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MARTIN RYLE

1918-1984

We regret to announce the death, on 14 October 1984, of Sir Martin Ryle, FRS. After completing his studies at the University of Oxford, he was one of the University graduates who were recruited in 1939 to assist with the operation and further development of the radar chain in England.

His wartime experience with radio techniques may well have influenced his later career for, on going to Cambridge after the war, he developed the radio equivalent of the optical Michelson interferometer which had been used for observations of stellar diameters. The study of the results obtained with the radio interferometer led ultimately to the conclusion that the great majority of the radio sources identified were extragalactic, a result which had important implications for cosmological studies.

However, Ryle's most spectacular achievement was probably his conception and his ultimate successful development of the 'synthetic aperture' technique, with which angular resolutions of a second of arc or less can now be achieved. The most advanced applications of this technique permit radio maps of stellar objects to be produced which have an angular resolution greater even than that attainable with optical instruments.

As early as 1963, URSI recognised the outstanding character of Ryle's achievements in awarding him the first Balduin van der Pol Gold Medal. In 1966 he received his knighthood, and in 1972 had the exceptional distinction of being appointed Astronomer Royal, even though he had never been Director of the Royal Greenwich Observatory. Although they worked in somewhat different branches of radio astronomy in Cambridge, Ryle and Hewish were jointly awarded the Nobel Prize for Physics in 1974. Unfortunately, since then, and to the regret of many of his colleagues, ill health severely limited his scientific activities.

GUIDELINES FOR URSI SPONSORSHIP AND CO-SPONSORSHIP OF SYMPOSIA

During the XXI General Assembly in Florence (August/September 1984), the URSI Council decided that a new set of Guidelines for the sponsorship and co-sponsorship of Symposia by URSI should be prepared. The Guidelines, reproduced below, have been circulated to the officers of the URSI Member Committees and of the Commissions and Inter-Commission Working Group.

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In order to promote its scientific objectives, URSI sponsors two kinds of meetings:

- (a) those which are organized by the URSI Commissions (for example, the URSI Symposium on Electromagnetic Theory, arranged by Commission B), the Working Groups, or the Member Committees; they should be particularly encouraged;
- (b) those which URSI co-sponsors, but which are organized by scientific bodies outside the Union.

Sponsorship may be granted in three different modes:

MODE A: Without financial support by URSI.

MODE B: Granting by URSI of a fixed, unconditional sum. This money should be spent in a manner which does not conflict with the rules of the host country. Typically it covers expenses of key speakers, young scientists, or other deserving scientists judged to be in need of support.

MODE C: Granting by URSI of a fixed sum, together with a supplementary sum which is to be regarded as a loan. The fixed sum should be spent in a manner which does not conflict with the rules of the host country. Typically it covers expenses of key speakers, young scientists, or other deserving scientists judged to be in need of support. The supplementary sum, typically used to cover preparatory costs such as publicity and correspondence,

is a loan, and it must be reimbursed if the meeting shows a profit. Partial reimbursement should be made if the profit is not sufficient to cover the totality of the loan.

URSI will not agree to participate financially in an event with a potential deficit. With regard to the coverage of unavoidable deficits, the total URSI share of the sum of such deficits may not exceed the net worth of the funds set aside for such purposes.

To secure URSI sponsorship for a Symposium, the organizers are asked to adhere to the following guidelines:

- (1) Select the desired mode of URSI participation from those sketched above (A, B or C).
- (2) Write an application for URSI participation, as detailed below. It is expected that this application will be made at least 8 months before the starting date of the meeting.
- (3) To accelerate matters, already secure the approval of the Chairman of the relevant URSI Commission, as well as a letter of endorsement from the Member Committee of the host country.
- (4) Send the application to the URSI Secretariat.

The URSI Secretariat will process the application, and send it to the relevant authorities (Board of Officers, Commission Chairman for endorsement, etc.). Preference for financial support will be given to Symposia proposed by the Commissions, but proposals by Member Committees will also receive consideration. Intended Symposia should display an international character, with an appropriate international representation on the scientific programme committee.

The application must include:

- (1) Title of the Symposium, subject matter and scope.
- (2) Proposed location and date.
- (3) Name and affiliation of (i) the Chairman of the Symposium, (ii) the proposed representative of URSI.
- (4) Names of participating organizations (both URSI and non-URSI) and the degree of their responsibilities or involvements.

- (5) A declaration that the host country adheres to the ICSU Rules on the free circulation of scientists, which imply that "bona fide scientists should not be excluded from participating in international scientific meetings because of race, religion, political philosophy, ethnic origin, citizenship, language or sex". In particular, no obstacles should exist to the granting of visas to bona fide scientists.
- (6) A statement for the purpose for which any money to be provided by URSI is to be used. Budgetary information should be submitted to confirm adherence to the above mentioned conditions of sponsorship.
- (7) Details of any items concerning participation by Young Scientists (defined as scientists of at most 35 years of age).
- (8) Information on the intended registration fee (which should be based on a realistic estimate of a break-even number of participants, but should also consider affordability).

After the meeting, the organizers must submit:

- (1) A short report on the meeting, in a form suitable for publication in the *URSI Information Bulletin*;
- (2) In the case of Modes B and C, a suitably detailed financial account which, for Mode C, should show the balance of profits or losses, and should include statements on income and expenditure.

