Bulletin No 200 Décembre 1976

U.R.S.I.

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SAMUEL SILVER

As we go to press, it is with the deepest regret that we have received the news of the death on 5 November 1976 of Professor Samuel Silver, Honorary President of URSI, and President of the Union from 1966 to 1969.

An appreciation of Professor Silver's many contributions to URSI will appear in our March 1977 issue.

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MESSAGE DU PRESIDENT

La publication de ce deux centième numéro du Bulletin de l'URSI - trente-huit ans après son apparition en 1938 et vingt ans après le numéro 100 - marque un jalon dans la vie déjà bien remplie de notre Union. Notre Secrétaire Général, le Dr. Minnis, qui assume depuis bien longtemps la charge de sa composition et de sa rédaction, avec une compétence et un dévouement qui forcent l'admiration, a bien voulu rappeler à cette occasion quelques-unes des étapes de son histoire.

En 1938, l'URSI comptait 17 pays membres. Il y en a aujourd'hui 36. Je souhaite que la parution de ce numéro 200 coïncide avec une accélération de notre diffusion et de notre tirage (actuellement de 1.300 exemplaires). Ainsi se manifesterait avec évidence le succès de notre politique d'implantation dans les pays neufs sur la voie du développement, qui constitue l'un de nos objectifs primordiaux.

J. Voge

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THE URSI INFORMATION BULLETIN: DOUBLE CENTURY

The appearance of the 200th number of the URSI Information Bulletin provides an occasion for looking at the origins and the development of this publication over a period of 38 years and for asking ourselves whether any changes will be desirable in the future.

In January 1938, Monthly URSI Bulletin No 1 appeared for the first time and included 25 stencilled pages stapled into a green paper cover. During 1938 and 1939 the Bulletin consisted of three parts: information and announcements of interest to the Member Committees and the Commissions of the Union, titles of scientific documents received in the URSI Secretariat in Brussels, and an extensive section which contained the text of the recent Ursigrams and replaced the earlier bulletin of Ursigrams.

During the whole of 1938 and 1939 the Bulletin was published at monthly intervals in spite of the outbreak of World War II in September 1939, and it continued to appear up to April 1940 (No 28) shortly before the occupation of Belgium.

Publication was resumed in November 1946 (No 29) following a decision of the General Assembly in Paris in 1946. The format and contents of the pre-war years were retained except for the section containing the Ursigrams the distribution of which had not yet been reorganised.

In October 1947, the Bulletin (No 40) was typeset for the first time in an experimental format. The format adopted in January 1949 (No 55), with the now familiar grey cover, remained unchanged until December 1975 after which, in the interests of economy, an offset printing process was adopted.

The firm of Vaillant-Carmanne SA of Liège has printed the Proceedings of URSI General Assemblies since 1934 and the URSI Information Bulletin since 1949. It is worth recording the long history of cooperation, over a period of 42 years, between the URSI Secretariat and the successive representatives of this firm including the present Managing Director, Monsieur Georges Dengis.

From 1949 to 1967, the Bulletin appeared at intervals of two months. However, since 1968, following the elimination of material considered to be of secondary importance, it has been published quarterly. The general policy

regarding the Bulletin is determined by the General Assembly and, in 1972, the Finance Committee made two recommendations: that the Member Committees of URSI should be asked for their views on the value of the contents, and that a further attempt should be made to reduce the space devoted to less important material. The replies received led to the decision not to print articles of a scientific character since these were not appropriate to an information bulletin. It was decided also to reduce the amount of detail contained in reports of meetings of various kinds, especially of those relating to organisations of secondary interest to URSI.

As a result of these changes the average number of pages per year was reduced from 217 (1969-1972) to 155 (1972-1975) as shown in Table 1. The changes in the amount of space occupied by different types of information during these two periods are shown in Table 2.

Table 1: Size of the URSI Bulletin

Period	Issues/ year	Average number of pages per year	per issue
1965-1967	6	494	82
Sept.1969-June 1972	4	217	54
Sept.1972-June 1975	4	155	39

Table 2: Space occupied by different subjects in the URSI Bulletin

	Sept.1972 June 1975 %	Sept.1969 June 1972 %
URSI Assemblies	25	14
Member Committees(addresses)	19	9
Symposia(announcements & reports)	12	7
FAGS(including BIH and IUWDS)	9	5
URSI Commissions(including IUCAF and IUCRM)	7	13
Reorganisation of URSI	7	11
URSI Board of Officers	5	3
Obituaries	3	3
ICSU	2	4
Scientific articles	0	16
URSI Statutes	0	4
Miscellaneous	11	11
	100	100

At the General Assembly in 1975, the Publications Committee recommended that the contents should remain similar to what they had been between 1972 and 1975 and, as mentioned earlier, that an offset printing process should be adopted. Following a discussion on the format of the Bulletin, in the URSI Council in 1975, it was decided to adopt the international A5 page size at the same time as the change in the printing process which took effect as from the March 1976 issue.

Several readers have remarked that the offset Bulletin is less attractive than it was when it appeared in its traditional typeset form. Although this is a valid comment, the loss in style must be balanced against the decrease of about 30% in the cost of printing and distributing the Bulletin in its new offset format.

No doubt the Bulletin will be a subject for discussion at the General Assembly in 1978. In the meantime, the Secretary General would welcome comments on the value of its contents and suggestions for improvements.

6 November 1976 C.M. Minnis

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THE UNIONS AND ICSU

1. Introduction

During the URSI General Assembly in 1975, the URSI Council discussed certain aspects of the relations between the Scientific Unions and ICSU. As a result, Resolution C.9 was adopted in which the Board of Officers was requested to examine the position of the Unions within ICSU, and to report its conclusions to the URSI Assembly in 1978.

At the ICSU General Assembly in 1976, there was some discussion on the question whether or not resolutions adopted at ICSU General Assemblies were applicable also to the adhering Unions. The Assembly expressed no opinion on this question, but the General Committee decided to ask the incoming President to take it up with the ICSU Executive Board, and to bear in mind the views that had been expressed in the General Committee by the representatives of the Unions and of some of the Academies.

Thus the study of the relations between the Unions and ICSU which has been undertaken by URSI will proceed along lines parallel to that of the ICSU Executive Board. Many of those in URSI who are interested in this question may not be fully aware of the origins of ICSU and of the Unions, and the purpose of this article is to summarise the more relevant events of the period since 1900 and to point out several features of the present situation.

