouraged to obtain highly accurate vertical soundings data, in particular stations which are providing support for rocket work or incoherent scatter installations, or which are at large and complex research institutions.

(*c*) Synoptic stations should be strongly encouraged to obtain as complete numerical data as possible; to this end, the URSI-STP Committee will re-examine the present "accuracy rules" in order to maximize the amount of numerical data available for synoptic purposes.

(*d*) Vertical incidence soundings measurements are not being used to their full potential for network purposes for study of ionospheric absorption; the URSI-STP Committee should prepare some detailed recommendations.

(*e*) Improvements should be made in the handling of vertical incidence soundings data in computer-compatible form. Again, recommendations and action by the URSI-STP Committee or by IUCSTP WGI and the WDCs are needed.

3. — Summary Conclusions and Recommendations of Sub-Group C (Ionosonde Network) of IUCSTP Working Group 1

The following are summary conclusions resulting from extensive and detailed discussions held January 28-30 at London in an ad hoc sub-group C of IUCSTP Working Group 1, Chairman W. R. Piggott. The participants included many of those who attended the URSI-STP sponsored meeting on the same subject on January 30, and the work of the sub-group was preparatory to that meeting.

3.1. — VERTICAL SOUNDINGS NETWORK RECOMMENDATIONS AND CONCLUSIONS.

The Working Group noted and supported the recommendations Nos 3, 4, 5, 7, 8, and with modification, No 6, of the URSI-STP Committee made at Brussels, September 1968 (*URSI Information Bulletin* No 169). The recommendations below supplement these.

Rec. 1 *Size of Network.*

The Working Group noted the views of consultants summarized in the circulated document, considered the use being made at present of data from high, low, and temperate latitude stations, felt that this use fully justifies the maintenance of the existing network at least for the period of the IASY and *strongly recommends* that stations already operating be maintained for this period.

Rec. 2 *Redeployment.*

The Working Group considers that the scientific value of proposals to alter the deployment of stations should be balanced against the cost and *recommends* the setting up of a small ad hoc group of experts, with knowledge of conditions in widely separated parts of the world, for the following purposes :

(*a*) to examine methods of determining where stations should be maintained or set up.

(*b*) on request, to consider and examine proposals for redeployment, closing or opening of stations, so that the organizations involved can be given a balanced brief for such proposals.

(*c*) to consider methods whereby the data required in the future could be more economically obtained, paying special attention to the different logistic and technical needs in advanced and developing countries.

(*d*) to report to the URSI-STP Committee within two years.

The Working Group *notes* that certain weather ships and meteorological stations exist at sites which would be very valuable for obtaining ionospheric data for scientific and operational purposes, and further *recommends* that the possibility of planning ionosondes or other ground-based monitoring instruments at these stations be investigated by the administrations involved.

Rec. 3 *High Accuracy Stations.*

The Working Group draws attention to the need for data with a higher accuracy than is usually obtained at rocket ranges, near incoherent scatter stations and where intensive studies of solar-terrestrial, ionospheric or magnetic problems are active; notes that some investigations using ionosondes demand an accuracy which is only available at one or two stations (e.g. Lindau); and draws attention to the need for a few more stations with this accuracy.

The Working Group *recommends* that action be taken to fill these needs.

The Working Group also stresses the need for synoptic data from these stations, and *recommends* that such stations be operated regularly and the data obtained circulated, even if they are not needed by the particular experimenters involved. In particular, groups using published data on rocket or satellite observations often need to know the synoptic conditions when the observations were made.

Rec. 4 *Information Bulletin.*

The Working Group felt a need to improve communication between the stations, the scientists using the data, the international bodies involved, e. g. URSI, IAGA, IUCSTP, and *recommends* the regular circulation of an Information Bulletin addressed to the stations of the network and all others concerned. The Bulletin should include all international recommendations involving its recipients, notices of Retrospective World Intervals and other special study periods, information on outstanding solar-terrestrial phenomena, discussions on scaling or other problems at stations, suggestions for regional studies, and notes on new projects or techniques, particularly when they involve interdisciplinary cooperation. There should be a section where inexperienced workers could raise their difficulties and request advice. A particular need at present was to interchange information on ship-board and aircraft techniques.

Rec. 5 *Visiting Experts.*

The Working Group *considers* that the most urgent STP requirement is to improve the operation at stations in the existing network which, apart from other important uses, is valuable for STP monitoring, and *recommends* :

(*a*) that suitable experts be sent to visit the stations, particularly in developing countries, to give advice on the analysis of ionograms and on instru-

mental problems, and to improve morale by drawing attention to the current intensive use of the data produced, particularly in support of other projects often in other disciplines. Initially special efforts should be made to visit the South American and African stations.

(*b*) that international interchange of station staff be encouraged.

(*c*) that young graduates be encouraged to spend a year or more as operators at V.I. stations both to help the station and to obtain first-hand knowledge of the characteristics of the ionosphere in different parts of the world.

Rec. 6 *Synoptic Stations : Revised Rules.*

The Working Group recognizes that current scientific needs demand both high accuracy data and data which are as complete as possible, particularly for monitoring events, comparisons with satellite data and synoptic problems. These requirements are not necessarily in competition; high quality equipment, well monitored and maintained, can satisfy both in many areas. In general, when the ionospheric conditions are difficult, completeness of numerical data can only be obtained by accepting lower accuracy.

The Working Group therefore *recommends* that the "accuracy rules" for synoptic stations be revised and requests the V.I. Consultant to do this and circulate the proposals in time for confirmation at the next URSI General Assembly.

3.2. — Interchange of Data by Computer Techniques.

The Working Group strongly believes that, in the future, most of the numerical data from the V.I. network should be handled, interchanged and stored in forms usable by computers; it draws attention to the growing use of computers for handling synoptic data and the need to produce data in forms readily compatible with each other. This involves :

(*a*) the use of a single system of station identification (Brussels, 1968, Rec. 8);

(*b*) the setting up of arrangements so that data processed locally by incompatible computers can be economically converted to an international standard form.

Rec. 7 *Characteristic Codes.*

The Working Group notes that the characteristic codes for punched cards given in the *URSI Handbook* (Piggott and Rawer) have been gene-

rally accepted for both punched card and tape use and *recommends* that these codes, with additions agreed upon at the London meeting 1969 and listed in Table I be adopted internationally.

The Working Group *recommends* that the following characteristic codes should also be added to the existing list and be used for interchange on a voluntary basis :

02 fzF2
07 MUF (3000) F2 (change of code number)
17 MUF (3000) F1 (change of code number)
26 h'E2
44 h'F1.5
47 fm2 (minimum frequency of second order trace)
48 fm3 (minimum frequency of third order trace)
together with codes given in Rec. 13 below
57 dfS (frequency spread of spread-F reflections)

Notes on Characteristic Codes.

In punched card column 12 (Layer identification, etc.), the first digit 5 was originally reserved for solar data (*URSI Handbook*) but has not been used for this purpose since there is an independent code system. Digit 5 is therefore adopted for parameters associated with spread-F and oblique reflections; see URSI-STP Rec. 6 (Brussels 1968), and Rec. 12 below.

Table I includes both international characteristics and certain others which are regularly analysed at some stations and are interchanged on a voluntary basis. In some cases a code has been adopted arbitrarily but in general the WWSC system has been adhered to.

Until now, the following parameter has not been defined internationally :

06 h'0x height of extraordinary wave trace at frequency equal to foF2

Parameters 47, 48, 50, 51, 52, 53, 54, 57 are defined in Recs. 12, 14 below.

Rec. 8 *Standards for Tape Interchange.*

The Working Group notes that interchange and storage of data in punched card form is inconvenient and expensive, but that there are often serious difficulties in reading punched or magnetic tape in different countries, and in different institutions in the same country, due to incompatibility between computers and computer languages.

TABLE I. Two-digit Codes used for identifying the characteristics of the ionosphere (Revised January 1969).

Layer	Card Col. 12	Frequencies			Parameters	Heights					
		Card. Col. 13									
		0	1	2	3	4	5	6	7	8	9
F2	0	00 foF2	01 fxF2	02 fzF2	03 M(3000)F2	04 h'F2	05 hpF2	06 h'0x	07 MUF(3000)F2	08 hc	09 qc
F1	1	10 foF1	11 fxF1		13 M(3000)F1	14 h'F1		16 h'F	17 MUF(3000)F1		
E	2	20 foE		22 foE2		24 h'E		26 h'E2			
Es	3	30 foEs	31 fxEs	32 fbEs	33 fEs	34 h'Es		36 Type Es			
Other	4	40 foF1.5		42 fmin	43 M(3000)F1.5	44 h'F1.5			47 fm2	48 fm3	
Spread F and Obliques	5	50 foI	51 fxI	52 fmI	53 M(3000)I	54 h'I			57 dfS		

The Working Group *recommends* that the standard parameters recognized for international interchange and listed in the characteristic codes (as amended) be stored at each WDC in such a manner that the equivalent punched cards can be rapidly produced without the use of specialized and large computers. The actual types of tape and language used should be determined by local conditions and the needs of the users of the data from WDC, but the needs of groups with small computers or card handling facilities should not be overlooked.

