

International Scientific Radio Union

U. R. S. I.

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IN MEMORIAM

It is our sad duty to inform our readers of the death of Mademoiselle Rachel Straetmans which occurred on October 26, 1957.

Since 1919, Mademoiselle Straetmans was a member of the Secretary-General's Staff. The older members of U.R.S.I. will always remember Mademoiselle Straetmans' great loyalty to the Union. It is some small consolation to learn that during her last days, she was able to realise something of the affectionate regards in which she personally was held by so many members of U.R.S.I. and particularly by the governing agencies.

XIIth GENERAL ASSEMBLY

Resolutions and Recommendations adopted by the General Assembly

EXECUTIVE COMMITTEE

1. NEW NATIONAL COMMITTEE. — The General Assembly recognized the National Committees appointed by Austria, Greece and U. S. S. R.

2. STATUTORY ELECTIONS. — On the proposals of the Executive Committee, the General Assembly elected :

2.1. *The Board of Officers :*

President : D. L. I. BERKNER.

Past-President : Dr. P. LEJAY (ex-officio).

Vice-Presidents : Dr. I. KOGA,

Dr. R. L. SMITH-ROSE (re-elected).

Dr. G. A. WOONTON.

Treasurer : Prof. Ch. MANNEBACK.

Secretary General : Ing. E. HERBAYS.

2.2. *The Commission Chairmen :*

Commission I : Mr. B. DECAUX (re-elected),

Commission II : Dr. R. L. SMITH-ROSE (re-elected),

Commission III : Dr. D. F. MARTYN (re-elected),

Commission IV : Prof. R. A. HELLIWELL,

Commission V : Prof. A. C. B. LOVELL,

Commission VI : Dr. S. SILVER (re-elected),

Commission VII : Dr. W. G. SHEPHERD.

3. U.R.S.I. DELEGATES TO INTERNATIONAL ORGANIZATIONS. — The following were appointed as U.R.S.I. delegates to International Organizations.

3.1. *International Council of Scientific Unions* : Prof. Dr. B. VAN DER POL.

3.2. *Mixed Commission on the Ionosphere* : Sir Edward V. APPLETON (*Chairman*), Dr. L. V. BERKNER, Father P. LEJAY, Dr. D. F. MARTYN.

3.3. *Joint Commission on Radiometeorology* : Dr. W. E. GORDON (*Chairman*), Dr. LHERMITTE, Dr. R. L. SMITH-ROSE.

3.4. *Joint Commisison on Solar and Terrestrial Relationships* : Dr. C. W. ALLEN, Mr. A. E. COVINGTON, Dr. Denisse, Dr. D. K. MENZEL.

3.5. *U.R.S.I. Committee for C.C.I.R.* : Mr. B. DECAUX, Dr. J. H. DELLINGER, Dr. R. L. SMITH-ROSE, Prof. Dr. B. VAN DER POL.

4. ORGANIZATION OF INTERNATIONAL SYMPOSIA. — The General Assembly decided :

That international symposia of U.R.S.I. on specialized subjects related to radio science be organized approximately annually if financially feasible. Subjects for such symposia shall be proposed by the Commissions of U.R.S.I. and selected by the Board of Officers. Subjects which fall into fields of other Unions may be recommended by the Board, after consultation with chairmen of the interested Commissions, as joint symposia with those Unions.

The Board is authorized to approve financial arrangements for such symposia and shall approve the organization proposed.

It is requested by the Executive Committee that rather specialized subjects, of interest to a wide range of workers, should be chosen.

The proceedings of the symposia should be published, if possible commercially.

5. MODIFICATION TO THE SCALE OF SUBSCRIPTION. — The following regulation for the payment of national subscriptions were adopted.

(a) Each National Committee is free to select its annual subscription from one of the categories in the following scale :

Category	U. S. Dollars	Votes
1	125	1
2	250	2
3	500	3
4	1000	4
5	2000	5
6	4000	6

(b) Each National Committee is assigned the corresponding number of votes as shown in the table.

(c) A National Committee may transfer to a higher category at the beginning of any Financial Year of the Union.

Other changes of category may be made only at a General Assembly.

(d) The Secretary General shall inform the National Committees of the category they may care to enter; for this purpose a list drafted by the Finance Committee has been approved by the Executive Committee.

(e) The revised fiscal scale shall be effective from November 1, 1957.

6. MODIFICATIONS TO THE STATUTES AND BYLAWS. — The following modifications to the Statutes and Bylaws were adopted.

6.1. *Statutes* :

Art. 10. — The Board of Officers comprises :

(a) the President, the immediate Past-President, the Vice-Presidents and the Treasurer,

(b) the Secretary General who is the executive officer of the Union and acts as Secretary of the Executive Committee.

Art. 11. — The Board of Officers are elected by the General Assembly on the proposal of the Executive Committee, to hold office from the end of the General Assembly at which they are elected until the end of the following ordinary General Assembly. They are eligible for immediate re-election except that the President

may not normally serve more than two consecutive terms, and the Vice-Presidents may not normally serve more than two consecutive terms.

Art. 26. — The number of official delegates entitled to represent a National Committee at General Assemblies, and the number of votes allocated to it in Assemblies and at the Executive Committee will depend on the number of unit of subscription paid annually by it, in accordance with the following schedule.

Category	Number of units of subscription	Number of delegates and votes
1	1	1
2	2	2
3	4	4
4	8	8
5	16	16
6	32	32

The value of the unit of subscription is fixed by the General Assembly.

Art. 27. — The category in which a National Committee may enter is left to its own choice. A National Committee may transfer to a higher category at the beginning of any financial year of the Union. Other changes of category may be made only at a General Assembly.

6.2. *Bylaws* :

Art. 24. — Besides the individuals mentioned in Art. 30 of the Statutes, the Honorary Presidents and Past-Presidents, and delegates of National Committees may attend the meetings of the General Assembly.

Art. 25. — With the approval of a National Committee, the President of the Union may invite any scientist from that country to attend as an observer. The President may also invite representatives of international organizations, and, on its own initiative, or at the request of the President of a Commission, scientists from countries that do not adhere to the Union.

The National Committee of the host country may invite individuals of its own country to be present as observers.

6.3. *Rules for Commissions :*

Art. 11 :

(a) A Commission may, with the approval of the General Assembly, appoint Sub-Commissions to study particular matters within its scope.

(b) The Chairman of each Sub-Commission is elected by the General Assembly on the recommendation of the appropriate Commission. In general, it is expected that he will be a delegate at that General Assembly.

(c) The members of each Sub-Commission shall be elected by the President of the responsible Commission, after consultation with its official members, if necessary by correspondence.

(d) The term of each Sub-Commission expires at the end of the General Assembly following its creation. If necessary, its mandate may be renewed.