2. The International Research Council (1919-1931)

During the late 19th century, rapid developments in science and improvements in international communications led to the formation of various small groups of scientists which were more or less international in character. In order to coordinate the activities of these often independent groups, the Akademie der Wissenschaften in Göttingen took the initiative which led to the formation, in 1900, of the International Association of Academies. At that time the main centres of scientific research were in Europe and, probably for this reason, the principal participants in the Association, besides the Academy in Göttingen, were the Austrian (Vienna), Bavarian (Munich), German (Berlin), and Saxon (Leipzig) Academies and the Academy in Heidelberg. The activities of this Association terminated with the outbreak of World War I in 1914.

At the end of 1918, two conferences of scientific academies were held in London and Paris; later, on the joint initiative of the Académie des Sciences (Paris), the Royal Society (London) and the National Academy of Sciences (Washington), the International Research Council (IRC) was created during a Constitutive Assembly held in July 1919 in Brussels.

The objectives of the IRC were:

(1) to co-ordinate international efforts in the different branches of science and its applications;

(2) to initiate the formation of international Associations or Unions deemed to be useful to the progress of science in accordance with Article I of the resolutions adopted at the Conference of London, October 1918;

(3) to direct international scientific activity in subjects which do not fall within the purview of any existing international associations;

(4) to enter through the proper channels into relation with the Governments of the countries adhering to

the International Research Council in order to promote investigations falling within the competence of the Council.

A country adhered to IRC through its Academy of Science or an equivalent body. Each Academy designated delegates to the General Assembly of IRC; when dealing with questions other than those of a purely scientific character, the number of votes to which an Academy was entitled was determined by the population of the country. Between Assemblies, IRC was managed by an Executive Committee consisting of five members elected by the Assembly. Later, each of the Unions was permitted to nominate a representative.

The number of countries adhering to IRC rose from 12, the number of delegations present at the Constitutive Assembly in 1919, to 29 in 1925. However, in view of the fact that IRC was created immediately after the end of World War I, only the "Allied Powers" and neutral countries were permitted to apply for membership. In consequence, the Academies that had been most active in the earlier International Association of Academies were not represented in the new International Research Council.

In accordance with item (4) of its objectives, the IRC Constitutive Assembly in 1919 recognised several Scientific Unions, each concerned with a branch of scientific research in which there had already been some coordinated international activity. One of these Unions was the International Union of Scientific Radiotelegraphy, later to become universally known as URSI; this Union was the successor of the International Commission for Scientific Wireless Telegraphy which had met in Brussels on several occasions in 1913 and 1914. By 1922, in addition to URSI, the Unions concerned with astronomy, geodesy and geophysics, mathematics and chemistry had already begun their activities; by 1925, other Unions had been formed to deal with the biological sciences, geography and physics.

The creation of these Unions, and the incorporation within them of some of the smaller bodies that had preceded them, was successful in ensuring better coordination, at international level, of a wide range of scientific research. However, during the 1920's the Unions objected to their lack of freedom as adherents to IRC. For example, a Union could not amend its Statutes without the approval of IRC, and it could not admit

countries that did not already adhere to IRC. Moreover, since the "Central Powers" in Europe were excluded from membership of IRC, and hence of the Unions, IRC could not be regarded as a genuinely international organisation.

At the IRC Assembly in 1928, it was pointed out that the Unions had been specially created to deal with scientific questions whereas IRC was, above all, an administrative organisation which, in the view of the Unions, possessed unnecessarily wide powers. As a result of the various criticisms of IRC, the Assembly decided to establish a Commission which was given the task of revising the Statutes which had been in force since 1919 and which were, in any case, due to expire in 1931. This Commission consisted of three representatives of the Unions (IUGG, IUPAP and URSI) and 12 representatives of the Academies. The Commission later expressed the view that IRC should be dissolved and replaced by a new body to be known as the International Council of Scientific Unions (ICSU). It recommended also that the great majority of the members of the future ICSU Executive Committee should be designated by the Unions and that "ICSU ought to be, in a very large measure, an emanation "of the Unions."

The recommendations of the Commission were accepted by the IRC Executive Committee in 1930 and submitted to the General Assembly in 1931. When opening this Assembly, the President referred to the view that the freedom of the Unions was threatened by the superposition on them of the IRC which exercised "a too strict tutelage".

3. The International Council of Scientific Unions (1931-1946)

The Commission's recommendations were approved by the IRC Assembly in 1931 and the objectives of the newly created ICSU were:

a) to establish links between the national adhering organisations and the various international Unions;

b) to deal with the orientation of international scientific activity in fields where there were no existing international organisations;

c) to enter, through the national adhering organisations, into relations with the Governments of the countries adhering to the Council, in order to promote scientific investigations in these countries.

In addition, the Statutes of ICSU no longer contained a clause which excluded the adhesion of the "Central Powers" in Europe. As in the former IRC, the Executive Committee was authorised to direct the affairs of ICSU between Assemblies; it included 16 representatives of the eight Unions, two members elected by the Assembly, and the four ICSU Officers (President, two Vice-Presidents, and Secretary General). As a result of these changes, ICSU could claim that it was a truly international organisation and that its main concern was the development of the activities of the then existing and future Unions.

4. The International Council of Scientific Unions (1946-1976)

Since the end of World War II, the ICSU Statutes have undergone major changes on several occasions. In the present Statutes, adopted in 1972, the stated principal objectives of ICSU are:

a) to encourage international scientific activity for the benefit of mankind;

b) to facilitate and coordinate the activities of the International Scientific Unions;

c) to stimulate, design and coordinate international interdisciplinary scientific research projects, and

d) to facilitate the coordination of the international scientific activities of its National Members.

Moreover, in order to further the attainment of these objectives, the Council may:

a) enter, through the intermediary of the national adhering organisations, into relations with the Governments of their respective countries in order to promote scientific research in these countries;

b) maintain relations with the United Nations and its specialised and related agencies, and

c) make such contacts and mutual arrangements as are deemed necessary with other International Councils, other Unions or other organisations where common interests exist.

The former Executive Committee, which was responsible for the direction of the affairs of ICSU between Assemblies, has now been replaced by two new bodies: the General Committee and the Executive Board. The General

Committee consists at present of 18 representatives of the 18 Unions, 12 national representatives (elected by the Assembly), and the 5 ICSU Officers (President, Past President, Vice-President, Secretary General and Treasurer). It meets once per year and is responsible for dealing with scientific matters in general, including the coordination of the cooperative activities of the Unions and the various Committees set up by ICSU. The Executive Board meets several times each year and is responsible for the day-to-day management of ICSU affairs, and for all financial matters. It consists of two representatives of the Unions and two National representatives, elected by the General Committee from its own membership, and the five Officers mentioned above.

5. The Development of ICSU and the Unions

It is obvious that the present objectives of ICSU are very much wider than they were in 1931 and, in particular, they are no longer centred, above all, on developing the activities of the Unions. In consequence, ICSU has ceased to be a purely administrative body concerned with matters arising out of the scientific activities of the Unions. The Council has become increasingly involved in dealing with numerous broad questions which are not the concern of individual Unions, and with many matters arising out of the links with UNESCO since 1946.