The Working Group *recommends* the setting up of a small working party of experts, linked with WDCs, who have experience in the different types of computer and computer language, with preferably an independent chairman, to examine the problem of computer incompatibility and to make recommendations on the most efficient ways of overcoming these difficulties, e.g. by the centralization of conversion programmes or provision of data in different formats.

Rec. 9 *Interchange of Computer Processed Data.*

The Working Group *recommends* that circulation of numerical data in a standard form (punched cards or an acceptable computer tape) be recognized as equivalent to sending data in tabular form for the purposes of international interchange through the WDC system.

Rec. 10 *Centralized Processing of Data.*

The Working Group feels that centralization of some of the steps in the handling of data from stations is rapidly becoming essential, since all the data will be needed in computer compatible form and it is inefficient and inaccurate to process data by hand when it will eventually be computerized. The Working Group *recommends* that all organizations having access to computer processing should use it both for interchange and, where desired, for the production of tables.

The Working Group draws the attention of the administrations responsible for WDCs or for large stations to the advantages of storing, interchanging and handling numerical data by machine, and the need to agree to a mechanism whereby data from stations without suitable facilities could be converted to standard forms. The Working Group suggests that the possibility of centralized punching of such data be considered and points out that cost at the station could be reduced if the data were sorted by computer and the standard tables printed out centrally and sent to the

station. Work at these stations would then be restricted to preparation of standard daily work sheets only, and sending these to an agreed center would meet the international interchange agreements. The Working Group suggest that a suitable body (e.g. IUCSTP Committee for WDCs) examine requests for central computing from time to time and limit those accepted to cases of need.

Rec. 11 *Standards for Sophisticated Equipment.*

The Working Group notes that sophisticated methods of producing ionogram data in numerical form are being developed in several groups, that there is a need for a standard format so that the data produced can be readily interchanged internationally and *recommends* that those working in this field keep in close contact with the URSI-STP Working Group on Data Processing (see *URSI Information Bulletin* No 169, pp. 32-40).

The Working Group notes that the operation of ionosondes on ships and aircraft involves specialized engineering and data handling problems but that such ionosondes are very important and *recommends* that their use be strongly encouraged.

3.3. — CHANGES IN PARAMETERS.

Rec. 12 *Revised Recommendation for Spread-F Parameter.*

The Working Group endorses the proposal, in URSI-STP Rec. 6, to establish a new international index for spread-F (*URSI Bulletin* No 169, p. 56) and discussed details of rules for this index and for the interchange of related parameters which may be circulated in the future. It was concluded that some confusion of the originally suggested nomenclature with the satellite parameter fxS (extraordinary mode plasma frequency at the satellite) was likely, and that the nomenclature should be changed to avoid this.

The Working Group *recommends* the following changes and additions to URSI-STP Rec 6 :

(a) *Codes*

Computer Code

50	Reserved for foI if required
51	fxI (Note : the previous nomenclature was fxS, 41)
52	fmI, lowest frequency of spread (in use at some stations only)
53	M (3000) I, factor deduced from spread (in use at some stations on experimental basis only)

54 h'I, minimum slant range of spread (in use at some stations only).

Only fxI is recommended for general use at present, but data available for the other parameters in punched form should conform to the recommended code.

(b) *Missing values of fxI.* The Working Group *recommends* that, for hours when spread-F is usually present, the value of fxF2 with descriptive letter X be included when spread is absent, so that the count and median can be representative of communication conditions for the month as a whole.

(c) *Treatment of slant-F.* Pending further investigation, the Working Group suggests that slant-F be treated like a polar spur for obtaining the value of fxI.

(d) *Frequency spread, dfS.* For scientific work, where the spread of the conventional scatter pattern is most important, the Working Group draws attention to the use of frequency spread at a number of stations and proposes that this be a recognized international parameter for interchange on a voluntary basis. The code 57 and symbol dfS are suggested for this and comments are invited from all concerned in time for acceptance, modification or rejection at the URSI General Assembly August 1969.

Rec. 14 *Change in Data Exchange Rules.*

The Working Group stresses that f-plots or equivalent records are essential for both accuracy in analysis and understanding of high latitude V.I. data, and for studies of the ionosphere elsewhere.

It therefore *recommends* :

(*a*) that all stations take ionograms at least at quater-hourly intervals.

(*b*) that current practice be maintained at high-latitude stations but that elsewhere f-plots be prepared only for selected Retrospective World Intervals, chosen primarily to support the special projects of the IUCSTP.

(*c*) that the declaration of such intervals be entrusted to the existing RWI mechanism, supported by the advice of the Chairmen of the IUCSTP working groups where appropriate. The need for quick decision and circulation of these intervals is stressed.

Rec. 15 *Monitoring of Absorption by Ionosondes.*

The Working Group notes that the variation of absorption with position and time appears to be more complicated than can be adequately monitored

by existing absorption stations and *recommends* that all V.I. stations attempt to produce a parameter which is dependent on the absorption present.

The following tehniques can be used to obtain an improved measure of absorption for synoptic purposes and the Working Group *recommends* that they be adopted, as appropriate.

(*a*) At stations where fmin is mainly determined by absorption, at least when it is appreciable, the operation of the ionosonde should be examined and changed, where needed, to make the fmin values more consistent. In particular, in any month diurnal gain changes should be made at fixed times of day only and the gain at fixed time be kept as constant as possible. Where possible the times and gain changes in dB should be recorded and circulated with the fmin data.

At stations where the fmin for the second order trace, fm2, is mainly determined by absorption, measurements of fm2 will usually show absorption changes more accurately than fmin and be less sensitive to interference and equipment characteristics. The Working Group encourages stations to compare fmin and fm2 (or fm3 if usually available) and to report their findings either in the literature or through the V.I. or Absorption Consultants.

(*b*) At high sensitivity stations where fmin is not usually a measure of absorption, the Working Group *recommends* that fm2 be reduced and circulated instead of or in addition to fmin. Note that in this case the appropiate value of fmin should always be shown in tables of other parameters when the value of fm2 is below fmin, e.g.,... EB;... ES cases. The Working Group encourages the substitution of fm2 for fmin at stations in group (*a*) above when local experience shows that this gives a better description of absorption changes.

(*c*) The Working Group draws attention to the use of amplitude measures on selected ionograms (e.g. hourly) and of simple attachments to ionosondes which enable crude measure of amplitude to be monitored (e.g. 1967 Rawer & Suchy, *Handbuch der Physik* 49/2, pp. 248-250; 1964 Paul, A. K., *Electron Density Distributions in the Ionosphere*, ed. Thrane, E., North Holland, pp. 17-20). All such methods can be misleading in particular circumstances which often depend on local conditions — as can fmin or fm2.

3.4. — Miscellaneous Points.

The Working Group draws the attention of IUCSTP and the URSI-STP Committee to the generally agreed need for a permanent service for the

V.I. network and suggests that the possible alternative ways of meeting this need (Solar Terrestrial Service; WMO type organization, etc.) be examined by a competent body.

The Working Group considered the problems of certain stations whose data were needed for scientific purposes outside the nation concerned. The value of the data from some of these stations could be greatly increased by quite a small subsidy. The Working Group draws the attention of administrations cooperating with such stations to this point and feels that the international needs may justify special support from an international fund. Any application for such support should be firmly established scientifically and be reviewed by a competent body.

The Working Group draws attention to the need to improve the sharing of topside sounder data and to publicize the available facilities, both in tape and booklet form.

The Working Group supported in principle the recommendations of the CCIR and V.I. Consultant for the maintenance of stations for monitoring the parameters used in calculating indices, e.g. IF2, and made recommendations which will be included in the Report to URSI on these problems.

The Working Group draws attention to the need for more interchange of technical and engineering experience between groups wishing to work on new types of equipment or on the use of ionosondes in ships or aircraft and requests those willing to collaborate to send their names, addresses and speciality to Mr. W. R. Piggott, the V.I. Consultant, Radio and Space Research Station, Ditton Park, Slough, Bucks., England, who will arrange for their publication.

The Working Group considered the value of continuing to interchange "types of Es" but was hampered by lack of representative opinion. The consensus was that Es types were still of value at high and possibly at low latitude stations, but that the main requirement for them at temperate latitudes was adequately met by existing data. If this is accepted, the interchange of Es types could be discontinued at temperate latitudes and perhaps at low latitudes. The value of Esq and Es at the latter was stressed. Most current Es studies were local and involved more complex analysis.

The Working Group notes that direct radio scatter from ocean waves is easily observable by efficient shipboard ionosondes, that such recordings can give information on the amplitude and wavelength of ocean waves out to 500 km from the ship and that they should be of value to oceanographic agencies.

4. — Recommendations of other IUCSTP Working Groups

The following recommendations involving V.I. soundings networks were made during the IUCSPT General Meeting in London (*STP Notes* No 4).

General Recommendations (*STP Notes No 4, p.* 22).

II.15. *Recognizing* that comprehensive studies of the conjugate behavior of the ionosphere require continuous records from an extensive network of ground stations, the IUCSTP *urges* that operation of the world-wide ionosonde station network be continued, and that existing gaps in conjugate coverage be remedied, whenever possible, with the establishment of new, conveniently located stations.