(e) At each General Assembly the Chairman of each Sub-Commission shall present to the parent Commission a report on the work of his Sub-Commission.

**COMMISSION I
ON RADIO MEASUREMENTS AND STANDARDS**

RESOLUTION N° 1

It is resolved that in view of the importance of atomic standards for frequency and time measurements it is recommended that their further development should be vigorously pursued and that their frequencies should be intercompared by means of radio transmissions and by the circulation of a single standard around a number of national laboratories. Additional Comment :

It should be noted that in making the proposed intercomparisons, the frequencies should be expressed either in terms of an atomic frequency such as that of the caesium F, $m(4.0) \leftrightarrow F, m(3.0)$ line at zero field or in terms of the unit of time scale UT2. In the latter case the time signals used should be stated so that the

interval between these signals can be expressed in terms of the caesium resonance.

If the frequency varies with any parameters external to the atom, the precise values of these parameters should be stated.

RESOLUTION N° 2

In order to establish the best means of securing a reliable worldwide service of standard frequency and time signals transmissions, it is recommended that attention be given to Resolution n° 179, Question nos 140, 141, 142, and Study Programme n° 101 of the C.C.I.R. Plenary Assembly, 1956. In particular, the following questions should be studied :

1. The merits of frequencies below 100 kc/s for standard frequency transmissions and time signals.

2. Methods of recognizing without ambiguity the seconds pulses of different standard frequency transmitting stations including the case of reception at great distances.

The study should include the optimum type of time signal to be used and the advisability of synchronizing time signals from different stations.

3. The number and location of stations required for world coverage. (Any further increase in the number of stations operating in some geographical areas will result in a degradation of the service.)

4. The advisability of reducing the period of tone in favor of pulses.

RESOLUTION N° 3

It is strongly recommended that the national laboratories should intercompare their standards of power measurement at frequencies in the neighborhood of 3 000 Mc/s and 10 000 Mc/s. The comparisons to be coordinated by Dr. R. L. Smith-Rose, Director, Radio Research Station, Ditton Park, Slough, Bucks, England.

RESOLUTION N° 4

In order to avoid confusion between the terms radio field strength and radio field intensity, it is recommended that :

1. *Radio Field Strength* refers to the magnitude of the electric

or magnetic field vector (E or H) at a given location resulting from the passage of radio waves.

2. *Radio Field Intensity* refers to the power density of electromagnetic waves passing through a surface normal to the direction of propagation.

RESOLUTION N° 5

In order to stimulate international and national efforts in the standardization programs of high-frequency and microwave quantities such as power, impedance, voltage, current, attenuation, field strength, noise, etc., the XIIth Assembly of U.R.S.I. recommends to members of the U.R.S.I., the I.E.C., the C.C.I.R., I.S.O., and other international groups concerned with electrical standards that the following be done :

(a) Compile, as soon as possible, a table of *rf* quantities including those distributed in time, frequency and space to be standardized. This table shall specify dynamic ranges, frequency ranges and corresponding desirable practical accuracies for primary standards. It shall also specify desirable priorities for the various quantities and corresponding ranges.

(b) Information and tabular material, as requested in (a) above, shall be forwarded to the President of Commission I, U.R.S.I., for consolidation and possible adoption at the XIIIth U.R.S.I. General Assembly. It is desirable that this table be brought up to date at successive General Assemblies.

RESOLUTION N° 6

In view of the progress made since the XIth General Assembly in the measurement of the velocity of electromagnetic waves, it is recommended that in radio engineering problems its value in vacuum be taken as :

$$299\,792.5 \pm 0.4 \text{ km/s}$$

COMMISSION IV ON RADIO NOISE OF TERRESTRIAL ORIGIN

RECOMMENDATION N° 1

Measurement of Atmospheric Noise

U.R.S.I. Commission IV recommends that the following comments on the measurements of atmospheric noise be communicated to the C.C.I.R.

« U.R.S.I. has considered the C.C.I.R. question « What are the most easily measured characteristics of terrestrial radio noise from which the interference to different types of communication system can be determined » and has also considered C.C.I.R. Study Programme n° 96 dealing with the measurement of atmospheric radio noise. The following comments on these topics are offered to the C.C.I.R.

» Considerable progress has been made during the last few years in the measurement and description of the amplitude characteristics of atmospheric noise. Although time characteristics are also required for a complete statistical description of the noise, useful relationships have been found between the amplitude characteristics alone and the interference caused by the noise to many types of radio service.

» There is general agreement on what amplitude characteristics should be measured, and members of U.R.S.I. are being encouraged to study these characteristics at many more locations, in accordance with the recommendations contained in the Annex. »

RECOMMENDATION N° 2

U.R.S.I. Special Report on Atmospheric Noise

Commission IV recommends that a working group be set up under the Chairman of Commission IV to prepare an U.R.S.I. special report on the measurement of the characteristics of atmospheric noise and their relation to radio interference. This report should be based on the material collected to formulate a reply to C.C.I.R. questions.

RECOMMENDATION N° 3

Symposium on Naturally-occurring VLF phenomena

Considering the wide current interest by members of U.R.S.I. Commissions III, IV and V in the study of whistling atmospherics and related types of very low frequency atmospheric noise, Commission IV recommends that consideration be given to the possibility of arranging a symposium on this subject before the XIIIth General Assembly.

RECOMMENDATION N° 4

*Collection of Atmospheric Noise Data
from Astronomical Observatories*

Commission IV recommends that a communication be addressed to the International Astronomical Union, expressing the belief that measurements of atmospheric radio noise are being made at many astronomical observatories throughout a large part of each day, and requesting that the results of any such measurements be made available to radio workers. The communication should further suggest that there should be consultation between the I.A.U. and U.R.S.I. to ensure that the measurements are made in as useful and uniform a manner as possible for radio as well as for astronomical applications.

RECOMMENDATION N° 5

Cooperative Measurements of the Waveforms of Atmospherics

Commission IV recommends that where groups of workers have coordinated their work on the recording of waveforms of atmospherics with the object of showing their variations from place to place, and where such workers desire to publish a joint account of their combined work, U.R.S.I. should facilitate this work by providing means for exchanging data and for joint consultation.

RECOMMENDATION N° 6

Working Group on Terminology relating to VLF Noise Phenomena

Commission IV recommends that a working group be set up under the Chairman of Commission IV to review continually the terminology used in the description of whistlers and related phenomena, and to make further recommendations on this topic to the XIIIth General Assembly.

RECOMMENDATION N° 7

Provisional Terminology relating to VLF Noise Phenomena

Until the Working Group set up under Recommendation 6 has reported, Commission IV recommends that the following terminology be adopted tentatively in work on whistlers and related phenomena.