THE MEASUREMENT OF SOLAR ACTIVITY

Foreword

This document was prepared at the request of the Council of the Federation of Astronomical and Geophysical Services at its meeting in May 1984. The author wishes to acknowledge with thanks the comments and the supplementary information that he received from those to whom the first draft of the document was submitted: L.W. Barclay, J. Kovalevsky, G. Pillet, K. Rawer and P. Simon.

Indices of Solar Activity

It is well known that the activity of the Sun is cyclic, and that the maxima and minima recur at intervals of about 11 years. However, although there is no single method of measuring the level of "solar activity", observations and measurements relating to many different phenomena can be made and these are often used as the basis for so-called "indices" of solar activity. Such indices are in general agreement about the duration of a solar cycle but, for any given index, the amplitude of the cycle depends on the type of data on which the index is based.

The best known index of solar activity is the Relative Sunspot Number developed by Wolf; this is based on an empirical combination of the numbers of sunspot groups and of individual spots visible on the disk on a given day. Quite reliable values of this index date back to the mid-18th century and are generally treated as a homogeneous series. Monthly and annual mean values of the index are often used as a basis for comparison with indices derived from other types of observation and measurement.

The electromagnetic radiation emitted by the Sun extends over the whole spectrum from x-rays to radio waves, and some of these emissions exert a strong influence on the Earth's atmosphere. In addition, there are the important particle emissions which constitute the solar wind and which also affect the terrestrial environment. Both the electromagnetic and the particle radiations can be recorded using artificial satellites or, in some cases, by making ground-based observations. In other cases, variations in the intensity of these radiations can be

deduced indirectly from observations of physical phenomena occurring in the terrestrial environment, and especially in the atmosphere and the geomagnetic field. Such observations, whether made in satellites or on the ground, can provide the basic data required for constructing solar indices of various kinds.

Errors in Indices

Since different types of measurement lead to different measures of "solar activity", there can be no absolute criterion for assessing the accuracy of any given index. Nevertheless, it is clear that all the indices that have been devised are subject to the usual errors of measurement or of interpretation of data, and often to errors in the calibration of the measuring instruments. Where diurnal or seasonal variations are superposed on those attributable to changes in the incident solar radiation, the elimination of these short-term changes is also a potential source of error.

The unsmoothed series of values of a solar index will fluctuate above and below what is assumed to be the main component of the trend of solar activity. Such fluctuations may have real but unidentified origins, but in many applications it is frequently convenient to regard them as statistical errors. When such errors appear to be large, it is often desirable to smooth them out by using moving averages, rather than the individual hourly, daily or monthly values in the series, as the best available indication of the trend of solar activity.

In practical applications of solar indices, the statistical and other errors may or may not be a significant factor. For example, studies of the broad characteristics of the sequence of solar cycles are based mainly on the information contained in the long series of Relative Sunspot Numbers which covers about 20 cycles. In such studies, and especially when making forecasts of the future level of solar activity, it is usual to concentrate attention on the 12-month moving average rather than on the very erratic monthly or daily average values of the sunspot number. In such circumstances it is reasonable to accept the inevitable smoothing out also of the real short-term variations in the index in order to simplify the forecasting procedures and to enable an approximate value of the index to be obtained for some future date.

However, it is often overlooked that the most recent available value of a 12-month moving average always refers to a date 6 months backwards in time. Hence, if there is a requirement for a forecast relating to a date 12 months ahead of the present time, then the index must be extrapolated over an interval of 18 months with an increased risk of error. It should be remembered also that, even if the future value of a 12-month average has been forecast without any error, there may still be a large difference between the apparent level of activity, as indicated by the average value of the index, and the real value for the central month or day to which the forecast is intended to apply. This discrepancy represents the price that must be paid for adopting the smoothing procedure, and hence for ignoring the probable existence of short-term changes in the level of solar activity.

Since each sunspot can be regarded as a local centre of activity, it seems not unreasonable to assume that the overall level of activity will be related in some way to the total number of spots and spot groups visible on the solar disk. However, the short-term fluctuations in the values of the sunspot number are often very large, and they usually do not accurately reflect the changes in the solar emissions that have the greatest influence on terrestrial phenomena. This situation had led to the search for and the development of other indices that are more closely correlated to the important sources of solar radiation.

Forecasts of Indices

Although numerous investigations have been made of the statistical characteristics of the solar cycle, no satisfactory explanation of the variations has yet been discovered. Fourier analyses of the past 20 cycles have led to no conclusive results, and it seems more likely that each new cycle is "prepared" during the preceding cycle, and then initiated by some trigger mechanism which determines, at least partly, the trend of the cycle over the following 10 or 11 years. For this reason, forecasts are often based on comparisons between the observed trend of the current cycle, and the idealised trend of a typical cycle. It is sometimes possible to obtain additional help from approximate empirical relations between, for example, the rate of increase in activity during the early stages of a cycle, and the amplitude and length of the cycle.

The action of the solar uv- and x-radiation on the terrestrial atmosphere is the subject of important studies of the photochemical reactions between the various constituents of the atmosphere, including the ionization processes responsible for the formation of the ionized layers that play an important rôle in radiocommunications. Forecasts of the most appropriate operating frequencies for use in particular circumstances usually refer to dates from a few months to a year in advance. Hence it is desirable to have an index which reflects the short-term, as well as the long-term, trends in solar activity. Two types of index are appropriate in such applications: measurements of the solar radio noise flux at a suitable frequency, and of the maximum electron density in the E and F2 layers of the ionosphere.