Recommendations of Working Group 5 *(STP Notes No* 4, *p.* 61*).*

(1) *Considering* the suitable location in L-value and longitude range of the pair of stations at Kerguelen Island (France, South Indian Ocean) and Sogra (USSR), Working Group 5 *encourages* the pertinent French and Soviet institutions to continue conjugate point studies at these locations, and to implement them with VLF experiments and correlation studies with data obtained from satellites crossing the Sogra-Kerguelen magnetic meridian.

(3) *Considering* the geophysical observations currently being made at Petropavlovsk on Kamchatka (USSR), and *recognizing* that Canberra (Australia) is almost exactly conjugate to Petropavlovsk, Working Group 5 *draws* the attention of Australian and Soviet scientists to the opportunity to organize conjugate point experiments at the foregoing pair of stations.

(5) *Considering* the importance of conjugate point studies at low latitudes, Working Group 5 *recommends* the installation of stations in the region between the Japan-Australia Chain, in which the Ogasawara (Bonin) Islands are situated.

(6) *Considering* (1) that Arecibo Ionospheric Observatory (Puerto Rico) has a conjugate point near an easily accessible area in Argentina, (2) that the said Observatory is appropriately equipped to study a maximum number of parameters relevant to conjugate photoelectron effects, and (3) that the field geometry is particularly well oriented for studies of winter-summer comparison, Working Group 5 *recommends* that a station, equipped

with a photometer and eventually an ionosounder, be set up as close as possible to the theoretical conjugate point of Arecibo.

Other Recommendations (STP Notes No 4, p. 82).

Working Group 11 makes the following recommendations for the application of radio methods to the solution of problems in D- and E-region ion chemistry.

5.1. — Ionosondes with enhanced antenna efficiency and frequency range extended downward as well as multilink LF pulse and CW sounding should be used for monitoring the night-time E layer ionization (STP 27 (68) Sect. 1).

APPENDIX II

URSI-STP Committee

Working Group on Whistler Observations of the Magnetosphere

Initial Membership :

Chairman : D. L. Carpenter (1) (USA);
G. McK. Allcock (New Zealand);
K. Bullough (UK);
N. D. Clarence (S. Africa);
B. J. Fraser (Australia);
F. Jiricek (Czechoslovakia);
Ya. I. Likhter (USSR);
M. G. Morgan (USA);
R. Rivault (France);
M. J. Rycroft (UK);
J. Vigneron (France).

Working Group on Digital Data Pre-processing

Initial Membership :

Chairman : K. Bibl (2);
L. Bossy (Benelux, S. W. and S. E. Europe);

(1) *Address :* Radioscience Laboratory, Stanford University, Stanford, Calif. 94305, USA.
(2) *Address :* Lowell Technical Institute Research Foundation, 450 Aiken Street, Lowell, Mass., USA.

I. A. Bourne (Australia and Far East);
E. Harnischmacher (Mid- and S. Europe);
L. W. Hewitt (N. America);
W. R. Piggott (UK, Asia and English-speaking Africa);
G. M. Pillet (France and French-speaking Africa);
S. Radicella (S. America);
J. Taubenheim (E. Europe).

URSI-STP Committee

MEMBERSHIP

Chairman : W. J. G. Beynon

Secretary : G. M. Brown, Department of Physics, University College of Wales, Aberystwyth, Cards., UK.

Ex offcio Members :

Commission II :
Chairman : W. E. Gordon;
Vice-Chairman : P. Misme.

Commission III :
Chairman : K. Rawer (1);
Vice-Chairman : S. A. Bowhill (1).

Commission IV :
Chairman : J. W. Dungey;
Vice-Chairman : F. L. Scarf.

Commission V :
Chairman : C. A. Muller;
Vice-Chairman : J. L. Locke.

Commission VIII :
Chairman : R. Rivault;
Vice-Chairman : N. D. Clarence.

Chairmen of Working Groups :
Ionosphere : K. Rawer (1);
Ionospheric Drifts : R. W. H. Wright;
Ionosonde Network Advisory Group : W. R. Piggott;
Whistler Observations : D. L. Carpenter;

(1) Serves in two capacities.

Digital Data Preprocessing : K. Bibl;
Radio Science Data Centres : A. H. Shapley.

IUCSTP Members active in URSI :

S. A. Bowhill (1);
J. W. King.

INTER-UNION COMMISSION ON FREQUENCY ALLOCATIONS FOR RADIO ASTRONOMY AND SPACE SCIENCE

Doc. IUCAF/155

Report of 9th Meeting of IUCAF held in Brussels on 18, 19 February 1969

PRESENT

Professor F. G. Smith (in the Chair);
Dr. E. J. Blum;
Professor M. Ceccarelli (vice Professor G. Puppi);
Dr. J. W. Findlay;
Professor O. Hachenberg;
Dr. J. P. Hagen;
Mr. J. Herbstreit;
Mr. A. J. Higgs;
Dr. F. Horner;
Professor H. C. van de Hulst;
Dr. C. M. Minnis;
Mr. T. Nishizaki;
Dr. H. Sterky;
Dr. R. L. Smith-Rose (Secretary General).

1. — At the opening of the meeting, Dr. Minnis introduced M. Jaumotte, Rector of the Université Libre de Bruxelles, and referred to the satellite Heos, in which Belgian scientists had installed some scientific equipment.

(1) Serves in two capacities.

M. Jaumotte spoke appreciatively of the work of the Commission and welcomed its members to this meeting in Brussels. This was warmly supported by M. Coutrez, who was personally interested in the work of the Commission particularly in the field of radio astronomy.

The chairman of IUCAF, Professor F. G. Smith, expressed the gratitude of the Commission for this opportunity to meet in Brussels, and particularly for the arrangements after the business meeting, for members to see some of the work of the Université Libre de Bruxelles in the fields of Plasma Physics and Radio Astronomy.

2. — APOLOGIES.

Apologies for absence were announced from Dr. Denisse, Professor Oort, Dr. Sanamian and Professor Tanaka.

3. — REPORT OF EIGHTH MEETING AND APPROVAL OF AGENDA.

The report of the eighth meeting in Washington (June 1967) circulated as Doc. IUCAF/113, was approved after some minor corrections had been made. Matters arising from these minutes are dealt with as appropriate at later stages of this document.

The revised agenda for the present meeting as given in Doc. IUCAF/139 was adopted.

4. — FINANCE.

The statements of Income and Expenditure for the years 1967 and 1968, and the Budget Estimate for 1969, as given in Doc. IUCAF/137, were approved.

The Commission noted with gratitude that the Subvention from ICSU was to be raised from $ 1,500 to $ 2,500 for the year 1969. In this connection it was pointed out that, during the next two years, IUCAF would incur greater expense in securing adequate representation at the Plenary meetings of CCIR in Europe and India in 1969-70; and at the World Administrative Conference on Space-Radio Communications which is scheduled to begin in June 1971 under the International Telecommunication Union.

5. — FREQUENCIES FOR WORLD-WIDE COMMUNICATIONS.

Arising out of minutes 17 of the previous meeting and of Doc. IUCAF/116, Dr. Sterky referred to his letter (reproduced in Doc. IUCAF/117) on the conditions relating to Global Commercial Communications Satellites

Systems as these are developing. It was agreed that IUCAF should take note of these developments, but that any action must await the World Administrative Conference to be held in 1971. The Commission was reminded of the fact that in the Final Acts of the Extraordinary Administrative Radio Conference of 1963, it was recommended that the next appropriate World Conference should give further consideration to the provision of improved frequency allocations for Radio Astronomy (Recommendation No. 11A).

6. — Interim Meeting of CCIR Study Group IV.

The Commission noted with interest the report of the Interim Meeting of CCIR Study Group IV in Geneva, given in Doc. IUCAF/136. Drs Hagen and Horner expressed their disappointment at the apparent lack of interest by the Study Group in the frequencies to be used for communications or other purposes on the far side of the moon. It was observed that this was a subject of continuing interest to IUCAF in its future work. This could result in a revised question and a new report on the subject to be submitted to CCIR.

The Commission noted that no fresh contributions had been made to CCIR on the subject of Radar Astronomy; and it was agreed that while the subject is of continuing interest, IUCAF had no problems to raise at the present time.

7. — Use of the Standard Frequency Guard Bands.

Arising out of minute 8 of the Washington meeting and Appendix I of Document IUCAF/113, the possible use of the Standard Frequency Guard Bands for either radio astronomy or space research was discussed at some length. It was agreed that the Commission should not abandon its claim to the use of the Guard Bands at 2.5, 5, 10, 15, 20 and 25 MHz for radio astronomy in accordance with footnote 204 of the Radio Regulations. But on account of the interference experienced in these guard bands, it was considered desirable that efforts should be made to improve the position particularly in the bands 10.003-10.005, 19.990-20.010 and 39.986-40.002 MHz, which are allocated on a secondary basis, to the space and earth-space services for research purposes.