ATMOSPHERICS : Natural electrical disturbances originating in the earth's atmosphere. Atmospherics may be subdivided into the following types :

A. SPHERICS : Atmospherics which originate in, and are propagated through, the space between the earth and the ionosphere.

B. WHISTLERS : Atmospherics which originate in lightning discharges and which are propagated through the ionosphere along dispersive paths.

C. VLF EMISSIONS : Atmospherics which are *not* produced by lightning. They are usually associated with magnetic disturbance and have often been referred to loosely by the term « dawn chorus ». The following sub-groups are recognized :

1. *VLF Hiss* : A relatively steady VLF emission generally exhibiting a frequency-dependent amplitude spectrum. Its spectrum and intensity may change slowly (period of several seconds or more) with time.

2. *Discrete events* : Well-defined VLF emissions having durations of the order of a few tenths to several seconds. A definite and repeatable frequency-time relation is often observed.

3. *Chorus* : A series of discrete VLF emissions, often overlapping, with time separations of less than one second.

Annex to Recommendation n° 1

Prepared by : W. Q. CRICLOW, *Chairman*,
G. FOLDES, F. J. HEWITT, F. HORNER, H. SHINKAWA
and A. W. SULLIVAN

I. — MEASUREMENTS

It would be highly desirable to obtain detailed statistical information on the amplitude-probability distribution of the instantaneous envelope voltage, the various time functions, and the direction of arrival of the noise at many locations throughout the world. However, since continuous detailed measurements of this type at all frequencies and at a large number of stations become prohibitive because of the complexity of the equipment involved and the large number of personnel necessary to carry out the obser-

vations, it is recommended that these complete studies of the detailed noise characteristics be confined to a few selected locations with continuous measurements of one or more simple parameters at a larger number of stations.

The amplitude-probability distribution has been measured at a number of locations and three proposals have been made for the mathematical representation of the distribution. The simplest of these is the log-normal distribution, which can be completely represented by means of two parameters, the average logarithm and the standard deviation, expressed in logarithmic units. By simple mathematical relationships, it can also be expressed in terms of the average power and the average envelope voltage.

Another representation is of the form :

$$Q(v) = \left[1 + \left(\frac{2v}{\bar{v}} \right)^q \right]^{-1}$$

where $Q(v)$ is the fraction of the time for which the envelope exceeds different voltages v , \bar{v} is the average envelope voltage and q is a constant determined experimentally. This expression can be evaluated in terms of three measured parameters.

The third form is represented by the following expressions :

$$\begin{aligned} Q(v) &= e^{-y^2} \\ v &= a_1 y + a_2 y^{\frac{b+1}{2}} + a_3 y^b \\ b &= 0.6 \left[20 \log_{10} \frac{v_{\text{rms}}}{\bar{v}} \right] \end{aligned}$$

The constants in these expressions can be evaluated by means of three measured parameters such as the average power, the average envelope voltage, and the average logarithm of the envelope voltage. Although this expression is more complex and requires the measurement of one moment more than the log-normal distribution, it has the advantage of being able to represent the complete amplitude time distribution of the noise over a much wider range of probabilities.

Since all three of these representations of the amplitude time distribution can be described by means of measured moments, it is recommended that measurements be made at as many locations as possible of the average power, the average envelope

voltage, and the average logarithm of the envelope voltage. If only one parameter is to be measured, priority should be established in the order given. The number of parameters actually necessary to describe the true distribution will be determined by the variability of shape that is observed from one place to another and as a function of time and frequency. If a sufficient number of systematic tendencies can be found for the shape of the distribution, then fewer moments will be required to show the variability.

It is recommended that studies be continued of the relationship between the various parameters, such as the ratio of the r. m. s. to the average under all conditions, i. e. as a function of time, frequency, and location. Studies of the influence of band-on all of the parameters as well as the statistical distributions are recommended.

It is certain that measurements of some time functions of the noise such as lengths of pulse or of noise bursts will be required for a full description, but it is not present clear which of these should be recommended.

Direct measurement of the moments is preferred instead of measurements of the Thomas type, but it is recommended that the operation of existing Thomas stations be continued until they can be replaced with the recommended measurements.

Although DF measurements are desirable at certain selected locations, it is recommended that omnidirectional antennas be used at most stations, in order to insure uniformity of results.

In making any measurements of noise, it is extremely important to carefully state all conditions of measurement so that observations by different experimenters can be interrelated.

II. — TECHNIQUES

A. — *Probability Distributions*

In making detailed statistical measurements on the instantaneous noise envelope voltage, it is recommended that measurement should be based on counting techniques, for example, using 10 kc/s pulses gated by the noise. These are the most versatile, since counting equipment can readily be adapted to the measurement of a number of parameters, such as the amplitude probability distributions, the distributions of the pulse lengths, and the intervals between the pulses.

The equipment necessary for making such measurements will generally contain the following components :

1. antenna,
2. calibrating signal,
3. calibrated attenuator,
4. receiver,
5. selective circuits of known effective bandwidth,
6. envelope detector,
7. amplitude discriminator,
8. gating circuits,
9. signal generator (usually about 10 kc/s),
10. one or more frequency counters.

The design of the receiver must be such that its recovery time is very short upon overload by high amplitude pulses. Except for this limitation, there are no severe dynamic range or linearity requirements. The receiver noise, of course, must be lower than the level of external noise that is to be measured.

The distributions are obtained by gating the 10 kc/s signal on for the period of time during which the noise level exceeds the threshold of the gating circuits, and by changing the amount of the attenuation at the input of the receiver in known steps. Various lengths of counting time are used at the different threshold levels. In general, 100 seconds is used for values of 5 % and greater, 200 seconds for values in the range of 0.0005 %, and 300 to 1000 seconds for values less than 0.0005 %. In general, a total of about 10 minutes is required to obtain all but the last three low percentage readings which themselves may take 10 to 20 minutes in order to obtain statistically constant data. The total time required is a function of the type of noise being measured. A longer time is required for noise with a large dynamic range.

B. — *Individual Parameters*

1. *Average Envelope Voltage.* — The basic equipment for measuring the average envelope voltage is as follows :

- (a) antenna,
- (b) calibration source (signal generator or noise diode),
- (c) frequency selective circuits of known effective bandwidth,
- (d) envelope detector (detector capable of following the peaks of the I.F. cycles at the audio-frequency rate),
- (e) integrating circuit (usually an RC circuit with a time constant of 100 seconds or more),
- (f) AGC or variable attenuator circuit (controlled by the integrated voltage),
- (g) recorder circuit (the recorder should indicate the magnitude of the control voltage which is calibrated in terms of the input signal level).