The day-to-day fluctuations in the 10.7cm solar noise flux and in indices based on E-layer ionization are small; moreover, since there is a close similarity between the behaviour of the two types of index, it seems fair to assume that both of them provide an indication of the day-to-day changes in the flux of the solar x- and uv-radiations that give rise to the ionization in the terrestrial atmosphere at heights near 100 km.

Great progress has been made in the use of artificial satellites for making direct measurements of the incident solar radiation. As techniques improve, the differences of opinion about the absolute accuracy of the measurements will, without doubt, be resolved. Routine observations, in satellites, of selected portions of the solar spectrum would be of considerable value both for the forecasting of solar activity and for research on the photochemistry of the terrestrial atmosphere.

Indices based on the ionization in the F2 layer are also available. However, since this layer is controlled not only by electromagnetic radiation, but also by dynamic processes in the atmosphere and the effects of the solar wind, the day-to-day fluctuations in F2-layer indices are greater than those associated with E-layer indices and 10.7cm solar noise. In spite of this, the monthly-mean values of an F2-layer index provide the best available indication of the short- and medium-term changes in solar activity as it affects this layer. In addition, such indices are closely correlated with the critical frequencies of the F2 layer and hence they can be successfully used for making short- and medium-term forecasts of the type

required by organisations responsible for systems of radio-communication.

Some success has recently been achieved in the development of a daily index, based on F2-layer critical frequencies, which shows not only the changes in the solar electromagnetic radiation, but also the global effects resulting from the incidence of solar particle radiation.

For historical reasons, the relations between the F2-layer critical frequencies and solar activity are still based on the 12-month moving averages of the sunspot number; these relations are contained in CCIR Report 340, published in 1984 and will later be considered by CCIR. At some future date it would seem to be appropriate also to relate the various ionospheric parameters to one of the monthly-mean ionospheric indices, with which they are highly correlated, rather than to the 12-month mean value of the sunspot number. Long-term forecasts of the ionospheric indices could still be based on forecasts of the sunspot number since the statistical relations between the two types of index have been established over the past few decades.

Indices and Scientific Research

Indices of solar activity are used not only as an aid to making forecasts of future trends, but also in investigations concerned with the physics of the Sun and of the terrestrial atmosphere and magnetic field.

The orbits of artificial Earth satellites are influenced to a greater or lesser extent by changes in solar activity, depending mainly on the minimum height of the satellite orbit. The solar control of the orbit originates in the braking effect exerted by the atmosphere, whose characteristics vary with the level of solar activity. The sunspot number probably provides adequate information for use in making long-term plans for satellite programmes.

On the other hand, the sunspot number is quite inadequate in applications relating to the very short-term changes in the upper atmosphere that influence the trajectories of satellites, and that are, in consequence, of vital importance in research work concerned with space geodesy and space geodynamics. The fact that most of the models of the upper atmosphere make use of daily values of 10.7cm solar radio noise and the 3-hourly

A/K_P geomagnetic indices emphasises the importance of maintaining the observations on which these indices are based.

Geomagnetic indices of many different kinds have also been used for a long time in research on the nature of the electric current systems in the upper atmosphere that cause the regular and irregular changes in the geomagnetic field. Although such indices are not designed specifically as indicators of the level of solar activity, they can be seen to vary with the general trend of the cycle after the removal of daily and seasonal variations. Some of the geomagnetic indices have been regularly compiled and published over very many years; these series represent a valuable source of information on the long-term changes in the geomagnetic field, and their relations to changes in solar activity, as well as on the very short-term changes associated with magnetic disturbances, solar flares and so on.

In the preceding Section, reference has already been made to the importance, for research, of continuing and improving direct measurements, in space, of appropriate parts of the solar ultraviolet and x-radiation spectrum.

Conclusions

On various occasions, the Council of the Federation of Astronomical and Geophysical Services has expressed the opinion that the value of a long series of observations and measurements does not increase linearly with the length of the series, but rather with the second or some higher power of the length. Even though the long- and short-term variations in such series may not yet be fully understood, it seems reasonable to suppose that the chance of extracting hitherto unsuspected new information from a series will increase with its length.

In the context of the different types of observation relating in some way to the level of solar activity, it is possible to distinguish between two groups of indices: those that have been regularly compiled for at least a century, such as the Sunspot Number and some geomagnetic indices, and those that have existed for only several decades, such as solar noise flux at 10.7cm and some ionospheric indices.

It would be unwise at present to consider any interruption in the compilation of the Sunspot Number since, in spite of its defects, the series represents the only extensive source

of information about the characteristics of the solar cycle, and since the physical processes responsible for the cycle are still far from being understood.

On the other hand, in many investigations relating to the interaction between solar radiation and the physical characteristics of the Earth's atmosphere and magnetic field, there are advantages in using indices that are more closely related to the flux of the incident radiation than is the sunspot number. Once such an index has become available for at least one or two solar cycles, its relation to the Sunspot Number can be established and, if necessary, the new index can be expressed as an "equivalent sunspot number" by adopting the same numerical scale as that already used for the sunspot number.

The printing and publication of tables of astronomical and geophysical data and indices, especially when hourly or 3-hourly values are included, is becoming increasingly time-consuming and expensive. However, in many branches of research, the treatment and analysis of large volumes of data is being carried out with the aid of computers, and there seems to be a case for considering the issue of the original material only on magnetic tapes ready for use in computers. It would, of course, be desirable to prepare, in addition, several complete computer print-outs of the data for deposit in the archives of the World Data Centres.

On the other hand, it is important to remember that, when a forecast of some kind is required a few hours or a few days ahead, there is then a need for the very rapid dissemination of values of the appropriate index or, alternatively, of the basic data required for the calculation of at least a provisional value of the index.