The results of the discussion are given in more detail in Appendix I to this Report. Following this review of the position, Appendix II forms a draft request to be submitted to the International Telecommunication Union (ITU) for the exclusive allocation to Radio Astronomy of a frequency band

at least 20 kHz wide in the vicinity of 20 MHz; and preferably, at or slightly below this frequency, say within the band 17-20 MHz.

If this request could be granted, then radio astronomers would relinquish their claim to the use of the standard frequency sidebands in favour of the request for the use of these for space research, in accordance with footnotes 215, 221 and 235 of the Radio Regulations.

8. — The Deuterium Frequency Band.

Reference was made to the discussion held at the previous meeting on the Deuterium Frequency Band at 322 to 329 MHz, and recorded in minute 9 of Doc. IUCAF/113. The Commission was informed that the United States authorities, after exploring the position, had decided not to press for better protection for this frequency band than that already provided by footnote No. 310 in the ITU Radio Regulations, 1959.

The acceptance of this position, however, means that there is no band of frequencies adequately protected for radio astronomy between the 150 and 408 MHz bands. Later research may lead to a request for better protection from interference at an intermediate frequency between these limits.

9. — Radio Astronomy in the Frequency Band 406-410 MHz.

Consideration was given to Document IUCAF/138, which suggests that the Commission should seek the support of some national administrations to a claim for the allocation on a primary world-wide basis of the frequency band 406-410 MHz, together with an exclusive allocation of a band 2 MHz in width within the above band.

It was realised, and accepted, that this would mean the abandonment of the right granted by footnote 317 for the band 404-406 MHz to be allocated to radio astronomy in Region 2. Dr. Hagen reported that this would be acceptable to the United States authorities, including the radio astronomers, provided that the ITU was able to accede to the request for the exclusive allocation of the 2 MHz band referred to in the preceding paragraph.

10. — The Frequency Band 606-614 MHz.

This band is dealt with in footnote 332 of the revised Radio Regulations (Geneva 1963) : in which the bands allocated to radio astronomy are 606-614, 608-614 and 610-614 MHz in Region 1, 2 and 3 respectively.

The Commission noted (*a*) that the band 606-614 MHz is not used for the television service in many countries; and (*b*) that, as noted above, different

allocations for radio astronomy have been suggested in the three regions of the world. It was now recommended that the Commission should press for the best possible allocation to radio astronomy within the band 608 to 614 MHz on an exclusive and world-wide basis. To assist in giving effect to this, IUCAF should take appropriate action with the international bodies (CEPT, EBU and OIRT) concerned with broadcasting in Europe before the next administrative Conference of the ITU.

11. — THE HYDROGEN BAND : 1,400 TO 1,427 MHz.

The Commission noted that the whole of this band is fully used by radio astronomers and is still required for continuous observations on the hydrogen content in the atmosphere, the Milky Way and in extra-galactic nebulae. In view of the fact that radiations from some galaxies are being observed at frequencies below 1,400 MHz, the Commission suggests that protection from interference be sought at frequencies down to 1,390 MHz without prejudice to the exclusive allocation (1,400-1,427) referred to above.

12. — THE SPECTRAL LINES OF OH RADIATION.

The Commission noted that radiation from OH lines had formed the subject of discussion by CCIR Study Group IV, but that a revised footnote No. 53A in the Radio Regulations (Geneva 1963) gives inadequate protection to radio astronomy within the band 1,660-1,670 MHz. Dr. Hagen suggested that the whole of this 10 MHz band was required for radio astronomy sharing on the best possible basis with other users of this part of the spectrum.

The wish was also expressed that national administrations will be able to give adequate protection to the radio astronomy service to facilitate the observation of the natural radiations within the bands 1,611.5-1,612.5 and 1,720-1,721 MHz.

13. — ADDITIONAL ALLOCATIONS FOR RADIO ASTRONOMY TO BE SOUGHT AT HIGHER FREQUENCIES.

The Commission discussed at some length the requirements of astronomers at higher frequencies in the spectrum, and recommendations were made as follows :

(a) *2,690-2,700 MHz.*

This band is at present allocated to radio astronomy on an exclusive basis throughout the world. It is desired to maintain this status. But in

order to accommodate and protect new observations which are now being planned, and which will require a bandwidth of 30 MHz (2,670-2,700 MHz), it is desired to seek the use of the additional band 2,670-2,690 MHz, on an equal shared basis with other users.

(b) *4,990-5,000 MHz.*

This band is allocated exclusively to radio astronomy in Region 2, and is shared on an equal primary basis with fixed and mobile users in Regions 1 and 3. Here again it is desired to seek an extension of the band downwards to 4,950 MHz on a similar basis. It was noted that one of the difficulties anticipated by radio astronomers in the use of this band was that of avoiding interference from the second harmonics of microwave heaters using the band 2,450 $\pm$ 50 MHz (see Paragraph 14 below).

(c) *10.68 to 10.70 GHz.*

This band is allocated exclusively to radio astronomy. The usefulness of this allocation would be greatly enhanced if the adjacent bands 10.66 to 10.68 and 10.70 to 10.72 GHz could be made available to radio astronomy on an equally shared basis with the other users (fixed and mobile) of these bands.

(d) *Frequencies between 15 and 40 GHz.*

The exclusive allocation to radio astronomy at 15.35 to 15.4 GHz is satisfactory at present; but is would be an advantage for astronomers to share with space scientists the immediately adjacent band of 15.25 to 15.35 GHz.

Dr. Findlay stated that the US astronomers were considering a request for a change from the band 19.3 to 19.4 GHz, at present allocated exclusively to radio astronomy on a world-wide basis, to the band 23.0 to 23.5 GHz, in order to facilitate the study of the natural radiation from ammonia and water vapour lines in this part of the spectrum.

The Commission agreed that it was premature to do more than note the present discoveries and the great interest of radio astronomers in these. It was agreed, however, that with the additional knowledge being gained in current research, a more precise statement should be presented at the forthcoming World Administrative Radio Conference (WARC).

(e) *Frequencies above 40 GHz.*

Dr. Sterky suggested that steps should be taken to ensure that some National Administrations, as members of the ITU, actively seek an extension

of the Radio Regulations to frequencies above 40 GHz. Following this, and as already mentioned in paragraph 14 of Doc. IUCAF/142, the Inter-Union Commission should be prepared to state their requirements at frequencies above the present limit of 40 GHz, when such an extension of the spectrum to be allocated is adopted by the International Telecommunication Union (ITU).

Mr. Herbstreit called attention to the existence of windows in the earth's atmosphere, through which radiation from natural phenomena can be detected at frequencies up to 300 GHz. (CCIR Study Group IV, Report 223-1, Plenary Assembly, Oslo, 1966).

14. — INTERFERENCE FROM INDUSTRIAL APPLIANCES.

In the Radio Regulations of the International Telecommunication Union, the frequency band 2,450 $\pm$ 50 MHz is designated for industrial, scientific and medical purposes. Footnote No. 357 of these regulations also states that :

"Radiocommunication services operating within these limits must accept any harmful interference that may be experienced from the operation of industrial, scientific and medical equipment".

The second harmonic of the above designated band covers the whole of the radio astronomy band 4,990-5,000 MHz (see 13 (b) above). It would therefore seem desirable that radio astronomers should avoid the above band of frequencies and the harmonics thereof. Dr. Findlay stated that the United States astronomers would be reluctant to change their existing primary allocations; but Dr. Horner suggested that there were good reasons to make all the higher frequency allocations to radio astronomy harmonics of the lower bands. After further discussion however, it was agreed that it might be difficult and even dangerous to suggest any changes in the bands already allocated.

At a later stage in the discussion, Dr. Hagen suggested that the ITU had not paid sufficient attention to harmonic and other out-of-band radiation which causes interference to radio astronomy. Some national action was in progress in a few countries, but there appeared to be a need for international intervention to reduce such types of interference at the source.

The IUCAF notes that few legal limits of interference have been adopted by the various countries, and it was not clear what international body could ensure compliance with the conditions described in the footnote No. 357 of the Radio Regulations, already referred to above. It was also observed that Study Group 1 of the CCIR is the body responsible for considering

the technical aspects of interference arising from out-of-band radiation from transmitters operating their normal services.

15. — Frequencies for Space Research.

Drs. Hagen and Horner referred to the question drawn up at the previous meeting on "Radio Propagation Studies using Space Vehicles", issued as Appendix III of Doc. IUCAF/113 and submitted to CCIR. At the interim meeting of CCIR Study Group IV in September 1968, a report from IUCAF was adopted with certain alterations (the revised Doc. IUCAF/128 is published in the URSI Information Bulletin No. 170, March 1969).

Attention was drawn to the fact that the list of frequencies included in the Recommendation from COSPAR (1966-67) reproduced in Section C of Doc. IUCAF/118 was already obsolete in some respects; and that the requirements of space research workers now ranged up to much higher frequencies than those detailed in this document.

At the request of the chairman, Drs. Hagen and Horner have reviewed the position up to and beyond 40 GHz, and their conclusions have been incorporated in Section C of Doc. IUCAF/142. Attention was drawn to the request that space research should not use any frequency assignments at or near 80 MHz, in order to avoid causing any interference to radio astronomy in this band.