It is essential for the receiver to be linear over the important dynamic range of the noise being observed, for a fixed gain, so that the noise envelope is undistorted at the detector output. This requires an instantaneous dynamic range of 40 db or more. The required dynamic range is a function of the type of noise being measured and the bandwidth of the equipment. The narrower the bandwidth, the smaller the dynamic range. Usually bandwidths the order of 300 cycles to 1000 cycles are used. The gain stability of the equipment must be adequate to insure repeatability of calibrations. The noise figure of the equipment must be as low as possible to minimize contamination of low noise levels.

2. *Average Power.* — The required circuitry for measuring the r.m.s. voltage, or noise power, is similar to that required for average envelope measurements, except that just prior to detection a square law circuit is used. This circuit can consist of two tubes with the grids in push-pull and the plates in parallel; thus, producing in the plate circuit a voltage at twice the input frequency and with an amplitude proportional to the square of the input voltage. The amplifier and detector that follow must have a much larger dynamic range in order to handle the squared values without distortion. Using a bandwidth of about 300 c/s, a dynamic range of 80 db or more is required; however, much smaller bandwidths can be used for the power measurement, since the power is directly proportional to bandwidth regardless of the type of noise. Using a bandwidth the order of 1 c/s, the required dynamic range is reduced to about 40 db or less, since for these bandwidths the noise has the characteristics of thermal noise and approaches a

Rayleigh distribution. The time constant used will depend to a certain extent on the bandwidth; however, a time constant of of 500 seconds seems to give adequate smoothing.

3. *Average Logarithm.* — The equipment required for measuring the average logarithm is again very similar to the equipment for average envelope measurements. The principal difference is that a logarithmic amplifier is inserted between the envelope detector and the integrating circuit. A convenient circuit is a triode operating at zero bias and with a high value of grid resistance so that the plate current is an exponential function of the applied grid voltage. With this type of measurement, a time constant of the order of 50 seconds has proven satisfactory. It should be noted that the logarithmic amplifier must be capable of operating at the envelope frequency, i. e. the integration must occur after the logarithmic circuit rather than prior to or within the logarithmic circuit. It should also be noted that the gain control voltage must be obtained after integration rather than before integration.

COMMISSION V ON RADIO-ASTRONOMY

RESOLUTIONS

1. Sub-Commission Va on «continuous measurements of solar radio emission» should be discontinued.
2. A member of Commission V should be appointed to the Ursigram Permanent Committee.
3. Sub-Commission Vc on «the basic solar index» should be continued with the following membership :

Chairman : S. CHAPMAN,
Members : J. BARTELS,
A. E. COVINGTON,
M. NICOLET,
M. WALDMEIER,
S. F. SMERD,
J. F. DENISSE,
C. M. MINNIS,
H. DODSON PRINCE,
R. N. BRACEWELL,
A. MAXWELL.

4. Sub-Commission Vd on «Standards» should be continued with the following membership :

Chairman : C. SEEGER.

Members : A. E. COVINGTON,
F. T. HADDOCK,
M. LAFFINEUR,
D. A. MACRAE,
C. H. MAYER,
F. G. SMITH,
J. L. STEINBERG,
T. HATANAKA,
R. HANBURY BROWN.

5. The Commission endorses the following recommendation put forward by sub-commission Vd :

«There is now general agreement on the desirability of establishing certain of the stronger discrete sources as members of a standard sequence of flux density. To achieve this objective, it is desirable that U.R.S.I. Commission V and I.A.U. Commission 40,

(1) designate the following sources as members of a standard sequence of flux density,

23N5A (Cas A)	12N1A (Vir A)
19N4A (Cyg A)	16N0A (Her A)
05N2A (Tau A)	09S1A (Hyd A)

(2) call the attention of all radio astronomy observation to the urgent need for more accurate values for the absolute flux densities of the above sources.

(3) recommend that, in observational studies of discrete sources, greater attention be paid to obtaining accurate, well defined intensity ratios between the objects under observation and the members of the above standard sequence.

(4) recommend that persons making high resolution « pencil-beam » surveys, pay particular attention to the regions surrounding the above sources and publish their findings in the form of detailed maps, perhaps 30×30 degrees and centered on the individual sources. »

Commission V proposes that this recommendation should be forwarded to the I.A.U. for consideration by Commission 40.

6. Commission V expresses its thanks to the I.A.U. and C.C.I.R. for considering resolutions 4 and 5 adopted by Commission V at the XIth General Assembly in 1954. Once again it insists on the absolute necessity that those observatories engaged in radio-astronomy which are troubled by interference should receive the backing of the authorities in their own and neighbouring countries.

7. A new Sub-Commission *Ve* on «Frequency Allocation» should be established. This Sub-Commission is charged with preparing recommendations to be submitted through the appropriate authorities to the International Telecommunication Union at their meeting in 1959. The membership of this Sub-Commission is to be :

Chairman : F. T. HADDOCK (U. S. A.).

Members : E. J. BLUM (France),
A. HEWISH (U. K.),
V. VITKEVITCH (U. S. S. R.),
W. N. CHRISTIANSEN (Australia),
A. H. DE VOOGT (Netherlands),
T. HATANAKA (Japan),
L. ERIKSON (Norway),
F. BECKER (Germany),
A. E. COVINGTON (Canada),
G. RIGHINI (Italy),
J. TUOMINEN (Finland),
O. E. H. RYDBECK (Sweden),
R. COUTREZ (Belgium),
A. P. MITRA (India).

8. A working party, consisting of the Presidents of Commissions III and V, should examine the division of subjects between these two commissions.

9. Commission V recommends that U.R.S.I. should assent to the request by I.A.U. to sponsor a joint Symposium on Radio Astronomy in France just prior to the General Assembly of I.A.U. in 1958.

It recommends that the subjects matter should be restricted to those aspects of radio astronomy which are particularly of astronomical interest ; it should include solar, galactic and extra-

galactic radio emission together with a short session on radio studies of other bodies of the solar system. The number of scheduled speakers should be restricted so as to leave adequate time for discussion.

It also recommends that the proceedings should be published in book form.

The Commission suggests that the following persons should serve on a joint U.R.S.I.-I.A.U. organizing committee :

Chairman : J. L. PAWSEY (President of Commission 40 I.A.U.).

Secretary : F. T. HADDOCK,

Members : The Chairman of Commission V of U.R.S.I.
J. F. DENISSE,
V. VITKEVITCH,
R. MINKOWSKI,
A. C. B. LOWELL,
H. C. VAN DE HULST,
R. N. BRACEWELL.

J. L. PAWSEY, representing the I.A.U. at this General Assembly, has informed Commission V that he considers these proposals entirely acceptable to the I.A.U.

COMMISSION VI

ON RADIO WAVES AND CIRCUITS

1. The Commission notes with regret the passing of Prof. Marcel Bayard, an outstanding representative of the French National Committee in the field of Circuit Theory.

Resolved that a memorial be published in the Proceedings of the XIIth General Assembly.