The International Ursigram and World Days Service has had a long experience in the rapid collection and dissemination of selected geophysical and astronomical data in accordance with the needs of several groups of research workers. This service to the international scientific community could be expanded if there were a demand for the diffusion of new types of data, and if the necessary national and international communication facilities would be made available.

NEWS FROM MEMBER COMMITTEES

UK URSI NATIONAL COLLOQUIUM

A UK National URSI Colloquium was held on 5-6 July 1984 at the University of Leeds. This was the first UK National Colloquium to be held and was attended by 72 people with a wide ranging interest in Radio Science. Contributions were presented by 43 people and included papers on measurements, radio propagation in the ionosphere and non-ionized media, antennas, remote sensing, image processing, and signal processing.

There were also contributions on the work of various UK research groups working on Automated RF and Microwave Measurements, Mobile Radio Research, Microwave Experiments on Satellites, HF Research, and Magnetosphere, Ionosphere, Solar, and Terrestrial Physics.

The problems of the interaction between industry, the Universities, URSI and CCIR were discussed and also the problems of financing research.

The Colloquium was organised by Professor Peter Matthews of the University of Leeds on behalf of the British Committee for Radio Science.

30TH ANNIVERSARY OF THE URSI MEMBER COMMITTEE

IN THE FEDERAL REPUBLIC OF GERMANY

During its 1984 annual convention, traditionally held in the castle of Kleinheubach in Bavaria, the URSI Member Committee in the Federal Republic of Germany celebrated its 30th anniversary; a special colloquium took place on 2 October with more than 150 members and guests attending.

In his introduction, Dr. H.J. Albrecht, President of the Member Committee, briefly mentioned the development from the early fifties onwards and acknowledged the assistance rendered by government authorities throughout the past decades. More

historical details were given in subsequent presentations, in particular in a review entitled "Early URSI Activities in Germany" by Prof. W. Dieminger, Honorary President of URSI and of the Member Committee, 1969-72 President of URSI, up to 1967 President of the Committee. Germany first participated in the General Assembly in 1938.

The Federal Minister for Post and Telecommunications, Dr. Ch. Schwarz-Schilling, was represented by Dipl.-Ing. R. Dingeldey, President of the Fernmeldetechnisches Zentralamt in Darmstadt. In his keynote address, he emphasized the continuous and for both parts very satisfactory cooperation between the Committee and the Deutsche Bundespost.

Congratulations were also offered by Dr. G. Greger on behalf of the Federal Minister for Research and Technology, Dr. H. Riesenhuber, and by Prof. Dieminger, on behalf of the President of the Deutsche Forschungsgemeinschaft, Prof. E. Seibold. A message of congratulations had been sent by Professor J. Van Bladel, Secretary General of URSI.

With "Reminiscences in Telecommunications", a vivid and detailed account of progress in radio science in the early decades was given by Prof. W.T. Runge, Honorary Member of the Committee and one of the few who could report on personal experiences from 1910 onwards.

With the view on a present main field of URSI and as a proper outlook into the future, Prof. H. Marko completed the Colloquium with his paper on "Information and Communication".

The Colloquium reviewed the steady growth of activities from early efforts to today's state of the art; it reminded senior members and younger participants alike of the difficulties during the initial phases but also allowed to recognize the goal of future progress for the benefit of radio science and URSI.

IRREGULARITIES IN THE HIGH LATITUDE IONOSPHERE

The XI Lindau MPAE Workshop on Irregularities in the high latitude ionosphere was held in Lindau, Federal Republic of Germany, on 10 - 12 September 1984. It was sponsored by URSI and organized by Drs E. Nielsen and K. Schlegel.

48 scientists from 12 countries participated in the Workshop, which included four scientific sessions as follows:

- Irregularities in the auroral E Region
- Irregularities in the high-latitude F Region
- The influences of the neutral atmosphere
- Heater induced irregularities.

According to the organizers, since many of the leading experts on high latitude ionospheric irregularities were present in Lindau, the papers exhibited a high standard and covered the most recent developments in the field. In addition extensive discussions helped to clarify the complex phenomena in question and stimulated new approaches.

It is worth noting that the dates of this Workshop were chosen very appropriately to follow the General Assembly of URSI in Florence.

ANNOUNCEMENTS OF MEETINGS AND SYMPOSIA

6TH SYMPOSIUM AND TECHNICAL EXHIBITION ON

ELECTROMAGNETIC COMPATIBILITY

5-7 March 1985

"Electromagnetic compatibility (EMC) is the ability of an electric device to operate satisfactorily within its electromagnetic environment without causing unacceptable interference to other electric systems". The EMC discipline may thus be viewed as a sort of protection of the electromagnetic environment.

The Symposium and Technical Exhibition on Electromagnetic Compatibility is organized every odd year and will celebrate in 1985 its 10th anniversary. According to the interest registered a new record-breaking participation is expected with far over 600 attendees and over 30 exhibitors.

The "EMC 1985" will be organized under the auspices of the Director General of the Swiss PTT by the Institute for Communications Technology of the Swiss Federal Institute of Technology in Zurich. It is sponsored by the Association of Swiss Electrotechnicians and co-sponsored by URSI. The Organizing Chairman is Dr. T. Dvorak (Zurich), and the technical programme Committee is chaired by R.M. Showers (USA). The cooperation of renowned scientists and professional organisations from all over the world promises again a successful conference.