The chairman invited Dr. Hagen to ensure that any relevant documentation on frequencies requested by COSPAR should be made available to the members of IUCAF. If necessary the secretary should approach COSPAR for their agreement on any communication to be made to the International Telecommunication Union (ITU) in connection with frequency allocations for space research.

Members of the commission (IUCAF) re invited to submit their comments on the present position as summarised in Section C of Doc. IUCAF/142.

16. — Preparation for the World Administrative Radio Conference (WARC).

The attention of the meeting was drawn to Doc. IUCAF/130, which comprised a circular letter from Mr. Mohamed Mili, the Secretary General of the International Telecommunication Union (ITU). Annex 1 to this letter describes in some detail the Role of the ITU in Space Telecommunications : while Annex 2 announces the recommendation to convene a World Administrative Radio Conference during the latter part of 1970 or early 1971. The agenda for this conference includes among other items the

revision of administrative and technical regulations and the adoption of "such new provisions as necessary for the space radio services and the radioastronomy service which will ensure the efficient use of the spectrum".

The Commission discussed at some length the manner in which its views on this subject might be made known to the Conference, and it was decided to make an approach either direct or through the International Council of Scientific Unions (ICSU), to which the three parent bodies of IUCAF adhere.

Since the meeting, Dr. Smith-Rose has made a direct approach to the Secretary General of the ITU in a letter dated 4th March 1969, a copy of which is reproduced in Appendix III. This letter has been acknowledged by Mr. C. Stead, Chief of the Department of External Relations, ITU, pending a formal decision by the Conference itself.

In anticipation of the granting of this request, it was decided to prepare a document describing the scientific requirements of frequencies for radio astronomy in particular, and also for space research. An outline of these requirements has been prepared by Professor Smith and Dr. Horner and this has already been distributed in Document IUCAF/142.

17. — PUBLICITY.

With the view of stimulating interest in, and drawing attention to, the aims and activities of IUCAF, it was suggested that some members of the Commission might prepare articles for publication in the Journal des Télécommunications, the official organ of the ITU. Such articles might include radar, as well as radio, astronomy; and the chairman proposed to prepare an up-to-date article on "Pulsars".

Dr. Sterky suggested that the distribution of reprints of all such articles would assist in publicising the work of IUCAF, particularly among the members of its parent bodies, URSI, IAU and COSPAR.

18. — PRESIDENT JOHNSON'S MESSAGE ON COMMUNICATIONS POLICY.

Members of the Commission appreciated the receipt of Doc. IUCAF/115 describing the policy outlined by President Johnson to the Congress of the United States on the future of world communications. This constituted a very welcome look into the development of Global communication systems by means of satellite relays, for the operation of which an international consortium had already been formed. The Inter-Union Commission will look forward with interest to the report of the "Task Force on Communi-

cation Policy", which will examine a number of major questions including that of direct interest to IUCAF, viz. "Are we making the best use of the electromagnetic frequency spectrum ?"

19. — Registration of Frequencies in use at Radio Astronomy Observatories.

The Commission noted the submission of Doc. IUCAF/126 as a progress report to the International Council of Scientific Unions (ICSU).

Arising out of this, Mr. Nishizaki referred to Doc. IUCAF/101 giving details of the Radioastronomy Observations which had reported the frequencies in use; and stated that the International Frequency Registration Board (IFRB) at Geneva was now maintaining a register of the frequencies used by these observatories throughout the world. Up to the present time 14 countries had recorded about 208 frequency assignments to Radio Astronomy in the Master International Frequency Register maintained by the IFRB. The Chairman thanked the Secretary General of IUCAF for the collection of data in the above and earlier documents, and for his progress reports to ICSU.

20. — Date and Place of the next meeting.

Unless there is a need to deal with an unexpected situation, it was agreed that the next meeting of IUCAF should be held after the CCIR Plenary Assembly (January 1970) and well in advance (at least six months) of the World Administrative Conference to be called for 1970-71.

Considerable discussion took place on the desirability of seeking an invitation to hold a meeting of IUCAF in the USSR, where it was noted that an Inter-Union Symposium on Solar-Terrestrial Physics, and a meeting of the Popov Society were both scheduled for May 1970. While some doubt was expressed as to whether an adequate attendance of the members of IUCAF would be realised, it was agreed that Messrs Herbstreit and Minnis (in conjunction with Professor Smith as chairman) should explore the practical possibilities of a meeting in the USSR. The question of the finance involved in such a meeting should also be borne in mind.

The alternative to the above proposal would be to hold the next meeting in a European country at a suitable time, and the possibility of Nice was mentioned for consideration.

APPENDIX I

Note on the use of standard frequency bands for radio astronomy and space research

1. The frequency allocation tables in the ITU Radio Regulations of 1959 allowed for

(*a*) radio astronomy observations to be made in the standard frequency bands 2.5, 5, 10, 15 and 20 and 25 MHz (footnote No. 204); so as to permit the extension of measurement of spectra of radio sources to as low a frequency as possible.

(*b*) space research to be carried out in parts of the bands at 10, 20 and 40 MHz (footnote Nos. 215, 221 and 235) on a basis of no interference to the standard frequency service. This provision allowed certain experiments on ionospheric propagation to be carried out using harmonically related frequencies. These arrangements were confirmed in 1963.

Since that time additional factors have arisen, or have been recognised, and the following notes indicate how they have affected the views of IUCAF on the use of these bands.

2. It has become evident that the use of the bands for radio astronomy is generally impracticable, mainly because they contain unauthorised transmissions which interfere with the observations but also because the bands of frequencies which are nominally free of transmissions are very narrow.

Radio astronomers are therefore of the opinion that the allocation of these bands on a shared basis by footnote gives a false impression that their needs in the part of the spectrum below 30 MHz are met at least partially. The need for radio astronomy frequency bands at frequencies in the region of 10 and 20 MHz nevertheless still exists and it is hoped that it will be possible to make more suitable allocations. First importance is given to an allocation in the frequency range 17-20 MHz with a bandwidth of at least 20 kHz.

3. Space research workers have appreciated the provisions for operating in the standard frequency bands at 10 and 20 MHz on a secondary basis and have requested that similar access to the other bands should be available to them. This request is endorsed by IUCAF.

4. Experiments are being made to test the feasibility and value of radiating standard frequency transmissions at different carrier frequencies within the allocated bands. This represents an important departure from the concept that the standard frequency is the centre frequency of the band, as indicated in the Radio Regulations, that the standard frequency signal should occupy only such part of the band as is necessary to carry the normal modulation and that there should be guard bands to protect the standard frequency service from interference. IUCAF is seriously concerned that if the principle of staggered standard frequencies is adopted generally, the guard bands may become unusable for space research, and it would then be necessary to consider the possibility of making alternative and comparable allocations to the service in this part of the spectrum. IUCAF therefore suggests strongly that the future method of using the bands for the standard frequency service be clarified as soon as possible in order that space research requirements can be reassessed.

APPENDIX II

Request to ITU from IUCAF for the exclusive allocation to the Radio Astronomy Service of a frequency band 20 kHz wide at or slightly below 20 MHz

Considering that :

1. The science of Radio Astronomy in its observation of the Universe requires measurements at the frequencies in the lower part of the spectrum that can traverse the earth's ionosphere;

2. That for some years attempts have been made by the Radio Astronomy Service in performing this task by using the guard bands assigned to the Standard Frequency Service at 2.5, 5, 10, 15, 20 and 25 MHz, as allowed by the Radio Regulations, 1959 (footnote 204);
3. That these attempts have been unsuccessful due to multitudinous unidentified spurious emissions in the guard bands detectable at the extremely low flux levels at which radio astronomy is by nature forced to work;
4. That observations in the lower part of the spectrum are important in determining the spectrum of radio sources, of solar, galactic and extra-galactic origin; and
5. That there is a possibility of long range propagation due to the ionosphere at these frequencies.

The IUCAF Requests that :

In place of the guard bands referred to in paragraph 2 above, a band for the exclusive use of the Radio Astronomy Service be allocated somewhere in the vicinity of 20 MHz, preferably at or below 20 MHz, and that the band-width be at least 20 kHz.

APPENDIX III

M. Mili,
The Secretary-General,
International Telecommunication Union,
Palais Wilson,
Geneva. 4th March 1969.

Dear Sir,

By letter of 29th May 1961 (your reference No. 3351/61/TT) this Inter-Union Commission was admitted as a participant in the work of the International Radio Consultative Committee (CCIR) in a consultative capacity.

The work of our Commission on behalf of radio astronomers and space scientists has greatly benefited by this close association with the Plenary Meetings of the CCIR and with those of Study Group IV over the past several years.

By our mutual efforts and interest, the recognition of the need to protect from interference certain bands of frequencies to foster research in radio astronomy and space science has been greatly appreciated by all workers in these subjects.

The needs of our scientists are kept constantly under review by this Commission, and every effort is being made to secure the most economical arrangements of the frequencies required on a uniform basis in all three Regions of the World. While some members of this Commission are in close touch with their national frequency-allocating and administrative authorities, it is necessary for us to be able to present our views and requests on an international basis.