2. Resolved that National Committee be urged to add to their membership circuit and communication engineers interested in operational problems of communication circuits to supplement the current theoretical work in the circuit field.

3. Resolved that National Committee be urged to add to their membership engineers and scientists interested in propagation in anisotropic media to contribute to the work of Commission VI in such areas as gyrators, isolators, etc.

4. Recommendation on organization of program for Commission VI for the XIIIth General Assembly : The main body of the program shall consist of discussion sessions on chosen topics introduced by invited papers, and that there shall be one or more sessions on contributed papers. Contributed papers shall be presented only if the author is present.

5. That a working group be named to study and report on the classification of surface waves.

6. That Commission sponsor an international symposium on Electromagnetic Theory in 1959 ; Toronto, Canada is being considered as the location.

7. That work on the monograph on communication systems be continued during the following three year period.

RECOMMENDATIONS FOR FUTURE WORK

1. The field strength in the neighborhood of antennas and obstacles under time-harmonic and transient conditions.

2. Wave propagation in anisotropic media.

3. The theory of surface wave and leaky wave antennas.

4. Calculation of the diffraction fields for dimensions of bodies in the resonance region.

5. Study of synthesis problem for actual antennas and scattering systems.

6. Scattering from periodic and « disturbed » periodic structures.

7. Study of broad-band antennas.

8. Study of design problems in large aperture antennas ; comparison between reflector antennas and arrays.

9. Application of communication theory principles to antenna design and scanning problems.

Special Reports

At the XIIth General Assembly the drafting of the following U.R.S.I. Special Report was decided :

Commission III. « Radar Observations of the Aurora » under the chairmanship of J. H. CHAPMAN.

Commission IV. « On Atmospheric Noise » under the chairmanship of the Chairman of Commission IV.

NATIONAL COMMITTEES

New scale of subscription

The General Assembly adopted a new scale of subscription which shall be effective from November 1st, 1957; this scale is given on p. 6 and 7.

After consulting the delegates of National Committees, the Executive Committee drafted a list of categories suggested to National Committees. This list has been forwarded to them.

On the other hand, the Executive Committee found desirable to publish the list of National Committees which give an answer, and to state the category they have selected.

Until now the following National Committees have sent their agreement :

Canada : category 4 (1000 \$).

Italy : category 4 (1000 \$).

Morocco : category 1 (125 \$).

Norway : category 1 (125 \$).

Canada

REPORT OF THE NATIONAL COMMITTEE

1954-1957

The Associate Committee on Radio Science (a committee of the National Research Council of Canada) was established in 1951 to further research in Canada in radio science, and to act as the Canadian National Committee of the Union Radio Scientifique Internationale. During the period 1954-1957 the following persons have been members of the main Committee :

Dr. D. W. R. MCKINLEY, *Chairman*, Radio and Electrical Engineering Division, National Research Council, Ottawa, Ontario.

- Dr. B. G. BALLARD, Vice-President (Scientific), National Research Council, Ottawa, Ontario.
- Dr. Pierre BRICOUT, 40, Golf Avenue, Pte. Claire, Montreal 33, Quebec.
- Dr. J. H. CHAPMAN, Radio Physics Laboratory, Defence Research Board, Shirley Bay, Ottawa, Ontario.
- Mr. A. E. COVINGTON, Radio and Electrical Engineering Division, National Research Council, Ottawa, Ontario.
- Dr. B. W. CURRIE, Physics Department, University of Saskatchewan, Saskatoon, Saskatchewan.
- Mr. F. T. DAVIES, Assistant Chief Scientist, Defence Research Board, Ottawa, Ontario.
- Dr. R. C. DEARLE, Physics Department, University of Western Ontario, London, Ontario.
- Dr. J. T. HENDERSON, Division of Applied Physics, National Research Council, Ottawa, Ontario.
- Dr. H. P. KOENIG, Physics Department, Laval University, Quebec, Quebec.
- Dr. J. S. MARSHALL, Physics Department, McGill University, Montreal, Quebec.
- Dr. P. M. MILLMAN, Radio and Electrical Engineering Division, National Research Council, Ottawa, Ontario.
- Mr. James C. W. SCOTT, Defence Research Telecommunications Establishment, Defence Research Board, Shirley Bay, Ottawa, Ontario.
- Dr. George SINCLAIR, Electrical Engineering Department, University of Toronto, Toronto, Ontario.
- Dr. G. A. WOONTON, Physics Department, McGill University, Montreal, Quebec.
- Mrs. K. M. ANN MARSHALL, *Secretary*, Radio and Electrical Engineering Division, National Research Council, Ottawa, Ontario.

Six National Commissions of U.R.S.I. have been established as follows :

Commission I : *Radio Measurements and Standards.*

Chairman : Dr. J. T. HENDERSON.

Members : Mr. K. A. MACKINNON,
Mr. C. F. PATTENSON.

Commission II : *Radio and Troposphere.*

Chairman : Dr. J. S. MARSHALL.

Members : Mr. BONNEVILLE,
Mr. C. J. BRIDGELAND,
Mr. R. W. DOBRIDGE,
Dr. Lorne DOHERTY,
Dr. W. E. GORDON (U. S. A.),
Mr. Donald HAY,
Dr. R. C. LANGILLE,
Mr. J. L. MARSHALL,
Dr. F. H. NORTHOVER.

Commission III : *Ionospheric Radio.*

Chairman : Mr. J. C. W. SCOTT.

Members : Dr. J. H. CHAPMAN,
Dr. B. W. CURRIE,
Dr. R. C. DEARLE,
Dr. P. FORSYTH,
Dr. A. G. McNAMARA,
Dr. W. PETRIE,
Mr. W. B. SMITH.

Commission V : *Radio Astronomy.*

Chairman : Mr. A. E. COVINGTON.

Members : Mr. G. HARROWER,
Mr. T. HARTZ,
Dr. D. A. MACRAE,
Dr. P. M. MILLMAN.

Commission VI : *Radio Waves and Circuits.*

Chairman : Dr. George SINCLAIR.

Members : Mr. E. HAYES,
Mr. K. A. MACKINNON,
Dr. G. A. MILLER.

Commission VII : *Radio Electronics.*

Chairman : Dr. H. P. KOENIG.

Members : Dr. D. A. ANDERSON,
Dr. Allna E. BOONE,
Dr. R. C. DEARLE,

Dr. A. D. MACDONALD,
Dr. W. R. RAUDORF,
Mr. P. A. REDHEAD,
Dr. J. R. WHITEHEAD.

Each Commission held several meetings in the period 1954-1957, some of which included technical sessions on a modest scale, involving the presentation and discussion of some scientific papers. Commission VI, represented by Dr. Sinclair, was active in the organization of the U.R.S.I.-sponsored meeting on Electromagnetic Theory held at Ann Arbor, Michigan, U. S. A., in June, 1955.