The growth, since 1931, in the number of Unions and other bodies associated with ICSU is illustrated below:

	1931		1976	
National Academies, etc.		41		65
Scientific Unions:				
Exact sciences, etc.	7		11	
Life sciences	1		7	
		8		18
Inter-Union Commissions		1		4
ICSU Committees, etc. (excluding administrative bodies)		0		14

It can be seen that whereas, in 1931, responsibility for scientific activities was almost entirely in the hands of the Unions, it is now about equally divided (in terms of the number of separate organisations) between the Unions and ICSU. The relatively large increase in the number of Unions concerned with the newer life sciences is also

worth noting.

The principal reason for the large growth in the number of ICSU Committees, as compared with that of the Unions, is the increasing attention that is being given to international scientific projects of various kinds which can not easily be regarded as the responsibility of particular Unions. The first of these was the International Geophysical Year (IGY) in which astronomers, communication scientists, geophysicists and physicists associated with several Unions were involved. It was followed by the International Biological Programme which was of interest mainly to the Unions concerned with the life sciences. These two projects were limited in duration but ICSU Committees are involved also in longer-term investigations where no limiting date has been specified; for example, the problems of the pollution of the terrestrial environment, science in the developing countries, oceanographic studies, the availability of scientific data, and the applications of space vehicles to scientific research. In each of these, the subjects covered extend over the fields of several Unions.

6. ICSU Committees and Inter-Union Commissions

When the IGY was first proposed, responsibility for the central organisation was given to an Inter-Union Commission. However, because of the increasingly large scale of the programme, it eventually became clear that neither the Unions nor ICSU would be able to provide the large-scale financial support that was required for the central coordination of such a complex project. In consequence, it became necessary to ask the countries which had agreed to participate in the project to make a series of special contributions, in addition to those they already made to the Unions and to ICSU, for use by the IGY Commission. Since the Commission could no longer be regarded as an Inter-Union Commission, controlled and financially supported by the Unions, ICSU decided to change its status to that of a Special Committee of ICSU. Responsibility for the IGY was, therefore, transferred from the Unions to ICSU and to the participating countries which made available the necessary funds.

The IGY Committee was the first of a series of ICSU Committees and it has provided a model for most of the Committees that have been created since 1959; their activities are determined mainly by the resources that can be made available by the participating countries and

most of their financial needs are met by these countries and by ICSU.

Inter-Union Commissions, on the other hand, continue to be the joint responsibility of the Unions which created them and which provide most or all of the finance required for their operation.

The increase in the level of the activities of ICSU is reflected also in the finances of the Unions and of ICSU itself. Over the past 25 years, the combined contribution made to ICSU by the Academies, and similar national bodies, and by UNESCO has increased from $39,000 in 1950 to nearly $2 millions in 1975. If an allowance is made for the real increases in costs over this period and for the decrease in the value of the US dollar, this increase represents an increase in purchasing power of about 10 times.

However, this tenfold increase corresponds to an increase of about 7 times for the Unions, as compared to 30 times for ICSU and its Committees. In other words, the Unions now receive a much smaller proportion of the total funds than they did in 1950. The amounts and the corresponding percentages are shown in Tables 1, 2 and 3. The amounts given in dollars for 1950 should be multiplied by a factor of 4 or 5 in order to obtain amounts corresponding approximately to values in present-day dollars.

Table 1: Contributions of Academies and other National Sources to ICSU and the Unions

	1975		1950	
	$(000)	%	$(000)	%
Unions	776	47	17	81
Inter-Union Commissions	12	1	0	0
	788	48	17	81
ICSU	306	19	4	19
ICSU Committees, etc.	495	30	0	0
GARP	57	3	0	0
	858	52	4	19
	1,646(a)	100	21	100

(a) Excluding special contributions, interest, sale of publications, etc.: total $(000)500 (approx.).

Table 2: Allocation of UNESCO Grants to ICSU

	1975 $(000)	1975 %	1950 $(000)	1950 %
Unions	168	60	0	0
Inter-Union Commissions	9	3	15	83
	177	63	15	83
ICSU	0	0	3	17
ICSU Committees, etc.	103	37	0	0
GARP	0	0	0	0
	103	37	3	17
	$(000) 280	100%	$(000) 18	100%

Table 3: Ultimate Destination of Contributions and Grants shown in Tables 1 and 2

	1975 $(000)	1975 %	1950 $(000)	1950 %
Unions	901	47	17	44
Inter-Union Commissions	57(b)	3	15	38
	958	50	32	82
ICSU	198	10	7(c)	18
ICSU Committees, etc.	698(d)	36	0	0
GARP	72	4	0	0
	968	50	7	18
	$(000) 1,926 (a)	100%	$(000) 39	100%

(a) Excluding special contributions, interest, sale of publications, etc.: total $(000)500 (approx.).

(b) Grants made to ICG account for $(000)40 of the total.

(c) Excluding a UNESCO grant of $(000)14 for administrative and office expenses.

(d) Income from other sources amounted to $(000)165 and administration expenses to $(000)382.

7. Relations between the Unions and ICSU

7.1 Points for Discussion

In any discussion of the relations between the Unions and ICSU, several different aspects of the question must be considered:

a) the statutory position of the Unions as adherents to ICSU;

b) the implications of differences of opinion between the representatives of the Unions and of the Academies in the ICSU General Assembly;

c) the relative importance of the programmes of the Unions, and of the activities of the ICSU Committees;

d) the allocation, to the Unions and other ICSU bodies, of the funds provided by the Academies and UNESCO.

7.2 The Statutory Position

The title of ICSU is misleading since it gives rise to the mistaken view that the Council was created by the Unions, and that it is controlled by them. ICSU should be regarded rather as a loose federation to which certain international Unions and national Academies adhere voluntarily without losing any of their independence or their freedom to act in their own best interests.

A condition for the admission of a Union to ICSU is that its Statutes should provide for the direction of the Union by a General Assembly of its members. In view of this, it seems obvious that resolutions adopted by the ICSU General Assembly are not automatically applicable to the Unions. Such resolutions may, however, be submitted to the General Assemblies of the Unions for consideration.

In the case of URSI, the Board of Officers is authorised to make decisions of various kinds between Assemblies of the Union, but such decisions are subject to ratification at the next Assembly. Hence, ICSU resolutions can be submitted to the URSI Board of Officers for consideration, and possible action, before the next Assembly.

7.3 The Unions and the Academies of Science

Both the Unions and the Academies are represented in the General Assembly of ICSU. In most cases the National Committee which adheres to a Union is established by the Academy which adheres to ICSU.