I am therefore instructed by this Inter-Union Commission to ask that we may participate in the appropriate sections of the work of the forthcoming World Administrative Radio Conference, which I undertand is being planned for 1970 or 1971. You have been good enough to send me for distribution to the members of this Commission (IUCAF) copies of your letter No. 6085/67/RE dated 26th June 1968. From Annex 2 to this letter dealing with Resolution No. 632, we note with great interest the proposal that the forthcoming WARC should, amongst other matters, "revise existing administrative and technical regulations and adopt such new provisions as necessary for the space radio services and the radio astronomy service which will ensure the efficient use of the spectrum".

I trust that you will be able to grant us the opportunity of expressing the views of the scientists interested in these matters so that the relevant parts of the radio frequency spectrum may be used in the most efficient manner by all concerned.

Assuring you of our appreciation of your recognition of the needs of the radio astronomers and space scientists, and of their readiness to achieve the objects of mutual interest to all users of the radio frequency spectrum.

Yours faithfully,

R. L. Smith-Rose, *Secretary General.*

(Inter-Union Commission on Frequency
Allocations for Radio Astronomy and Space Science)

INTER-UNION COMMISSION ON RADIO METEOROLOGY

Report of Business Meeting-June 11-12, 1969, Stockholm

1. — PLACE :

This meeting was held at Hasselby Slott, Stockholm during the period of the IUCRM Colloquium on the Spectra of Meteorological Variables (June 9-19, 1969).

2. — ATTENDANCE :

Present : R. Bolgiano (President), D. Atlas (Secretary), B. R. Bean, F. Eklund, L. Hasse (for K. Brocks), P. Misme, K. Naito, J. A. Saxton, J. A. Lane (Consultant), W. C. Swinbank (Consultant),N.K.Vinnichenko (for V.I. Tatarskii).

Absent : J. S. Marshall, K. Brocks, E. T. Pierce; G. D. Robinson, V. I. Tatarskii.

3. — DISCUSSION AND ACTION :

(a) *Official Representative to XVI General Assembly of URSI.*

In response to a request from Dr. Minnis, acting Secretary General of URSI, it was unanimously voted that Prof. Bolganio be designated the official IUCRM representative to the XVI General Assembly of URSI in Ottawa.

(b) *IUCRM Activities in Atmospheric Electricity.*

The question of IUCRM taking an increasingly active role in atmospheric electricity had been raised earlier in correspondence from URSI President Silver, Dr. Minnis, and Dr. E. T. Pierce. The problem is essentially that URSI Commission VIII (provisional) which is responsible for "Radio Noise of Terrestrial Origin" has, by virtue of its history, been at some disadvantage in fostering stronger efforts in atmospheric electricity since this area has been supported very actively by the Joint Committee on Atmospheric Electricity (JCAE) of IUGG. In particular, JCAE has been serving as the organizing body for an extended series of international symposia on atmospheric electricity (AE). Because Dr. Horner (Chairman, Commission VIII) has no official channel of communication to JCAE,

he has been unable to get them to deal actively with URSI aspects of AE. It was therefore thought that IUCRM, with responsibility to both URSI and IUGG, might provide an effective link between the two bodies concerned with AE. After extensive discussion, however, it was the general consensus that IUCRM should not merely act as a "mail-drop" or bridge between JCAE and Commission VIII. Indeed, if IUCRM assumed such a role, it might be detrimental to bolstering activities in AE because the assumption might then be made that this field was receiving adequate attention, while in fact, the interests of IUCRM have only been and would undoubtedly continue to be tangential to it. Accordingly, the following statement, prepared by Dr. Saxton, was adopted unanimously by those present.

Statement on IUCRM Interest in Atmospheric Electricity :

(1) The terms of reference of the IUCRM determined by the Commission at its meeting in Paris in 1961 included a responsibility for fostering the science of atmospheric radio electricity. The interests of the Commission since that time have developed in such a way, and the constitution of its membership has been such, that this responsibility has never been exercised in the broadest sense.

(2) To provide for any wider activity than at present would necessitate a different structure of the Commission from that which is now established and would involve the enforced combination of two groups with basically different interests. This the IUCRM believes to be unsatisfactory and essentially unsound.

(3) The Commission now considers, therefore, that its limited interests in the field of atmospheric radio electricity should be recognized; specifically that these interests are confined to investigations which facilitate the understanding of the interaction of the non-ionized atmosphere (including clouds and precipitation) with radio waves of frequencies greater than about 30 MHz.

It was noted that this statement should be communicated to the President and Secretary General of URSI so that URSI can take other steps to advance its interests in atmospheric electricity.

(c) *General Terms of Reference — Acoustic Probing Techniques.*

The general terms of reference of IUCRM, as represented in the report of the Sept. 1967 business meeting at Lucerne, were reviewed. With the exception of the above statement of clarification concerning atmospheric electricity, the terms of reference were found to be entirely satisfactory. We

note, however, that in the last two years acoustic radar techniques have been found to provide an excellent means of probing and understanding the fine-scale structure of the lower troposphere. Accordingly, while acoustic propagation as such is not within our realm of interest, acoustic probing methods definitely are.

(d) *Colloquium on Atmospheric Radiometry.*

In response to a proposal by Monsieur P. Misme that IUCRM sponsor a colloquium on atmospheric radiometry, the following resolution was adopted unanimously :

Resolution Concerning a Colloquium on Atmospheric Radiometry.

IUCRM, noting the increasing importance of radiometry as a means of sounding the thermal and gaseous structure of the atmosphere, proposes the convening of an international colloquium on millimeter radiometric probing of the atmosphere. It is further proposed that Monsieur Pierre Misme represent IUCRM in exploring with various national or international bodies and/or agencies the co-sponsorship of such a colloquium.

Because the funds required for such a colloquium will undoubtedly exceed those which can be expected from our parent unions, it was understood that primary support would be sought from the co-sponsoring agency or body.

(e) *IUCRM Contribution to the URSI Report on Electromagnetic Probing of the Atmosphere.*

President Bolgiano discussed how IUCRM might contribute to this overall URSI report which is being prepared by a working group under the chairmanship of Prof. W. E. Gordon. Both Bolgiano and Atlas were members of as US National Academy of Sciences Remote Atmospheric Probing Panel (RAPP) which recently completed a major report on all probing techniques capable of observing the neutral atmosphere below about 100 km. This report is a natural counterpart to the URSI Gordon panel report on ionospheric probing. Although it was not prepared by an international URSI panel, the US RAPP report is up to date, very comprehensive, and reasonably authoritative. It would therefore be a great duplication of effort if IUCRM were to conduct its own independent study. Accordingly it was hoped that IUCRM members might study the US RAPP report and endorse it after any necessary modifications and reservations. However, even this procedure would require more time than is available prior to the planned publication of the URSI atmospheric probing

report. Of course, without endorsement by IUCRM, the US RAPP report could not be regarded as representing the international views of URSI.

This dilemma was left unresolved. However, because of timing, and the great difficulty of reviewing and revising the US report for endorsement by IUCRM, Profs Bolgiano and Atlas will recommend one of the following alternatives :

(1) that the URSI report on probing of the ionosphere be published alone, but that reference be made to the US National Academy of Sciences RAPP report on probing of the neutral atmosphere.
(2) that a summary of the US RAPP paper be included in the URSI report with reference to the complete US report.
(3) that the US RAPP report be published in full along with the URSI report, but that mention be made that the former does not represent the official views of IUCRM or URSI.

(f) *Joint IAMAP-IUCRM Symposium on "The Formation and Dynamics of Clouds and Their Interaction with the Environment, IUGG XV General Assembly, Moscow* 1971.

Upon his return to the US, Prof. Atlas received a proposal from Dr. Helmut Weickman that IUCRM and IAMAP co-sponsor a two-day symposium, entitled as above, at the XV General Assembly of IUGG in Moscow in 1971. The suggestion apparently originated with Dr. Borovikov in the USSR. The thought was that a special session would be held on laser and radar measurements in cloud physics. This proposal is clearly in line with IUCRM interests. It will also provide an important vehicle for the exchange of recent results between the very active cloud physics and radar research groups in the USSR and those elsewhere. Apparently the rules for the XV General Assembly require that special symposia must be of an interdisciplinary nature. The joint sponsorship of such a symposium by IAMAP and IUCRM would satisfy this ground rule.

Since co-sponsorship of such a meeting in Moscow would require no financial assistance from IUCRM, and since it is consistent with our goals, I recommend endorsement of this proposal. IUCRM members are requested to return the enclosed ballot expressing their views.

(g) *Acknowledgements Concerning the Stockholm Colloquium on "The Spectra of Meteorological Variables,,.*

Upon a motion by Monsieur Misme, the members unanimously expressed their deep appreciation and high praise to the organizing committee of the Stockholm colloquium, Messrs Eklund, Saxton and Wickerts, to their

colleagues and assistants, and to the Swedish National Committee of URSI, for the superb arrangements which guaranteed both success of the meeting and the pleasure of the participants.