In all 124 papers will be delivered in 19 sessions covering a large variety of EMC topics (micro- and power-electronics, radio communications, nuclear electromagnetic pulse - NEMP, interference sources and countermeasures, measurements, biological effects, etc.). A technical exhibition, 5 workshops, technical excursions and a rich social programme round off the event.

As usual, the symposium will review the current status and future trends of the EMC science. The workshops, organized on a question-answer basis in direct contact with the speakers, provide an introduction to newcomers, and respond to the needs

of practicing engineers. Workshop 2, which will be held on 4 March afternoon, is being organized by the URSI Commission A Working Group on Measurements related to the interaction of electromagnetic fields with biological systems, under the chairmanship of Prof. S. Rosenthal.

The full text of all conference papers will be made available in the conference Proceedings: "EMC 1985".

Copies of the Preliminary Programme with registration forms and further information may be obtained from:

Dr. T. Dvorak
ETH Zentrum-IKT
CH-8092 Zurich
Switzerland.

BIOELECTROMAGNETICS SOCIETY
7TH ANNUAL MEETING

The Bioelectromagnetics Society announces its 7th Annual Meeting on 16-20 June 1985 in San Francisco, California, USA.

Original papers are solicited, for presentation in English, either from the platform or via poster, on the interaction of electromagnetic energy (from zero hertz through the visible light frequencies) and of acoustic energy with biological systems. Areas of interest include, but are not limited to:

- Behavioral studies
- Physiological studies
- Endocrine studies
- Developmental studies
- Genetic studies
- Cellular and subcellular studies
- Electric and magnetic properties of biological materials
- Mechanisms of interaction
- Instrumentation and measurement
- Dosimetry
- Exposure systems
- Extremely low frequency field studies

- Diagnostic and therapeutic applications
- Hyperthermia.

Authors wishing to present papers should request forms for submission of abstracts from:

The Bioelectromagnetics Society
1 Bank Street
Gaithersburg, Maryland 20878
USA.

Abstracts submitted by non-members must be sponsored by a Full Member of the BEMS. The deadline for submission of abstracts is 1 February 1985, to allow time for the selection of papers and organization of the programme. An award will be given for the best student paper presented at the meeting.

15TH EUROPEAN MICROWAVE CONFERENCE

The 15th European Microwave Conference will be held from 9 to 12 September 1985 in the Palais des Congrès, Paris, France. It is co-sponsored by the Société Française des Electriciens, des Electroniciens et des Radioélectriciens, EUREL, IMPI, URSI and Region 8 of IEEE.

The Technical Programme Committee is chaired by Professor M.Y. Bernard, C.N.A.M., Paris.

All aspects of microwaves will be considered. Special Emphasis will be placed on systems in general and, in particular:

- Impact of systems requirements on R. and D. programmes (Covering components, devices and circuits including hybrid and monolithic).
- Evolution of systems due to new devices (Cellular radio, radiometers, satellite paging, navigation aids, microwave imaging).

Other microwave subjects which will be specially considered are:

- Antennas and propagation
- Millimeter, sub-millimeter fields .."Towards Terahertz"

- Passive and active components - Hybrid and monolithic technologies
- Measurements and C.A.D.
- Biological, medical and industrial applications.

A selection of invited speakers will highlight important and developing areas.

Papers are sought describing work not previously published which can be either theoretical, technological or applications orientated. Papers will be in English. Authors are requested to submit 5 typed copies (single-spaced) of a 3-page summary. This should include a concise statement of the work under review, emphasizing what is new, as well as the techniques being employed together with the main conclusions. Whenever appropriate, a few essential figures should be added. The deadline for submission of summaries is 1 March 1985 and the summaries should be sent to:

Prof. M.Y. Bernard
15th European Microwave Conference
c/o GIEL, 11 rue Hamelin
F-75783 Paris, Cedex 16
France.

The summaries will be assessed by a European review board. The final decision, taken by the Technical Programme Committee, will be forwarded to the authors at the end of April 1985. A complete manuscript will be requested in June 1985, for inclusion in the Proceedings.

The Management Committee will award a prize of Sw.F. 1000 to the author(s) presenting the best paper at the Conference.

10TH INTERNATIONAL CONFERENCE ON INFRARED
AND MILLIMETER WAVES

This Conference will be held from 9 to 13 December 1985 in the Walt Disney World Village Hotel Plaza, Florida, USA.

The broad subject areas of the Conference will be: Millimeter waves; Gyrotrons/FEL; Sub-millimeter waves; Plasma diagnostics.

Authors of contributed papers are urged to submit their 30-40 word abstracts, before 1 July 1985, to the Programme Chairman:

Kenneth J. Button
M.I.T.
Box 72, M.I.T. Branch
Cambridge, MA 02139-0901
USA.

BOOKS PUBLISHED BY URSI PERSONALITIES

WAVES IN PLASMAS

In 1935, a *Report on the Present State of our Knowledge of the Ionosphere* was published by S.K. Mitra of the University of Calcutta. In fact, the term 'ionosphere' then included studies of wave propagation in plasmas, and indeed many of the 70 pages dealt with the rapidly developing magnetoionic theory and wave propagation in plasmas. Apart from the early work of Eccles, Larmor and Lorentz, many of those who had contributed to the theory up to that time belonged to the Cambridge and London groups: Appleton, Booker, Darwin, Hartree, and Ratcliffe, but important aspects of the subject had been discussed also by, for example, Bailey and Martyn in Australia, and Lassen in Germany. The Report must have been most welcome to those who were new to the subject of wave propagation in ionized media, and who required a concise survey of the current situation and of the more important of the numerous publications already available.