It seems reasonable to assume that the opinions of an Academy, in so far as they refer to science in general, are influenced by the combined views of its own National Committees, and that these opinions are determined primarily by national policies and objectives. On the other hand, the views of an international Union, in relation to its particular branch of science, and also to more general questions, represent the consensus of opinion of a considerable number of National Committees in different countries.

It is sometimes assumed that the combined views of the Unions must necessarily coincide with those of the Academies since the Academies adhere, through their National Committees, to the Unions as well as directly to ICSU. This is a mistaken idea since it ignores the distinction made above, and also the different geographical distributions of the Academies which adhere to ICSU and those which adhere to the various Unions. Even if these distributions were identical, it would not automatically follow that international opinions on scientific questions and on general matters, as expressed by the Unions, must be the same as the collective national opinions of the Academies.

The possibility of differences of opinion between the Unions and the Academies has led to the view that the Unions should perhaps have an opportunity of expressing their own opinions on various subjects independently of those expressed by the Academies. The suggestion that there should be two separate International Councils: one for the Unions and one for the Academies is probably impracticable. It would appear to be preferable to devise some method whereby the ICSU Assembly could give formal recognition to differences of opinion between its international and its national adherents. This would permit further examination of the reasons for any differences and would facilitate progress towards a convergence of opposing points of view.

7.4 The Unions and ICSU Committees

There are, at present, 14 ICSU Committees (or similar bodies) which receive practically all their financial support from the Academies, either directly or through ICSU, and from the UNESCO grant to ICSU. Five of these deal with very general topics which cover the collection and classification of scientific data and of information contained in publications, with the teaching of science

and with applications of science in the developing countries. The remaining nine Committees are concerned with various specialised short- or long-term programmes in fields which are of interest to several Unions: water resources and the oceans, the terrestrial atmosphere and inter-planetary space, certain biological studies, etc.

Experience has shown that, although it is possible to set up a Committee with certain objectives in mind, it is much more difficult to decide when the Committee has achieved its principal objectives and when to terminate it. There is a natural tendency for those who are active in such Committees to seek reasons for continuing their existence. There is also a tendency for Committees to step outside their terms of reference and to attempt to deal with matters that are more appropriate to the Unions.

The upward trend in the number of ICSU Committees can obviously not continue indefinitely and, at some stage, it will be necessary to review the rôles of the Unions and the need for the continued existence of some of the Committees. This question does not arise in dealing with the Inter-Union Commissions since they are solely responsible to the Unions which created them and which provide practically all their financial needs.

7.5 Allocation of Funds

No doubt every Union and every ICSU Committee believes that it merits a greater proportion of the funds made available by the Academies and by UNESCO for the encouragement of international scientific activities. It would be inappropriate to attempt to discuss this question in more detail in the present article which deals only with the broader aspects of the situation.

Tables 1 and 2 above show the amounts paid in 1975 by the Academies, and other national sources, and by UNESCO grants to 17 Unions and 14 ICSU Committees. After allowing for the reallocation of the UNESCO grants by ICSU, and for the contributions made by the Unions to their Commissions and to certain ICSU Committees, the final destinations of the funds in question were as shown in Table 3. The proportions received by the Unions and by ICSU Committees were 50% and 40% respectively in 1975, as compared with 82% and zero in 1950.

It would be illogical to conclude that if the ICSU Committees were dissolved, the contributions released would all become available to the Unions, since certain

funds are specifically allocated for use in particular projects. It is sometimes asserted that it is uneconomical to establish a separate ICSU Committee for each project; the cost of administration of the 14 ICSU Committees in 1975 was $382,000: an average of $27,000 per Committee. These figures suggest that there is room for a review of the present situation, including an investigation of the possibility of grouping secretarial and administrative services, or of transferring responsibilities for certain projects to the appropriate Unions.

The aim of this article has been to outline the origins of ICSU and the Unions, and to refer briefly to certain aspects of the relations between these organisations and the Academies of Science. It has not been possible to go into great detail and the intention is rather to provoke discussion among our members which will be helpful to the Board of Officers when it meets in 1977.

12 November 1976 C.M. Minnis

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REPORT ON IUCAF
Meeting in Grenoble, August 1976

The Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science (IUCAF) is entering a particularly active period of work in preparation for a World Administrative Radio Conference (WARC) of the International Telecommunication Union (ITU) in 1979, at which frequency allocations for all services will be reviewed. The Commission has already prepared its provisional views on the allocations and requirements for radio astronomy, and is carrying out similar preparations in respect of space research. The XVIth General Assembly of the International Astronomical Union (IAU) in Grenoble in August-September 1976, provided an opportunity to discuss the provisional views with a number of other radioastronomers, including many who had been serving as IUCAF correspondents in various countries and had already seen the provisional IUCAF proposals for radioastronomy. An "open" meeting organised by Dr. John Findlay was therefore held in Grenoble the day before the IAU General Assembly formally started, and was followed on the next day by a meeting of the Commission itself to consider the opinions which had been expressed.

The proposals of IUCAF were mainly endorsed, but many detailed changes were suggested and there was considerable emphasis on the specific actions which needed to be taken to ensure that the wishes of the radioastronomy community will be taken fully into consideration. Among the many topics discussed, three emerged as being of special importance for the WARC. The first is the recognition that if more allocations and wider bandwidths are to be obtained for radioastronomy, this will be achieved only by sharing frequencies with other services when such sharing is technically feasible. The second is the impractibility of sharing with services in which transmitters radiate from balloons, aircraft or earth-satellites within the line of sight from an observatory, and the difficulty of operating even in adjacent or harmonically related bands when the transmissions are of high power. The third topic is the increasing interest in line observations at millimetre wavelengths and the need to decide which of the many lines that have been observed should have priority in the requests for protection. The IAU is currently sponsoring a world-wide survey of opinion on this issue, coordinated by Dr. Brian Robinson of Australia, and a report has already been submitted to IUCAF.

The revised IUCAF proposals will soon be distributed to the IUCAF correspondents in many countries and to national administrations responsible for frequency policies. Bearing in mind that a frequency conference can take formal account only of proposals from these administrations, their sponsorship or support is necessary if radioastronomers are to achieve any significant improvement in frequency allocations and protection. IUCAF is playing an important rôle in coordinating the presentation of the requirements, but it is essential that individual scientists should make strenuous efforts in their own countries to ensure that these requirements are considered fully in the formulation of national frequency policies. IUCAF will be glad to help in any way it can.