(h) *New Members of IUCRM.*

The URSI members of IUCRM come up for review at the Ottawa General Assembly. However, it was thought that the time was ripe for a complete revision of the membership, including IUGG members. As a matter of general principle, it was agreed that members with the longest tenure on IUCRM should be relieved to make room for "new blood". In accordance with precedent, it was proposed by Dr. Saxton that the present officers should make the recommendations for the new slate of members. Profs Bolgiano and Atlas have therefore proposed the following action.

To be relieved : URSI members Misme, Bolgiano and Saxton (at his own request)
IUGG members Marshall, Robinson, and Tatarskii.

Proposed new members : URSI — J. A. Lane, D. Gjessing, and J. Strohbehn
IUGG — W. C. Swinbank, C. J. Readings, and a representative from the USSR.

Atlas will write to Dr. Pinus, Chairman of the USSR Committee of IAMAP for a recommendation concerning a Soviet member. It should be noted that the above proposed action does not become final until approved by URSI and IUGG.

Respectfully submitted,
David Atlas, *Secretary, IUCRM.*

Membership of IUCRM

Since the meeting of IUCRM reported above, URSI and IUGG have approved the following revised membership of IUCRM :

President : D. Atlas (USA).

Secretary : J. A. Lane (UK), Radio and Space Research Station, Ditton Park, Slough, Bucks., UK.

URSI Representatives : K. Brocks (Germany);
F. Eklund (Sweden);
D. Gjessing (Norway);
K. Naito (Japan);
J. Strohbehn (USA).

IUGG Representatives: R. Bean (USA);
E. T. Pierce (USA);
C. J. Readings (UK);
W. C. Swinbank (USA);
N. K. Vinnichenko (USSR).

X MEETING, ICSU EXECUTIVE COMMITTEE

EREVAN, OCTOBER 1969

The Executive Committee

(1) *Recommended* that the Officers be asked to set up a small group, including members concerned with the application of science, to draw, as it felt necessary, ICSU's attention, to specific problems resulting from the application of science and technology which affect world society.

(2) *Adopted* the report of the Treasurer.

(3) *Approved* the budget for 1970.

(4) *Adopted* the report of the Standing Finance Committee, and the recommendations contained therein.

(5) *Recommended* that an Inter-Union Commission on Geodynamics of IUGG and IUGS be established, with a membership not exceeding seven.

(6) *Approved* the new category of membership of COWAR.

(7) *Invited* SCAR to study the possibilities of extending its range of interest to include the promotion of co-operation on scientific research in the Arctic.

(8) *Recommended* that a Special Committee on Problems of the Environment (SCOPE) be created with a membership of 10, plus a Chairman, designated by the President of ICSU, together with one representative of each interested Union, at the expense of the Union concerned. The composition of the Committee to be decided by the Officers after receiving suggestion from the Members of ICSU, together with comments thereon from Profs. Coulomb and Farner.

(9) *Recommended* that the Joint Commission on Radioactivity be dissolved in accordance with the wishes expressed by the participating Unions.

(10) *Recommended* that an ad hoc committee, consisting of Messrs

H. Brown (Convenor), D. S. Farner, W. O. Fenn and H. W. Thompson, be requested to consider the proposal to prolong SCIBP for 2 years beyond 1972, and to report to the Officers at least 6 months in advance of the next General Assembly.

(11) *Expressed* its appreciation of the work of JOC, *Supported* the recommendation on GARP of the WMO Executive Committee (Resolution No 9 WMO EC21), *Requested* the Secretary General of ICSU in collaboration with the Secretary General of WMO, on the basis of the suggestions made by the ICSU Panel on GARP and of any further proposals made by the JOC, to organize a Planning Conference on GARP early in 1970, and to invite members of the ICSU family willing to take a significant part in the experiments to be represented at the Planning Conference on GARP.

(12) *Recognizing* that the final report of the ICSU-UNESCO Committee on UNISIST on the feasibility of a world-wide scientific information system will be available for distribution in the Summer of 1970, and with the understanding that the report leans to the view that such a system is feassible, the Executive Committee of ICSU *Expressed* its willingness to co-sponsor with UNESCO an international conference on scientific information in the Fall of 1961 for the purpose of stimulating commitments to UNISIST objectives.

The Committee made no financial commitment for the conference, but *Invited* the Chairman of the ICSU-UNESCO Committee on UNISIST to present a concrete proposal for ICSU participation to the Officers and the Executive Committee for their consideration four months in advance of the 13 General Assembly.

(13) *Resolved* that the question be studied of how the future of IAB could be related to UNISIST.

(14) *Adopted* the proposal from FAGS that a representative of IUGS be added to the Council of FAGS.

(15) *Noted* the recommendation by the 10 General Assembly, Vienna 1963, that the Unions adhering to ICSU adopt the policy of supporting free international collaboration among scientists,

Asked the Unions and their subdivisions to keep a record of visa refusals or abnormal delays,

Asked the Unions to exchange between themselves this information annually,

Asked the Unions and their subdivisions to take this information into account when selecting the location of future meetings, and

Requested the ICSU Standing Committee for the Free Circulation of

Scientists to develop the necessary procedure, in consultation with the General Secretaries of the Unions.

(16) *Recommended* that the Fédération Internationale de Documentation be admitted as a Scientific Affiliate of ICSU.

(17) *Recommended* that the International Federation of Information Processing Services be admitted as a Scientific Affiliate of ICSU.

(18) *Expressed* the grateful thanks of ICSU to the Armenian Academy of Sciences for the excellent way in which the meeting of the Executive Committee had been arranged.

US URSI COMMITTEE/IEEE SPRING MEETING

16-19 APRIL 1970

The above meeting will be held in Washington, D. C. in cooperation with the following IEEE Groups :

Antennas and Propagation	Information Theory
Circuit Theory	Instrumentation and Measurements
Geoscience Electronics	Microwave Theory and Techniques

Commissions 1-7 of the URSI Committee will hold technical sessions. The Secretary of the US URSI Committee is Dr. Francis S. Johnson, University of Texas at Dallas, P. O. Box 30365, Dallas, Texas 75230.

ELECTROMAGNETIC SCIENCE SERIES OF SHORT COURSES

The ESSA/CU series of short summer courses in electromagnetic science will again be offered in two sections from July 27 through August 8, 1970.

Sponsored by the Institute for Telecommunication Science (ITS) of the Environmental Science Services Administration (ESSA) and the Electrical Engineering Department of the University of Colorado, the classes are another in the continuing series of tutorial and specialized courses dating back to the radio propagation courses offered by the former Central Radio Propagation Laboratory.

The 1970 courses are : "Tropospheric Radio Propagation Engineering", July 27-August 7, organized by Albrecht P. Barsis, chief of the Tropospheric Radio Systems Predictions program for the ESSA Research. Laboratories (Fee $ 300); and "Electromagnetic Probing in Geophysics", August 3-8, organized by Dr. James R. Wait, senior scientist for the ESSA Research Laboratories (Fee $ 200).

The objective of the series is to offer high level, short, intensive courses conducted by recognized authorities for persons employed in the various phases of electromagnetic sciences.

Further information can be obtained from Prof. S. W. Maley, Electrical Engineering Department, College of Engineering, at the University of Colorado, Boulder, Colorado 80302.

URSI SECRETARIAT ADDRESS

Readers are required to note the new form of address of the URSI Secretariat which is as follows :

URSI,
Place Emile Danco 7,
1180 Brussels, Belgium.

Telegrams may be addressed, as before : URSISEC BRUSSELS BELGIUM.

ADRESSE DU SECRÉTARIAT DE L'URSI

Les lecteurs sont priés de noter que la nouvelle forme d'adresse du Secrétariat de l'URSI est :

URSI,
Place Emile Danco 7,
1180 Bruxelles, Belgique.

L'adresse télégraphique reste : URSISEC BRUXELLES BELGIQUE.

RÉUNION DU BUREAU
11-13 FÉVRIER 1970

Le Bureau de l'URSI a siégé à Bruxelles les 11, 12 et 13 février 1970; aux séances ont assisté tous les membres du Bureau ainsi que le Prof. Manneback, Président d'Honneur, qui avait été invité par le Président.

XVIe Assemblée générale

Le Secrétaire général a annoncé que le Compte Rendu de l'Assemblée d'Ottawa sortirait de presse vers la fin de février 1970 et que des exemplaires en seraient distribués, selon la procédure habituelle, à tous les Comités Membres et aux responsables de l'Union.

Progress in Radio Science 1966-1969 sera publié par l'URSI dans le courant de l'été 1970. L'ouvrage comprendra deux volumes de 400 pages et englobera les communications présentées à Ottawa dans le cadre des séances scientifiques des Commissions. Les Rédacteurs scientifiques, qui avaient été chargés par les Commissions de rassembler les documents et de les soumettre à une première rédaction, ont tous rempli leur mission.