For many years the experimental evidence in support of magnetoionic theory was restricted to ground-based observations of the ionosphere up to the peak of the F2 layer. However in 1953, Storey's explanation of 'whistling atmospherics' in terms of waves propagated above the ionosphere opened up a new field of experimental and theoretical investigations. Finally, since the advent of the 'space age', it has become possible to make in situ observations of many features of the Earth's plasma environment, and how waves are propagated in it, from the bow shock backwards towards the tail of the magnetosphere.

To those not closely concerned with the interpretation of such observations and with the essential related theoretical considerations, the subject of waves in plasmas must seem to be exceedingly complex. Without doubt, many of them would welcome a coherent and up-to-date survey of the whole subject, or at least of its essential features, which might perhaps be regarded as a modern equivalent of Mitra's Report in 1935.

Happily such a survey has become available with the recent publication of *Cold Plasma Waves* by Henry G. Booker of the University of California, San Diego. Noone will be surprised to find that the volume contains 345 pages, as compared with

the 70 pages which sufficed for the Mitra Report of 50 years ago.

It is particularly appropriate that this text should have been written by Professor Booker. Not only was he one of the early investigators of magnetoionic theory at Cambridge 50 years ago, but since then he has maintained a close and almost unbroken interest in the subject up to the present time. Moreover, his long experience as a teacher can be taken as a guarantee of the quality of presentation of the material which has already formed the basis of post-graduate courses at the Universities of Cambridge, Cornell and California, San Diego. The impetus to edit and publish the material came as a result of the course given in the Wuhan University, P.R. China.

Those associated with URSI will be particularly pleased to note that the author and J.A. Ratcliffe, to whom the work is dedicated, are both Honorary Presidents of the Union.

C.M. Minnis

+ *Cold Plasma Waves* by Henry G. Booker (pp. xv + 345) 1984. Published by Martinus Nijhoff Publishers, Dordrecht/Boston/Lancaster. Price (clothbound) US\$59.50/£ stg 33.50. ISBN 90-247-2977-7.

The Chapter headings provided by the publishers are as follows:

1. Elementary properties of a plasma
2. Maxwell's equations
3. Isotropic plasma
4. Alternating current in a magnetoplasma
5. General properties of phase propagation in a magnetoplasma
6. General properties of group propagation in a magnetoplasma
7. Propagation of phase along the imposed magnetic field
8. Energy flow and group velocity for longitudinal propagation
9. Propagation of phase transverse to the imposed magnetic field
10. Elliptic polarization of the X wave for transverse propagation
11. Energy behaviour of the X wave for transverse propagation
12. Propagation at any angle to the imposed magnetic field

13. The radio approximation
14. The hydromagnetic approximation
15. The quasi-longitudinal and quasi-transverse approximations
16. Directional behaviour of group velocity in a magnetoplasma
17. The field of an antenna in a magnetoplasma
18. Directional behaviour of the power radiated by a dipole in a magnetoplasma.

20TH GENERAL ASSEMBLY OF ICSU

The XX General Assembly of the International Council of Scientific Unions was held in Ottawa, Canada, from 23 to 28 September 1984. URSI was represented by its past President, Professor W.E. Gordon.

I. Election of Officers

The following have been elected:

President: Sir John Kendrew (UK)
Vice-President: Prof. Walter A. Rosenblith (USA)
Secretary General: Prof. L. Ernster (Sweden)
Treasurer: Prof. K. Thureau.(FRG).

Academician G.K. Skryabin (USSR) was elected as Extraordinary Vice-President until the 21st General Assembly of ICSU, in view of the situation created by the resignation of Prof. D.A. Bekoe from the Presidency.

II. Resolutions and Decisions

The following Resolutions and Decisions were adopted:

The 20th General Assembly

1. *Adopts* the revised version of the Statutes and Rules of Procedure as prepared by the Committee on Structure and Statutes, expresses its appreciation to the Committee for its work, and encourages the Executive Board to consider further changes in the structure of ICSU in the light of the discussions held at the 20th General Assembly and requests the Committee on Structure and Statutes to report to the 21st General Assembly.
2. *Taking into consideration* the discussions that have occurred over the past year relating to global change and the interaction between the physical and living world and at the ICSU Symposium held in Ottawa on 25 September 1984 and expressing its continued support for existing related programmes;
invites the Executive Board to establish an Ad hoc planning group on global change to review the relevant ongoing activities of bodies in the ICSU family and other organizations,

to identify priority subjects for early action and to develop a coherent programme after analysis of the possible contribution of ICSU Scientific Unions, National Members and specialist bodies; and

requests ICSU to provide the necessary resources to enable the planning group to undertake this task;

invites National Members of ICSU to support the development of the global change programme and to consider their possible contributions to the programme;

requests the planning group to report to the 21st General Assembly.

3. *Taking into consideration* the important role that remote sensing from space can be expected to play in a study of global change;

invites COSPAR to set up an appropriate interdisciplinary group to act as a focus for remote sensing activities; and

requests ICSU Unions and Scientific Committees and other appropriate bodies to nominate representatives to this group.

4. *Expresses* its appreciation to the Committee on Publications and Communications (COPAC) at the success of its activities and ratifies the establishment of the ICSU Press.

5. *Accepts* the report on the disposal of hazardous wastes, decides to create a special committee to consider further the problem of the disposal of toxic wastes;

requests the Executive Board to establish such a committee; and

expresses its grateful appreciation to Dr. J.M. Harrison and Colleagues.