F. Horner
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4 November 1976

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RADIO OCEANOGRAPHY
Hamburg, 1976

A Colloquium on Radio Oceanography was held at the Max-Planck Institute for Meteorology, Hamburg, Germany (FR) from 29 September to 6 October 1976. The Colloquium was sponsored by the Inter-Union Commission on Radio Meteorology at the suggestion of the parent Unions: URSI and IUGG. Its purpose was to review research, both theoretical and experimental, on radio, radar, and microwave observations of the ocean, to establish the needs of oceanic scientists for such data, and to delineate new avenues of research on the topic.

The Programme Committee consisted of:

Chairman: John Apel (USA), Co-Chairman: Robert Stewart (USA), Donald Barrick (USA), Pierre Broche (France), David Cartwright (UK), K.N. Fedorov (USSR), Preben Gudmandsen (Denmark), Klaus Hasselmann (Germany), Gaspar Valenzuela (USA), Bradford Bean (USA) and Isaac Revah (France).

Local arrangements were handled by Werner Alpers of the Max-Planck Institute.

The Colloquium was attended by 70 radio scientists and oceanographers from 13 countries. Ten review and 26 research papers were delivered during the first three days. Of these, 30 were submitted for inclusion in the proceedings of the Colloquium and, after review, they will be published in Boundary-Layer Meteorology.

The final three days were occupied with panel meetings designed to assess the contribution of radio techniques to the solution of problems in large-scale oceanography, wind waves, and ice and frozen oceans. These panel reports, together with appendices, will be published in the proceedings. The appendices will contain lists of radio instruments on (or planned for) satellites, recent important Russian publications in radio oceanography, and recent review papers on this subject.

Of the review papers, four surveyed the fields that can or will make use of radio measurements. Klaus Hasselmann summarised what is presently known of the ocean wave spectrum and of the modulation of shorter waves by longer, larger ocean waves. Walter Düing, in a lecture on the variability of major ocean currents and eddies, showed that most of the kinetic energy of the ocean is in eddies with wavelengths of around 100 km and periods of one to

two months. Little is known about the distribution of this random motion or the processes which govern it. The time and space scales are suitable for observation by satellite, and these data may be both useful and necessary. Preben Gudmandsen summarised the information necessary for a better understanding of ice dynamics and discussed how the Arctic Ice Dynamics Experiment contributes to this work. R.S. Mather described a way in which satellite geodetic data, when fitted into a four-dimensional reference frame, can be used to study ocean topography, currents, and tides.

Six papers reviewed radio measurements of the marine environment. Donald Barrick summarised ways hf radio signals can be, and are being,used to measure ocean wave spectra and sea surface currents. Gaspar Valenzuela reviewed the theories of microwave scatter from the sea surface, and J.W. Wright related how observations of this scatter have been used to measure short ocean waves in ways that illuminate the processes which govern the motion of the sea surface and its response to the wind. Expanding on this theme, Charles Elachi illustrated a variety of interesting and important oceanic features that are observed by synthetic-aperture radars with resolutions of around 25m. Thomas Wilheit surveyed ocean surface and atmospheric processes which influence the microwave temperature of the sea as observed from space and discussed how a multifrequency radiometer can measure wind speed,surface temperature, and rainfall over the world's oceans. Finally a combination of four microwave intruments designed to measure sea surface topography, ocean waves, sea surface temperature, wind speed, and other parameters, to be carried by the SEASAT-A satellite, was described by James Dunne.

The research papers, delivered for a day and a half following the review papers, described recent work in radio oceanography including hf radio scatter, microwave scatter and radiometry, and recent experiments that have used radio techniques to study the ocean surface.

The session on hf scatter demonstrated that the theory for this relatively simple scatter is well understood, and that it can now be used to make oceanographic measurements. D. Crombie used scatter at short ranges to measure waves travelling against the wind, and concluded they must be generated by non-linear interactions between components of the wave spectrum. J.C. de Maistre,P.Broche,

and M. Crochet related radio observations to wind directions, and B. Lipa described a mathematical technique which allows radio scatter at a single radio frequency to be used to calculate the ocean-wave directional spectrum. In a similar manner, D. Trizna demonstrated that long-period swell can be observed with shorter radio wavelengths. Finally, two papers described radars which use radio scatter propagated via the ionosphere to measure waves at great distances. A new Australian system was described by P. Dexter, while W. Sandham reported on measurements of winds in an Atlantic storm observed by a radar in England.

The second session of research papers was devoted to microwave radiometry. H. Blume described an airborne two-frequency radiometer used to map sea-surface temperature and salinity in the Chesapeake Bay and nearby Atlantic waters. Comparison with ship observations showed that the system had an accuracy of 1°C for temperature and 1 part in 1000 for salinity. W. Campbell, in summarising the Arctic Ice Dynamics Experiment, demonstrated that radiometer and radar measurements, when combined, can be used to differentiate first-year ice from multi-year ice and to map ice movements. Continuing on this topic, Gloersen analysed the time variation of sea ice concentration and multi-year ice fractions within the Arctic basin over a four-year period using satellite and aircraft data. M. Tiuri, extending radiometer techniques into low salinity areas of the Gulf of Bothnia, reported that a 3-frequency vhf radiometer can measure ice thickness, and detect ice ridges. L. Thrane modeled the performance of a multi-frequency radiometer and the techniques for processing these data, to evaluate its performance under typical conditions. He is optimistic that future spaceborne radiometers will provide useful measurements of sea-surface temperature through clouds. Windsor weighed the benefits obtainable from such a satellite radiometer system, assuming that it performs as expected, against the cost of obtaining such data.

The session on microwave radar observations of the sea generated the most discussion and controversy, and indicated that this difficult subject is still developing. R. Harger began by describing mathematically how large ocean-wave structure can be estimated efficiently from microwave observations of short ocean waves. G.P. de Loor reported on wave-tank and ocean studies designed to understand the processes producing images seen by synthetic-

aperture radars. His work shows that such radars can see sand waves on the bottom in shallow areas of the North Sea, ocean waves, and oil spills. R. Shuchman examined the influence of ocean wave motion on the performance of a synthetic-aperture radar. His observations indicate that the wave's phase velocity causes defocusing of the image, not the orbital velocities predicted by some recent theoretical investigations. Two papers summarised what is known about the average radar cross-section of the sea at microwave frequencies. Both find that it depends on wind speed to some power, but with considerable scatter. R. Moore concludes that the scatter is most likely due to errors in the independent measurements of wind speed, while L. Jones concludes that there is considerable scatter even when the wind speed is well measured. Two other papers analysed the use of microwave scatter at vertical incidence for measuring wave height. S. Clifford pointed out that the wave height spectrum, at least in principle, can be derived from the phase fluctuations of the microwave signal. E. Walsh compared the wave height variance observed by an airborne radar with heights measured by a wave buoy, and found that they agreed within about 10%.