Le Secrétaire général a informé les membres du Bureau que le coût total de la XVIe Assemblée générale se monterait à environ 43 000 dollars, y compris les frais de voyage et de séjour des responsables de l'Union, l'aide accordée à 18 jeunes scientifiques ainsi que la publication du Compte Rendu et de *Progress in Radio Science 1966-1969*. Il a été noté que le Comité organisateur canadien avait transféré à l'URSI l'excédent des recettes perçues au titre de frais d'inscription et que cette somme serait consacrée à couvrir en partie les frais des publications de l'Assemblée.

Prix de l'URSI

Conformément aux recommandations formulées à Ottawa par le Comité exécutif, le Bureau a réétudié la question des Règles pour l'attribution des Médailles d'Or Balth. van der Pol et J. H. Dellinger et du Prix Appleton. Les nouvelles Règles, approuvées par le Bureau, seront publiées dans le *Bulletin d'Information de l'URSI.*

Patronage de conférences scientifiques par l'URSI

Conformément à la Résolution 11 (1969) du Comité exécutif, le Bureau a approuvé le texte des règles et recommandations dont il s'inspirera pour accorder le patronage de l'Union à des colloques et autres conférences scientifiques internationales. Ce texte sera publié dans le *Bulletin d'Information de l'URSI.*

Comptes de l'exercice 1969

Le Secrétaire général a soumis aux membres du Bureau les comptes provisoires des recettes et dépenses de l'Union pour l'exercice 1969, en attendant la version définitive des comptes apurés. Il a été constaté que les recommandations formulées à Ottawa par le Comité des Finances relativement à la répartition des fonds destinés aux différentes activités scientifiques en 1970 avaient été suivies lors de l'établissement des comptes.

Comité du CIUS pour l'Enseignement des Sciences

Le Bureau a décidé que l'Union participerait aux activités du nouveau Comité pour l'Enseignement des Sciences et désignerait un représentant au sein de ce Comité (Résolution 9 (1969)). M. J. Voge, qui a représenté l'URSI à la première session du Comité, assistera également à la deuxième session pendant laquelle sera étudié plus en détail le programme d'activités de cet organisme.

Commission inter-Unions de la Lune

Le Bureau a étudié la proposition de l'Union Astronomique Internationale de créer une Commission inter-Unions ayant pour mission de coordonner les activités des Unions et des Comités du CIUS dans les différentes disciplines des études lunaires. Il a décidé d'appuyer cette proposition lors de la prochaine Assemblée générale du CIUS et, à l'issue de celle-ci, d'examiner la question de la représentation de l'URSI au sein de la nouvelle Commission.

CCIR et CCITT

Suite à sa récente Assemblée plénière à la Nouvelle Delhi, le CCIR adressera à l'URSI une nouvelle série de questions. En sa qualité de Coordonnateur URSI-CCIR, le Secrétaire général consultera les Présidents

des Commissions en vue de la constitution de petits groupes d'experts qui seront chargés de rédiger les Réponses de l'URSI.

Il a été noté que le Secrétaire général s'était rendu à Genève pour rencontrer le Directeur du CCIR, avec lequel il a mis au point certains détails concernant la collaboration URSI-CCIR, ainsi que le Directeur du CCITT, avec lequel il a examiné les prolongements éventuels de la Recommandation VI.1 (1969).

XVII[e] Assemblée générale, 1972

Le Professeur Groszkowski a annoncé que le Palais de la Culture et de la Science, situé au centre de Varsovie, avait été choisi comme siège de la XVII[e] Assemblée générale. Toutes les séances auront lieu dans cet édifice et les délégués seront logés dans des hôtels avoisinants.

Comme pour l'Assemblée d'Ottawa, les frais d'inscription seront destinés à couvrir les frais de location des salles, de l'impression de la brochure contenant les résumés des communications scientifiques, etc.

Il a été noté que le Secrétaire général avait établi un horaire provisoire pour la préparation de la Revue triennale de Radioélectricité scientifique, dont la publication a été recommandée à Ottawa par le Comité des Publications (voir Compte Rendu de la XVI[e] Assemblée générale, p. 70). Les instructions concernant le rassemblement des données relatives aux activités des Comités Membres seront diffusées en juin 1970. On espère pouvoir publier cet ouvrage peu avant le début de la XVII[e] Assemblée générale en 1972.

Réorganisation

Le Prof. Beynon, Président du Groupe de Travail constitué en application de la Résolution 2 (1969), a présenté un rapport verbal sur les activités de son Groupe et sur ses récents entretiens avec le Prof. Coulomb (Président du Groupe de Travail de l'UGGI pour les questions de réorganisation) sur les possibilités d'établir des liens plus étroits entre l'URSI et l'UGGI. Il poursuivra ces entretiens avec les membres du Groupe de l'UGGI ainsi qu'avec les autres organes intéressés du CIUS. Il espère pouvoir convoquer pendant l'été 1970 une réunion de son Groupe afin de mettre au point le rapport qui doit être soumis au Bureau de l'Union à la fin de septembre 1970.

BOARD OF OFFICERS MEETINGS 11-13 FEBRUARY 1970

The Board of Officers of URSI met in Brussels on 11-13 February 1970; all the members were present and Professor Manneback (Honorary President) also attended by invitation of the President.

XVI General Assembly

The Secretary General reported that the Proceedings of the Assembly would be published in late February 1970 and that copies would be sent, as usual, to all Member Committees of URSI and to the various Office-Bearers of the Union.

Progress in Radio Science 1966-1969 will be published by URSI during the summer of 1970. The two volumes each of about 400 pages will contain the papers presented in Ottawa at the scientific meetings of the Commissions. The text of all the papers have been received from the Scientific Editors, appointed by the Commissions, who had been responsible for collecting the papers from the authors and for preliminary editing.

The Secretary General reported that the total cost of the XVI General Assembly would be approximately $ 43,000 including travel and subsistence of the Office-Bearers, the support given to 18 young scientists and the cost of publishing the Proceedings and Progress in Radio Science. It was noted, however, that the Canadian Organising Committee had transferred the unused registration fees to URSI and that these would be used offset the cost of the publications relating to the Assembly.

URSI Awards

The Board agreed on drafts of the revised Rules for the Balth. van der Pol and the J. H. Dellinger Gold Medals and for the Appleton Prize. The new rules take into account the recommendations made in Ottawa by the Executive Committee. They will be published in the *URSI Information Bulletin*.

Cosponsorship of Meetings by URSI

Approval was given to the text of a set of rules and recommendations to be used by the Board in deciding whether or not URSI should agree to act as sponsor of international symposia and other meetings. The rules are based on the criteria given in Resolution 11 (1969) and will be published in the *URSI Information Bulletin.*

Accounts for 1969

The provisional accounts of income and expenditure in 1969, prepared by the Secretary General, were noted pending the completion of the audited accounts a copy of which was available in draft form. It was noted that, in the preparation of the accounts, consideration had been given to all the recommendations made by the Finance Committee in Ottawa relating to the allocation of funds for the various activities of the Union in 1970.

ICSU Committee on the Teaching of Science

The Board agreed to participate in the activities of the reconstituted Committee on the Teaching of Science and to nominate a representative to the Committee (Resolution 9 (1969)). M. J. Voge represented URSI at the first meeting and will do so at the next meeting when more detailed consideration will be given to the future programme of the Committee.

Inter-Union Commission on the Moon

It was noted that IAU had proposed the formation of an Inter-Union Commission on the Moon which would serve to coordinate the activities of Unions and Committees of ICSU relating to lunar studies in the various disciplines. It was agreed that URSI would support this proposal at the General Assembly of ICSU. The questions of URSI representation on the Commission will be considered after the ICSU Assembly.

CCIR and CCITT

Following the recent CCIR Plenary Meetings in New Delhi, a new series of questions will be submitted by CCIR to URSI. The Secretary General, as URSI-CCIR Coordinator, will consult the Chairmen of Commissions

concerning the nomination of small groups of experts who will be invited to prepare URSI responses.

It was noted that the Secretary General had visited the Director of CCIR to arrange cooperation and had, at the same time, met the Director of CCITT in order to discuss action on Recommendation VI.1 of the XVI General Assembly.

XVII General Assembly, 1972

Professor Groszkowski stated that the XVII Assembly would be held in the Palace of Culture and Science in central Warsaw. All the meetings will be held in the Palace and delegates will occupy nearby hotels.

As at the Ottawa Assembly there will be registration fees which will be used to cover the cost of renting the lecture halls and committee rooms, the printing of the booklet of abstracts, etc.

It was noted that the Secretary General had prepared a provisional time-table for the preparation and publication of the Triennial Review of Radio Science (See Proceedings of XVI Gen. Ass. p. 70). Member Committees will be notified, in June 1970, of the arrangements for the collection of information on the activities in their countries. It is intended to publish the review shortly before the XVII General Assembly in 1972.

Reorganization

Prof. Beynon, Chairman of the Working Group formed in accordance with Resolution 2 (1969), presented a verbal report on the activities of his Group and on his recent meeting with Prof. Coulomb (Chairman of the corresponding IUGG Working Group) on the possibility of establishing closer links between URSI and IUGG. He expected to hold further discussions with members of the IUGG Group and with other interested bodies in ICSU; he hoped to arrange a meeting of the URSI Group during the Summer so as to discuss progress before submitting a report on the work of his Group in September 1970.