The National Committee held two administrative meetings. Some changes in membership occurred, which have been noted in the *U.R.S.I. Information Bulletin*. Close cooperation has continued with the U. S. A. National Committee, and, in particular, Canadian scientists have taken advantage of the U. S. standing invitation to present papers at the Spring and Fall technical sessions held in the United States. Several factors have conspired to prevent a repeat performance of the Canadian-U. S. A. four-day technical meeting held at Ottawa in October, 1953, in particular, the two General Assemblies taking place on this continent this year, but there is a good prospect that another joint meeting may be held in Canada in the not-too-distant future.

The Canadian National Committee has a keen interest in the programme of the International Geophysical Year, naturally, but its participation as a Committee is indirect and chiefly concerns liaison with U.R.S.I. headquarters. The Canadian Committee for the I.G.Y. has the primary responsibility for organizing the Canadian effort, and this body is made up of representatives both from the U.R.S.I. Committee and from the I.U.G.G. National Committee which is also involved in I.G.Y. matters.

Finland

REPORT OF THE NATIONAL COMMITTEE

The Finnish National Committee is composed of 13 Ordinary Members representatives of the Finnish Academy of Science, Finland's Scientific Society, Finland Institute of Technology,

the State Institute for Technical Research, the General Direction of Posts and Telegraphs, the Finnish Broadcasting Company, the Meteorological Office, the Board of Navigation, the Defence Forces and the Institute of Radio Engineers.

The Finnish National Committee has had 5-6 meetings in the year. The third joint meeting between the National Committee and the Institute of Radio Engineers was arranged in April 1957. During this meeting 32 papers were presented. Following subjects were discussed :

microwave electronics,
microwave measurements,
pulse techniques,
wave propagation, electronics,
circuit theory and nuclear physics.

Upon the initiative of the Finnish National Committee we have now one ionosphere observatory working at Nurmijärvi in the southern part of Finland and the other one, Sodankylä observatory, will be finished before the Geophysical Year begins. Sodankylä is in the northern part of Finland.

Sweden

ADMINISTRATIVE REPORT OF THE SWEDISH NATIONAL COMMITTEE

ACTIVITIES OF THE SWEDISH NATIONAL COMMITTEE OF U.R.S.I.

The Swedish National Committee held full meetings in Stockholm on 5th November, 1956, and on 29th April, 1957, under the chairmanship of Dr. H. Sterky. (See also *U.R.S.I. Information Bulletin* n° 98, July-August, 1956.)

It was decided that the main radio scientific questions should be dealt with in the sections, and that the full committee meetings should deal only with questions of a general character and questions involving principles.

On 18th to 20th February, 1957, a radio-scientific conference was held in Stockholm. This conference — which was the fifth

of its kind — was arranged jointly by the Swedish National Committee of U.R.S.I., the Royal Swedish Academy of Engineering Sciences, and the Swedish Association of Electrical Engineers.

Sixty eight papers dealing with measuring methods and instruments, wave propagation, radio astronomy, radio waves and circuits, radioelectronics, materials and components, electro-acoustics, modulation and noise, were presented.

A complete list of the titles is attached to this report (Appendix 1). Most of the papers are in Swedish.

The Swedish National Committee now consists of 17 ordinary members and 23 adjoint members in accordance with the attached list (Appendix 2). There is also attached a list showing the official members of the U.R.S.I. Commissions. Those persons are also chairmen of the sections of the Swedish National Committee corresponding to the U.R.S.I. Commissions.

THE INTERNATIONAL GEOPHYSICAL YEAR 1957-1958

The organisation of the National Centre for Communications during the International Geophysical Year in Stockholm is now completed. The full address is as follows :

Mail. — The Royal Board of Swedish Telecommunications, Radio Department, Attention Mr. Sven Gejer, Brunkebergstorg 2, Stockholm 16, Sweden.

Telephone. — During office hours 08.00-15.30 GMT : Stockholm 44.97.40. During all other hours : Stockholm 10.01.76 (ask for supervisor).

Telegraph. — « I.G.Y. Centre », Stockholm.

Telex. — During office hours 08.00-15.30 GMT : 1208 (RADIOGEN STH). During all other hours : 1270 (RADIO-CENTR STH).

Note. — Reduced office hours are applicable on Saturdays : 08.00-14.00 GMT and during June, July and August : 08-00-14.15 GMT (08.00-12.00 GMT on Saturdays).

Daily telex messages containing hourly values of f_oF_2 at Luleå, Kiruna and Uppsala and hourly values of $h'F_2$ at Kiruna are sent regularly to Nera and Darmstadt.

Retransmission to Nera and Darmstadt from Helsinki of the hourly values of f_oF_2 at Nurmijärvi is also made.

The Swedish Telecommunications Administration has given permission to amateur radio stations to use frequencies in the band 50.0-50.5 Mc/s during the International Geophysical Year (1st July, 1957, to 31st December, 1958), especially for studies of propagation over long distances.

Permission has also been given to Swedish radio amateurs to transmit scientific observation data during the I.G.Y.

The contributions of the Swedish radio amateurs during the I.G.Y. will be furnished through medium of the Association of Swedish Radio Amateurs (Föreningen Sveriges Sändare Amatörer), and this Association will also work up certain of the observational data.

APPENDIX I

List of papers presented at the fifth Radio Scientific Conference in Stockholm 18th-20th February 1957

DATA PROCESSING ETC.

1. A system for time division transmission of two telephone conversations within a single channel bandwidth, by U. ÅBERG, *Research Institute of National Defence, Stockholm.*
2. A device for tape scanning of speech at short intervals, by P. A. WERNER, *Research Institute of National Defence, Stockholm.*
3. The problem of sensitivity in television transmissions of X-ray pictures, by H. WALLMAN, *Chalmers Institute of Technology, Gothenburg.*
4. Long-time storage in vidicon tubes, by N. STÅLBERG, *Institute of Technology, Gothenburg.*
5. Combined figure and analogy operations in swift non-linear computation units, by Ö. CARLSSON, *Chalmers Institute of Technology, Gothenburg.*
6. A system for swift continuous conversion of analogy form into figure form, by V. WENTZEL, *Chalmers Institute of Technology, Gothenburg.*

TRANSISTORS

7. Transistorized power converters, by B. KRUGER, *Royal Institute of Technology, Stockholm.*
8. Amplification as opposed to requirement of neutralization in tuned transistor amplifiers, by P. O. LEINE, *Royal Institute of Technology, Stockholm.*