6. *Recalling* the Resolution of the 19th General Assembly to establish an ICSU special committee to study the biological, medical and physical effects of the large-scale use of nuclear weapons;

expresses its appreciation to the Scientific Committee on Problems of the Environment (SCOPE) and its Committee on the Environmental Effects of Nuclear War (ENUWAR) and to the ICSU special committee for the work they are carrying out;

asks the ICSU special committee to continue its work and to submit a report to the 21st General Assembly that would include an unemotional, non-political, authoritative and readily understandable statement of the effects of nuclear war, as indicated in the 19th General Assembly Resolution;

urges scientists to continue to work actively towards reducing the risk to all nations posed by the threat of nuclear war.

7. *Recalling* the long period of close cooperation between UNESCO and ICSU,

expresses its hope that UNESCO will be able to maintain its universality in the future;

reaffirms the offer made by the Executive Board to continue to help UNESCO to attain its objectives.

8. *Expresses* its deep appreciation to a number of the National Members and to national organizations for the important contribution made to international scientific cooperation by providing accommodation and support to the Secretariats of ICSU and to other members of the ICSU family.

9. *Recalling* that ICSU's principles of universality embodied in Statute 5 (as adopted at the 20th General Assembly) are the only basis for genuine and effective international cooperation in science;

noting the guidelines given by the Standing Committee on the Free Circulation of Scientists in "Advice to Organizers of International Scientific Meetings 1983/84", firmly believes that the formal adoption of these guidelines by all ICSU organizations would drastically reduce violations of ICSU's principles of universality;

expresses its deep concern that visas have been refused to a number of scientists wishing to attend ICSU meetings in the period since the 19th General Assembly and that visas were refused even to members of one of the delegations to the 20th General Assembly itself.

10. *Reaffirms* its concern for the objectives of the Standing Committee for the Safeguard of the Pursuit of Science; and

invites the Executive Board to set up an Ad hoc committee to consider how the objectives of this Committee could be most effectively carried out in the future.

11. *Adopts* the report of the Assembly Finance Committee, as amended, and the recommendations contained therein.
12. *Expresses* its deep gratitude to the National Research Council of Canada for the generous and excellent arrangements made for the ICSU meetings;
and
also expresses its grateful thanks to the Secretariat for the excellent way in which it has ensured the efficient functioning of the meetings.

III. ICSU Scientific Symposium

On the occasion of the 20th General Assembly, ICSU organized, on 25, 26 and 27 September, a scientific symposium divided into three parts:

- 1) Global Change
- 2) Science Education and Social Needs
- 3) Gene Technology.

The Proceedings of the Global Change Symposium have been published by ICSU Press.

LIST OF FUTURE SYMPOSIA AND MEETINGS

Note: Events marked by an asterisk are sponsored or co-sponsored by URST.

2nd International School for Space Simulations⁺
Kapao, Kauai, Hawaii, 4-15 February 1985.

Contact Address: Dr. D.A. Dutton,
ISSS 2, IGPP,
UCLA,
Los Angeles, California 900024,
USA.

Conference on Ionospheric Physics and Radio Wave Propagation⁺
Sydney, Australia, 11-15 February 1985.

Contact Address: The Assistant Secretary,
IPS,
P.O.B. 702,
Darlinghurst 2010,
Australia.

6th EMC Symposium and Technical Exhibition⁺
Zurich, Switzerland, 5-7 March 1985.

Contact Address: Dr. T. Dvorak,
ETH Zentrum-IKT,
CH-8092 Zurich,
Switzerland.

4th International Conference on Antennas and Propagation⁺
(ICAP 85)

Coventry, United Kingdom, 16-19 April 1985.

Contact Address: ICAP 85 Secretariat,
Conference Services, IEE,
Savoy Place,
London WC2R 0BL,
United Kingdom.

4th International Conference on Digital Processing of Signals
in Communications
Loughborough, Leicestershire, UK, 22-25 April 1985.

Contact Address: The Conference Secretary,
Institution of Electrical and Radio Engineers,
99 Gower Street,
London WC1E 6AZ,
United Kingdom.

10th World Congress of the International Measurement Confede-
ration (IMEKO '85)
Prague, Czechoslovakia, 22-26 April 1985.

Contact Address: IMEKO Secretariat,
P.O.B. 457,
H-1371 Budapest,
Hungary.

6th Symposium on Information Theory in the Benelux
Steensel, The Netherlands, 23-24 May 1985.

Contact Address: Prof. J.P.M. Schalkwijk,
Department of Electrical Engineering,
Technische Hogeschool Eindhoven,
P.O.B. 513,
Eindhoven 5600 MB,
The Netherlands.

7th Annual Meeting of the Bioelectromagnetics Society
San Francisco, CA, USA, 16-20 June 1985.

Contact Address: The Bioelectromagnetics Society,
1 Bank Street,
Gaithersburg, Maryland, 20878,
USA.

1985 North American Radio Science Meeting and International
IEEE/APS Symposium
Vancouver, B.C., Canada, 17-21 June 1985.

Contact Address: Mr. K. Charbonneau,
Conference Services, NRC,
Montreal Road, M-58,
Ottawa, Ontario K1A 0R6,
Canada.

17th International Conference on Phenomena in Ionized Gases⁺
Budapest, Hungary, 8-12 July 1985.

Contact Address:

5th Scientific Assembly of IAGA
Prague, Czechoslovakia, 5-17 August 1985.