Two papers considered the application of satellite altimetry to measurement of the marine geoid. F. Vonbun compared the sea-surface topography observed by satellite altimeters with that predicted by models of the geoid, and found differences of 1m - 10m. B. Douglas pointed out that these differences come from inaccurate calculations of the satellite orbit. By using altimeter data at intersections of satellite passes, this error can be greatly reduced.

Several field experiments contributed to an understanding of processes influencing microwave scatter from the sea. Two papers, by W. Alpers and by A. Reece, investigated the hydrodynamic modulations of short waves by longer gravity waves. This process is of fundamental importance in accounting for the variability of the radar cross-section of the sea which allows microwave radars to image the longer waves. The wind/wave channel study by Reece measured the variation of wind-generated short waves in the presence of a sinusoidal, longer wave. Alper's data, collected during the North Sea Wave Observation Project, included radar measurements of wave modulation and wave heights. His theory, based on work by J. Wright, adequately explained the observed modulation

of radar cross-section. In another experiment, D. Ross and L. Jones measured the radar cross-section as a function of fetch at constant wind speed; they found no variation, although one was expected. Shemdin, using data collected off Florida, compared spectra obtained from X- and L-band synthetic-aperture radar images with wave buoy spectra. He found that the radar spectra compare well with wave-height spectra, and not with the wave-slope spectra as previously proposed. In a final paper, D. Levine investigated the effect of the ionosphere on SEASAT sensors, and concluded that it can be important during the peak of the sunspot cycle.

October 1976 Robert Stewart

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US NATIONAL COMMITTEE - AUTUMN MEETING

The Annual Meeting of the US National Committee of URSI was held in Amherst, Mass., from 11-15 October 1976 and a copy of the scientific programme has been received in the URSI Secretariat. The broad coverage of the field of telecommunications science and related subjects is illustrated by the topics covered in the sessions arranged by the local representatives of the URSI Commissions (see below).

A Antenna measurements, dielectric measurements.

A, B Dosimetry, microwave measurements and exposure systems; instrumentation - probes; auditory and sensory effects; prompt behavioural effects; central nervous system effects; immunologic and hematopoietic effects; physiological and behavioural effects; hyperthermia; therapeutic and diagnostic applications; developmental and mutagenic effects; ELF effects.

B Transmission lines and propagation; numerical solution of scattering problems; electromagnetism; antennas and arrays; ground effects on antennas; poles and transients; fibre and integrated optics.

C Signalling and processing.

C, E Electromagnetic coupling to leaky cables; telecommunications via leaky cables.

E ATS-6 electromagnetic survey; radio noise and interference.

F Remote sensing; radio meteorology; new satellite beacon propagation experiments above 10 GHz; electromagnetic and acoustic waves in the Earth environment; radio oceanography; Doppler radar studies of the atmosphere; scintillations and the turbulent atmosphere; electromagnetic devices, measurements and theory; scattering observations and effects.

G MF and HF propagation; transionospheric propagation and ionospheric irregularities; ionospheric structure.

J Communication with extraterrestrial intellingence; astronomical image formation; instrumentation; solar system and galactic radio astronomy.

Readers of the URSI Bulletin are requested to note that the papers presented at these meetings are not

published in a volume of proceedings. In general, authors arrange for the publication of their papers in the appropriate recognised scientific journals. Enquiries concerning further details of the programme should be addressed to:

Mr. R.Y. Dow,
Staff Officer, USNC/URSI,
National Academy of Sciences,
2101 Constitution Avenue,
Washington D.C. 20418, USA.

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LIGHTNING

A Symposium on Lightning Instrumentation was held in Uppsala, Sweden in November 1975. Approximately 20 participants from European countries and the USA were present. The proceedings (135 pages) are now available at a nominal cost of $30. Orders should be sent to:

Institutet för Högspänningsforskning,
S - 755 90 Uppsala, Sweden.

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ELECTROMAGNETIC WAVE THEORY

The next URSI Symposium on Electromagnetic Wave Theory will be held, from 20-24 June 1977, at Stanford University, Palo Alto (near San Francisco), California, USA. It is being organised in conjunction with the IEEE Symposium on Antennas and Propagation and the annual technical meeting of the US URSI Committee.

As in previous Symposia in this series, the main emphasis will be on recent developments in electromagnetic theory, including such subjects as wave propagation, scattering and diffraction, antennas, and the relevant mathematical and numerical techniques. The Symposium will be concerned primarily with recent theoretical advances, but papers containing experimental results will also be welcome, particularly if they contribute to a better understanding of the theory. Papers dealing with the impact on electromagnetic theory of, for example, optics and microwave acoustics will also be welcome.

Intending contributors are required to submit summaries (original plus 3 copies) of their papers. These

should be typed, single spacing, on white paper (215 mm x 280 mm approximately) with double spacing between paragraphs and margins of 25 mm. The title, in capital letters, should appear at the top of the first page and be followed by the author's name and affiliation. The length of the summary, including diagrams and references, must not exceed three pages.

Summaries should be sent, by 1 January 1977, to:

Dr. Frederick M. Tesche,
Science Applications, Inc.,
P.O.Box 277,
Berkeley, California 94701, USA,

who will notify the authors in early February whether their papers have been accepted.

Accepted summaries will be reproduced, as submitted, in a Digest which all participants will receive on arrival.

Further information about the arrangements for the Symposium will later be available from Dr. Tesche at the above address.

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TRAVELLING INTERPLANETARY PHENOMENA

A specialised Symposium on the Study of Travelling Interplanetary Phenomena will be held in Tel Aviv, Israel, from 7-10 June 1977, in connection with the XX COSPAR Meeting. The Symposium is being arranged as a Memorial to Dr. Leendert Dirk de Feiter who died in 1975.

Intending authors are invited to send their abstracts to:

Dr. Murray Dryer,
Space Environment Laboratory,
NOAA/ERL,
Boulder, Colorado 80302, USA,

with additional copies to the COSPAR Secretariat in Paris and to the authors' respective national institutions. The last date for the receipt of abstracts is 15 February 1977.

Particular attention will be given to results obtained during the STIP Intervals: September-October 1975 and 15 March - 15 May 1976.

ELECTROMAGNETIC COMPATIBILITY
Montreux 1977

The Second Electromagnetic Compatibility (EMC) Conference and Exhibition will be held in Montreux, Switzerland, from 28-30 June 1977. The successful first presentation of this biannual event in 1975 was attended by 450 participants from 25 countries and there were 19 exhibitions of scientific equipment, etc. The Proceedings (570 pages) included 108 papers.

The scope of the forthcoming EMC Symposium is, as before, the interaction of radio-frequency energy with electrical and biological systems, the pollution of the radio spectrum, and system immunity.