9. Temperature influences in junction transistors, by R. MELBING, *Royal Institute of Technology, Stockholm.*
10. Temperature influences on small signal parameters of transistors at low frequency, by R. PARHAM, *Royal Institute of Technology, Stockholm.*
11. Measurements of thermal resistance and current amplification in power transistors, by G. MARKESJÖ, *Royal Institute of Technology, Stockholm.*
12. Transistor blocking oscillator, *n-p-n-p-n-p* multivibrator, by G. WESTERBERG, *Royal Institute of Technology, Stockholm.*
13. A device for measuring the transistor parameters h_{21} and h_{11} as functions of the working point, by H. BERGQVIST, *Royal Institute of Technology, Stockholm.*

LINES AND CIRCUITS

14. Determination of the Q factor of a microwave resonator by means of impedance measurements and the application of tests on cylindrical surface wave conductors, by B.-O. ÅS, *Royal Institute of Technology, Stockholm.*
15. Ferrites used for the deflexion of polarization at the wave-lengths of 3, 6 and 10 cm, by P. E. LJUNG, *Research Institute of National Defence, Stockholm.*
16. Directional attenuators for the wave length of 6 cm, by P. E. LJUNG, *Research Institute of National Defence, Stockholm.*
17. Fine-line switches, by G. GOBL, *L. M. Ericsson Telephone Co, Stockholm.*
18. Wave-type filters, by H. SCHEFTE, *L. M. Ericsson Telephone Co, Stockholm.*
19. A connection to be used for exact measurements of the reflection factor, by H. OLSZANSKI, *L. M. Ericsson Telephone Co, Stockholm.*
20. Quantum theories of filter networks, by T. LAURENT, *Royal Institute of Technology, Stockholm.*
21. The linearity of FM discriminators, by B. G. OLSSON, *L. M. Ericsson Telephone Co, Stockholm.*
22. A measuring method for wide-band limiting and an improved limiter stage, by A. DUDNIK, *L. M. Ericsson Telephone Co, Stockholm.*
23. Klystron modulator, by J. PISARSKI, *L. M. Ericsson Telephone Co, Stockholm.*
24. The hybrid cascode — a combined transistor and electronic valve amplifier, by V. WENTZEL, *Chalmers Institute of Technology, Stockholm.*
25. A sensitive group transit-time meter, by R. MAGNUSSON, *Chalmers Institute of Technology, Gothenburg.*

ELECTRONIC VALVES

26. Application of the diode « telegraph equation » in the case of a microwave resonator being coupled to an electron beam, by O. E. H. RYDBECK, *Chalmers Institute of Technology, Gothenburg.*

27. Development work effected in view of producing a reflex klystron having good modulation properties, by L. TORSTENSSON, *AB Svenska Elektronrör, Stockholm.*
28. Theoretical and experimental investigations of the strophotron, by B. AGDUR, *Royal Institute of Technology, Stockholm.*
29. The development of strophotrons, by H. HÄGGBLUM and S. TOMNER, *AB Svenska Elektronrör, Stockholm.*
30. The movements of electrons in magnetic quadripole fields, by H. ALFVÉN, *Royal Institute of Technology, Stockholm.*
31. The meander valve, a new oscillator valve for microwaves, by T. HANAAS, *Royal Institute of Technology, Stockholm.*
32. Electron paths in meander valves, by E. ÅSTRÖM, *Royal Institute of Technology, Stockholm.*
33. The representation in a Smith diagram of complex propagation constants in a travelling-wave tube, by S. OLVING, *Chalmers Institute of Technology, Gothenburg.*
34. Plasma waves in electron beams having inhomogeneous cross sections, by O. E. H. RYDBECK, *Chalmers Institute of Technology, Gothenburg.*
35. An approximate phase relation for plasma waves in electron valves having a continuously variable longitudinal electron velocity, by S. OLVING, *Chalmers Institute of Technology, Gothenburg.*
36. Current nodes of the total plasma wave in an electron beam of constant velocity, by K. NYGÅRD, *Chalmers Institute of Technology, Gothenburg.*
37. Experimental measuring of plasma waves in the electron beam of a voltage stage valve, by O. STEINSTÖ, *Chalmers, Institute of Technology, Gothenburg.*
38. The plasma resonator, by A. DATNER, *Royal Institute of Technology, Stockholm.*

AERIALS

39. The horn-type reflector aerial, by H. SCHEFTE, *L. M. Ericsson, Telephone Co, Stockholm.*
40. A wide-band omnidirectional slot aerial system in a circular conductive cylinder, by G. SVENNÉRUS, *Research Institute of National Defence, Stockholm.*
41. A quater-wave dipole, by B. JOSEPHSON, *Research Institute of National Defence, Stockholm.*
42. The circular frame aerial, by P. O. BRUNDELL, *Royal Institute of Technology, Stockholm.*
43. The measurement of phase distribution in aerials, by E. CASSEL, *Research Institute of National Defence, Stockholm.*
44. An omnidirectional vertically polarized VHF and UHF aerial, by R. BERGLUND, *Royal Board of Telecommunications, Stockholm.*

45. An equipment for measuring space radiation from aerials, by R. BERGLUND, *Royal Board of Telecommunications, Stockholm.*
46. A full-scale study of the influences of terrain conditions on the radiations qualities of short-wave aerials, by R. LINDQUIST, *Research Institute of National Defence, Stockholm.*
47. Submerged wire aerials placed in sea-water, by G. SVENNÉRUS, *Research Institute of National Defence, Stockholm.*

WAVE PROPAGATION

48. Dimensioning of equipments for tropospheric scatter systems by P. GUDMANDSEN, *Mikrobolgelaboratoriet, Copenhagen.*
49. Signal characteristics in forward scatter systems using the 10 cm band, by G. CARLSON, *Research Institute of National Defence, Stockholm.*
50. Teleprinter communication over forward scatter circuits, by G. CARLSON, *Research Institute of National Defence, Stockholm.*
51. Experiences of wave propagation in a radio relay system using 2300 MHz over mid-Sweden terrain, by F. EKLUND, *Research Institute of National Defence, Stockholm.*
52. Range estimates for the propagation of ground waves in the VHF bands, by Å. BLOMQUIST, *Research Institute of National Defence, Stockholm.*
53. Influences of terrain conditions on the propagation of ground waves in the VHF bands, by Å. BLOMQUIST, *Research Institute of National Defence, Stockholm.*
54. Some preliminary results of a study of the conditions of propagation of long waves, by R. LINDQUIST, *Research Institute of National Defence, Stockholm.*
55. Devices for measuring and recording rapid variations of temperature and humidity in air layers near the ground, by H. ERIKSSON, *Research Institute of National Defence, Stockholm.*
56. The deformation of the E layer during a total solar eclipse, by O. E. H. RYDBECK, *Chalmers Institute of Technology, Gothenburg.*
57. The reflexion of radio waves from a drifting ionosphere, by O. E. H. RYDBECK, *Chalmers Institute of Technology, Gothenburg.*
58. The phase integral method and the Riccati equation, by O. E. H. RYDBECK, *Chalmers Institute of Technology, Gothenburg.*
59. A semi-automatic curve analyzer, by F. EKLUND, *Research Institute of National Defence, Stockholm.*