Contact Address: Dr. V. Kropacek,
IAGA, Geophysical Institute,
Bocni II,
14131 Praha 4 - Sporilov,
Czechoslovakia.

Special IAMAP/IAPSO Assembly
Honolulu, USA, 5-16 August 1985.

Contact Address: Mr. S. Ruttenberg,
Secretary General IAMAP,
National Center for Atmospheric Research,
P.O.B. 3000,
Boulder, Colorado 80307,
USA.

Conference on Science and Technology Education and Future
Human Needs
Bangalore, India, 8-15 August 1985.

Contact Address: Prof. J.L. Lewis,
Secretary, ICSU Committee on the Teaching
of Science,
Malvern College,
Malvern, Worcestershire WR14 3DF,
United Kingdom.

International Symposium on Antennas and Propagation (ISAP '85)⁺
Kyoto, Japan, 20-22 August 1985.

Contact Address: Prof. Kazuaki Takao,
Secretary of ISAP '85,
Department of Electrical Engineering,
Kyoto University,
Kyoto 606, Japan.

International Symposium on Antennas and EM Theory (ISAE 85)⁺
Beijing, China, 24-26 August 1985.

Contact Address: Prof. Mao Yukuan,
Northwest Telecommunication Eng.,
Institute, Xian,
Shannxi Prov.,
China.

Special Workshop on International Reference Ionosphere⁺
Athens, Greece, Fall 1985.

Contact Address: Prof. L. Bossy,
Chairman, Working Group on IRI,
Institut Royal Météorologique,
3 avenue Circulaire,
B-1180 Bruxelles,
Belgique.

15th European Microwave Conference⁺
Paris, France, 9-13 September 1985.

Contact Address: Microwave Exhibitions and Publishers Ltd,
Convex House,
43 Dudley Road,
Tunbridge Wells, Kent TN1 1LE,
United Kingdom.

Symposium on the Comparative Study of Magnetospheric Systems
France, 9-14 September 1985.

Contact Address: Dr. A. Roux,
CRPE/CNET/CNRS,
38 rue du Général Leclerc,
F-92131 Issy-les-Moulineaux,
France.

5th International Conference on Integrated Optics and Optical
Fibre Communication (IOOC-ECOC '85)⁺
Venice, Italy, 1-4 October 1985.

Contact Address: Secretariat of IOOC-ECOC '85,
Istituto Internazionale delle Comunicazioni,
Via Pertinace - Villa Piaggio,
I-16125 Genova,
Italy.

10th International Conference on Infrared and Millimeter Waves
Florida, USA, 9-13 December 1985.

Contact Address: Prof. K.J. Button,
M.I.T.,
Box 72, M.I.T. Branch,
Cambridge, Massachusetts 02139-0901,
USA.

6th International Symposium on Solar-Terrestrial Physics⁺
Toulouse, France, June 1986.

Contact Address: Prof. C.H. Liu,
Secretary, SCOSTEP,
Department of Electrical Engineering,
University of Illinois,
Urbana, Illinois 61801,
USA.

XXVI COSPAR Meeting and Associated Activities
Toulouse, France, June/July 1986.

Contact Address: Mr. Z. Niemirowicz,
Executive Secretary, COSPAR,
51 boulevard de Montmorency,
F-75016 Paris,
France.

Symposium on Global Studies of the Upper Atmosphere with
Incoherent Scatter Radars⁺
Boulder, Colorado, USA, Spring or Summer 1986.

Contact Address: Dr. V. Wickwar,
SRI International,
Menlo Park, California 94025,
USA.

Symposium on Ionospheric Studies Using Satellite Radio Beacons⁺
Oulu, Finland, Summer or Fall 1986.

Contact Address: Prof. R. Leintinger,
Institut für Meteorologie und Geophysik,
Universität Graz,
Halbärthgasse 1,
A-8010 Graz,
Austria.

International Symposium on Surface Acoustic Waves in Solid and Layered Media,⁺ Novosibirsk, USSR, June 1986.

Contact Address: Dr. V.N. Gubankov,
Secretary, Soviet URSI Committee,
Institute of Radioengineering and Electronics,
Prospekt Marksa 18,
103907 Moskva K-9,
USSR.

URSI Symposium on Electromagnetic Wave Theory⁺
Budapest, Hungary, August 1986.

Contact Address: Prof. K. Géher,
Secretary, Hungarian URSI Committee,
Technical University of Budapest,
Stoczek u.2,
H-1111 Budapest,
Hungary.

8th Colloquium on Microwave Communication (MICROCOLL)
Budapest, Hungary, August 1986.

Contact Address:

19th General Assembly of IUGG
Vancouver, Canada, 9-22 August 1987.

Contact Address: Prof. P. Melchior,
Secretary General, IUGG,
Observatoire Royal de Belgique,
3 avenue Circulaire,
B-1180 Bruxelles,
Belgium.

XXIIth General Assembly of URSI⁺
Tel Aviv, Israel, 24 August - 4 September 1987.

Contact Address: URSI Secretariat,
32 avenue A. Lancaster,
B-1180 Bruxelles,
Belgium.

International Conference on Digital Signal Processing⁺
Florence, Italy, Fall 1987.

Contact Address: Prof. V. Cappellini,
I.R.O.E.,
Via Panciatichi 64,
I-50127 Firenze,
Italy.

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URSI OFFICERS AND OFFICERS OF MEMBER COMMITTEES

Note: An alphabetical index of names, with addresses and page references, is reproduced at the back of this Bulletin.

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