In accordance with arrangements made between the Chairman of the Programme Committee (Prof. F.L. Stumpers) and the Chairman of URSI Commission E (Dr. Ya.I. Likhter), a special session is being organised by URSI. This will deal with topics relating to statistics of quasi-impulsive noise and to signal processing in the presence of noise.

A detailed programme will be available in February 1977. Intending participants who have not already made contact with the organisers are invited to write to:

Ing. T. Dvorak,
ETH Zentrum/HF,
CH - 8092 Zurich,
Switzerland.

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US NATIONAL COMMITTEE OF URSI

The Secretary (Dr. J.R. Wait) of the US Committee has made available a list of meetings and symposia which are being arranged by his Committee, often in cooperation with another national organisation or with an URSI Commission. Enquiries relating to these meetings or to the possible publication of the Proceedings should be addressed to the Chairman of the local arrangements or of the technical programme Committee as indicated below.

1977

19-24 June — NC[+] + URSI Commission B, EM Theory, J.Damonte, 1716 Hillman Ave., Belmont, CA 94002, USA.

19-24 June — NC + IEEE AP-S[++] (some Commissions), K.K. Mei, Dept. of Electrical Engineering and Computer Sciences, College of Engineering, University of California, Berkeley, CA 94720, USA.

30 Oct.-4 Nov. — NC + URSI Commission A, Biological effects of EM waves, S.W. Rosenthal, Polytechnic Institute of New York, 333 Jay Street, Brooklyn, NY 11201, USA.

1978

9-13 Jan. — NC (all Commissions), S.W. Maley and J.R. Wait, Dept. of Electrical Engineering, University of Colorado, Boulder, CO 80309, USA.

15-19 May — NC + IEEE AP-S (some Commissions), G.Hyde,Mgr. Propagation Studies Dept., Comsat Labs,P.O.Box 115, Clarksburg, MD 20734 and I. Katz,Applied Physics Lab., Johns Hopkins University, Johns Hopkins Road, Laurel, MD 20810, USA.

5-10 Nov. — NC (all Commissions), S.W. Maley, Dept. of Electrical Engineering, University of Colorado, Boulder, CO 80309, USA.

1979

18-21 June — NC + IEEE AP-S (some Commissions), A. Ishimaru Dept. of Electrical Engineering, FT-10, University of Washington, Seattle, WA 98195,USA.

1980

2-6 June — US and Canadian National Committees (all Commissions), J.A. Cummins, Université Laval,

Dépt. de Génie Electrique, Faculté des Sciences, Cité Universitaire, Québec, Canada G1K 7P4 and F.J.F. Osborne, Plasma and Space Physics Lab., RCA Ltd Research Labs, Ste-Anne-de-Bellevue, P.Q., Canada.

+ NC = US National Committee of URSI

++ IEEE AP-S = Institution of Electronics and Electrical Engineers (Antennas and Propagation Symposia).

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CORRECTION A LA DUREE DE L'INTERVALLE UNITAIRE DU TEMPS ATOMIQUE INTERNATIONAL ET DU TEMPS UNIVERSEL COORDONNE

1. Le Comité Consultatif pour la Définition de la Seconde, dans les instructions pour la mise en pratique du Temps Atomique International (TAI), établies en 1970, et dans sa Recommandation S4 (1974) a spécifié que l'intervalle unitaire du TAI doit être égal à la seconde du Système International d'Unités rapportée à un point fixe de la Terre au niveau de la mer.

2. L'Union Astronomique Internationale, en août 1976, prenant note de la différence entre l'intervalle unitaire du TAI et la seconde du SI au niveau de la mer, a adopté la Résolution suivante (Résolution No 2 des Commissions 4 et 31):

(Les Commissions 4 et 31 de l'UAI)

Considérant

(a) que l'UAI a adopté pour la dynamique du système solaire une nouvelle échelle de temps basée sur la seconde du Système International d'Unités (SI),

(b) que la nouvelle échelle est étroitement reliée au Temps Atomique International (TAI) et qu'une haute uniformité et une haute exactitude du TAI sont souhaitées et

(c) qu'il a été établi, par référence aux étalons primaires améliorés, que la durée présente de l'intervalle unitaire de l'échelle TAI diffère de la seconde du SI au niveau de la mer de $(10 \pm 2) \times 10^{-13}$ s,

recommandent

qu'un unique ajustement par saut de $+10 \times 10^{-13}$s soit effectué à 0h 0m 0s TAI, le 1er janvier 1977, afin d'amener la durée de l'intervalle unitaire de l'échelle du TAI en bon accord avec la seconde du SI au niveau de la mer et que par la suite l'uniformité et l'exactitude du TAI soient maintenues.

3. En accord avec la Résolution précitée, la durée de l'intervalle unitaire du TAI sera accrue de 10×10^{-13}s exactement à la date 1977 janvier 1, 0h TAI (c'est-à-dire 1976 décembre 31, 23h 59m 45s UTC).

4. En conséquence, la durée de l'intervalle unitaire du Temps Universel Coordonné, UTC, sera également accrue de 10×10^{-13}s exactement à la date 1976 décembre 31, 23h 59m 45s UTC et

5. Les fréquences émises dans le système UTC devraient décroître de 10×10^{-13} en valeur relative, à la date 1976 décembre 31, 23h 59m 45s UTC.

B. Guinot
Directeur du BIH

20 septembre 1976

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SAUT DE TEMPS DE UTC LE 1er JANVIER 1977

En accord avec les Recommandations du Comité Consultatif International des Radiocommunications et de l'Union Astronomique Internationale, nous annonçons que:

une seconde intercalaire positive sera introduite à la fin de décembre 1976. La séquence des dates des repères de secondes de UTC sera:

31 déc.1976, $23^h\ 59^m\ 59^s$
31 déc.1976, $23^h\ 59^m\ 60^s$
1 jan.1977, $0^h\ 0^m\ 0^s$

B. Guinot
Directeur du BIH

15 octobre 1976

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USE OF IONOSONDE NETWORK DATA

A recent study of requests made to World Data Center A for Solar-Terrestrial Physics for vertical incidence ionospheric data led to the following summary. During the year July 1975 through June 1976, data were requested from 86% of the vertical incidence stations believed to be currently operating (126 out of 146) and from 58% of all stations whether currently operating or not, and whose data are held at WDC-A (185 out of 320). The 1,015 requests during the year resulted in the transmission of 9,636 station-months of data. This is of the order of 5.5 times the present annual accumulation of data. Actually, 1,519 more station-months of data were requested but were unavailable, mainly because of the rate of data flow to WDC-A, or because the station for which data were requested was not in operation for time wished, or because the requester wanted data in an unavailable format. There were 59 stations, not currently operating, for which data were requested and this indicates that the reopening of stations in many geographic locations would be welcomed.

The table below gives evidence of the desire for data from all regions of the earth. Statistics are given on the number of requests and the number of stations involved for four longitude divisions (with three latitude ranges in each) plus data from the South Pole separately.

Longitude Range	Latitude Range	Number of Requests	Number of Stations Involved
40°-130°E (Asia)	above 40°N	86	18
	40°N-40°S	95	23
	above 40°S	15	6
130°-220°E (Pacific)	above 40°N	45	10
	40°N-40°S	98	15
	above 40°S	25	7
220°-310°E (Americas)	above 40°N	193	21
	40°N-40°S	178	29
	above 40°S	12	3
310°-40°E (Europe/ Africa)	above 40°N	202	35
	40°N-40°S	41	12
	above 40°S	21	6
South Pole	90°S	6	1

The more recent data, those for 1970-1976, were in greater demand. For example, 44% of the ionograms requested were from those years. Though data from all years were requested, the IGY period 1957-58 and the IQSY period 1960-65 remained popular with 27% and 16% of the ionogram requests.

World Data Center A for Solar-Terrestrial Physics would, on request, be happy to share the above details in terms of individual stations. Such summaries have been furnished to the large ionosonde networks. For total usage of vertical incidence ionospheric data, it would be necessary to ask the other World Data Centers to prepare similar reports. Additionally, there is also a great deal of direct exchange of data from the networks to the users without the intermediary of the World Data Center system.

The continuing need for a widespread geographical network of the order of 150 ionosonde stations seems to be indicated by the recent data usage.

November 1976 J. Virginia Lincoln

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INTERNATIONAL GEOPHYSICAL CALENDAR 1977

The operational edition of the Calendar for 1977 (see following pages) has been issued by the International Ursigram and World Days Service (IUWDS) and copies are available on request from:

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

or

Miss J.V. Lincoln,
WDC-A for STP,
NOAA,
Boulder, Colorado 80302, USA.

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

International Geophysical Calendar for 1977

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

JANUARY

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

FEBRUARY

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

MARCH

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

APRIL

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

MAY

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

JUNE

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

JULY

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

AUGUST

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

SEPTEMBER

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

OCTOBER

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

NOVEMBER

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

DECEMBER

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

JANUARY 1978

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

(18) Regular World Day (RWD)

(19) Priority Regular World Day (PRWD)

<16> Quarterly World Day (QWD) also a PRWD and RWD

2 Regular Geophysical Day (RGD)

[18] Day of Solar Eclipse

19* Dark Moon Geophysical Day (DMGD)

[9 10] World Geophysical interval (WGI)

[3 Day with unusual meteor shower activity, Northern Hemisphere

5] Day with unusual meteor shower activity, Southern Hemisphere

[16 17] Airglow and Aurora Period

1. N-MAC (noon-midnight auroral correlations) periods are: Jan. 12-26, Mar. 10-24, Nov. 5-19 and Dec. 4-18, 1977.

2. IAGA/URSI Working Group on Passive Electromagnetic Probing of the Magnetosphere international campaign June 21-July 20, 1977.

3. Special Satellite Periods identified by Satellite Situation Center: Jan. 3, 0700—Jan. 5, 1000; Jan. 27, 0300—Jan. 28, 2300; Feb. 3, 1000—Feb. 4, 0800; Mar. 5, 1200—Mar. 7, 1800; Apr. 13, 0000 — Apr. 15, 0000; Jun. 25, 2000—Jun. 28, 0600; Jul. 10, 1800—Jul. 11, 0800; Aug. 3, 2000—Aug. 5, 1800; Aug. 13, 0000—Aug. 14, 1200; Aug. 28, 1700—Aug. 29, 0900; Oct. 13, 1900—Oct. 16, 0600; Oct. 16, 0400—Oct. 18, 1200; Oct 26, 1100—Oct. 27, 0100; Nov. 21, 0300—Nov. 23, 0600; Nov. 24, 2000—Nov. 26, 0600; Nov. 27, 1400—Nov. 30, 0500; Dec. 13, 1800—Dec. 15, 2300; Dec. 23, 0300—Dec. 23, 1800; Dec. 27, 1900—Dec. 30, 0600.

OPERATIONAL EDITION, AUGUST 1976

see other side

URSI MEMBER COMMITTEES

The following list of names and addresses of Presidents and Secretaries of URSI Member Committees is based on information available in the URSI Secretariat on 15 November 1976. It would be appreciated if any errors or modifications could be notified to the URSI Secretariat before 15 May 1977 for inclusion in the June issue of the URSI Bulletin.

ARGENTINA:

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

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

AUSTRALIA:

President: Prof. W.N. Christiansen, School of Electrical Engineering, University of Sydney, Sydney, N.S.W.2006.

AUSTRIA:

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

BELGIUM:

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

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

BRAZIL:

President: Dr. F. de Mendonça, Scientific Director CNAE, C.P. 515, Sao José dos Campos, Sao Paulo.

BULGARIA:

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

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

CANADA:

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

Secretary: Dr. J.Y. Wong, National Research Council of Canada, Montreal Road, Bldg M-50, Ottawa, Ontario, K1A OR8.

CZECHOSLOVAKIA:

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

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

DENMARK:

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

EGYPT, ARAB REPUBLIC OF:

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

GERMAN D.R.:

President: Prof. Dr. Ing. H. Frühauf, Technische Universität Dresden, Helmholzstrasse 18, DDR-8027 Dresden.

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URSI COMMISSIONS

The following lists of Official Members of URSI Commissions is based on information received in the URSI Secretariat up to 15 November 1976. Where the names of Official Members of the new Commissions have not yet been submitted, a blank space has been left so as to permit them to be inserted when they become available.

Additions and modifications to these lists will be published in the June issue of the URSI Bulletin. It would be appreciated if notification of these could be submitted so as to arrive in the URSI Secretariat not later than 15 May 1977.

The next complete lists will be published in the December 1977 issue of the Bulletin.

Commission A - Electromagnetic Metrology

Chairman: Dr. H.M. Altschuler, National Bureau of Standards, 272.10 Room 4066, Boulder, Colorado 80302, USA.

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Commission B - Fields and Waves

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Commission C - Signals and Systems

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JSA: Mr. G. Hagn.

USSR: Dr. Ya.I. Likhter.

Yugoslavia:

Commission F - Wave Phenomena in Non-ionized Media

Chairman: Mr. F. Eklund, Research Institute of National Defence, Dept.3, S-104 50 Stockholm 80, Sweden.

Vice-Chairman: Prof.A.T. Waterman, Jr., Stanford Electronics Laboratories, Stanford, Calif.94305, USA.

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Yugoslavia:

Commission G - Ionospheric Radio and Propagation

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