RADIO ASTRONOMY

60. Preliminary results of measurements on two wave lengths of the scintillation of radio stars, by T. ORHAUG, *Chalmers Institute of Technology, Gothenburg.*

61. Milky Way isophots on the wave lengths of 9 and 2 m, by B. HÖGLUND, and H. HVATUM, *Chalmers Institute of Technology, Gothenburg.*
62. Measurements of the Milky Way on the wave length of 21 cm, by H. HVATUM, V. RADHAKRISHNAN and S. ELDÉR, *Chalmers Institute of Technology, Gothenburg.*
63. Investigation of the structure on the solar corona on 80 MHz during the sunspot minimum of 1954, by J. TUOMINEN, *Helsingfors University, Helsingfors.*
64. Radio echoes from aurora borealis, by S. OLIVING and J. MEOS. *Chalmers Institute of Technology, Gothenburg.*
65. Further investigations of radar echoes from meteors, by B. A. LINDBLAD, *Lund Astronomical Observatory, Lund.*

ATMOSPHERICS

66. Predischarges in relation to following lightning strokes, by H. NORINDER and E. KNUDSEN, *Institute of High-Tension Research, Uppsala.*
67. Variation forms and the time sequence of multiple lightning strokes. by H. NORINDER and B. VOLLMER, *Institute of High-Tension Research, Uppsala.*
68. Atmospheric electric discharges from distant snow squalls and occlusion fronts, by H. NORINDER and B. KNUDSEN, *Institute of High-Tension Research, Uppsala.*

APPENDIX II

MEMBERS OF THE SWEDISH NATIONAL COMMITTEE 1st JANUARY, 1957

ORDINARY MEMBERS

The Chairmen of the sections are also official members to the corresponding U.R.S.I. Commissions.

Appointed by the Government :

- DR. HÅKAN K. A. STERKY (*Chairman*), Director General, Swedish Telecommunications Administration.
- MR. MARTIN E. FEHRM (*Chairman of section II*), Head of Division, Research Institute of National Defence, Div. 3, Stockholm 80.
- MR. HILDING E. BJÖRKLUND (*Chairman of section I*), Engineer-in-Chief, Electrotechnical Laboratory of Swedish Army Administration, Solna 6.
- MR. GÖSTA A. BRIGGE, Engineering Captain, Swedish Admiralty, Stockholm 80.
- MR. HENRIK A. LINDGREN, Head of Division, Swedish Air Force Administration, Stockholm 80.

MR. SVEN A. GEJER (*Secretary, Chairman of section III*), Head of Division, Royal Board of Telecommunications, Stockholm 16.

MR. LARS-OLOW RAAB, Master of Science, Meteorologist, Swedish Meteorological and Hydrological Institute, Fridhemsgatan 9, Stockholm 12.

Appointed by the Teaching Staff of the Royal Institute of Technology, Stockholm :

DR. ERIK O. LÖFGREN, Professor, Royal Institute of Technology, Valhallavägen 79, Stockholm 70.

DR. NICOLAI HERLOFSON, Demonstrator, Royal Institute of Technology, Valhallavägen 79, Stockholm 70.

Appointed by the Chalmers Institute of Technology, Gothenburg :

DR. OLOF E. H. RYDBECK (*Chairman of section V*), Professor, Chalmers Institute of Technology, Gothenburg.

DR. HENRY WALLMAN (*Chairman of section VII*), Professor, Chalmers Institute of Technology, Gothenburg.

Appointed by the Royal Academy of Sciences :

DR. HANNES ALFVÉN (*Vice Chairman*), Professor, Royal Institute of Technology, Valhallavägen 79, Stockholm 70.

DR. ERIK G. HALLÉN (*Chairman of section VI*), Professor, Royal Institute of Technology, Valhallavägen 79, Stockholm 70.

DR. YNGVE ÖHMAN, Professor, Stockholm Astronomical Observatory, Saltsjöbaden.

Appointed by the Royal Academy of Engineering Science :

MR. ERIK B. ESPING, Engineer-in-Chief, Royal Board of Telecommunications, Stockholm 16.

DR. HARALD E. NORINDER (*Chairman of section IV*), Professor, Institute of High-Tension Research, Uppsala.

DR. MAURITZ VOS, L. M. Ericsson Telephone Co, Stockholm 32.

ADJOINED MEMBERS

MR. BERTIL AGDUR, Tech. lic., Royal Institute of Technology, Stockholm.

MR. PER ÅKERLIND, Head of Division, Royal Board of Telecommunications, Stockholm 16.

DR. NILS AMBOLT, Head of Division, Royal Swedish Board of Shipping and Navigation.

DR. CARL-GEORG AURELL, Professor, Chalmers Institute of Technology, Gothenburg.

MR. TORSTEN GUSSING, Demonstrator, Research Institute of National Defence, Div. 3, Stockholm 80.

MR. HEIN HVATUM, Electrical Engineer, Chalmers Institute of Technology, Gothenburg.

- Mr. BERTIL HÅÅRD, Tech. lic., L. M. Ericsson Telephone Co, Stockholm 32.
- Mr. BENGT JOSEPHSON, Tech. lic., Research Institute of National Defence, Div. 3, Stockholm 80.
- Mr. HUGO LARSSON, Director-in-Chief, Research Institute of National Defence, Stockholm 80.
- Mr. BERTIL ANDERS LINDBLAD, Master of Science, Lund Astronomical Observatory, Lund.
- Mr. RUNE LINDQUIST, Tech. lic., Research Institute of National Defence, Div. 3, Stockholm 80.
- Dr. D. MULLER-HILLEBRAND, Professor, Institute of High-Tension Research, Uppsala.
- Mr. THOMAS ÖVERGAARD, Head of Division, Royal Board of Telecommunications, Stockholm 16.
- Mr. SVEN G. RAHMN, Senior Radio Engineer, Radio Section of Telecommunications Administration, Vallgatan 10, Gothenburg.
- Mr. ARNE SCHLEIMANN-JENSEN, Director of Schleimann-Jensen Laboratory, Klingsta Skogsväg 26, Danderyd.
- Mr. CARL H. VON SIVERS, Electrical Engineer, Sivers Laboratory, Kristallvägen 18, Hägersten.
- Dr. LENNART STIGMARK, Lund University, Lund.
- Mr. WILLY STOFFREGEN, Research Engineer, Ionosphere Laboratory, Uppsala 11.
- Mr. GUNNAR SVALA, Head of Division, L. M. Ericsson Telephone Co, Stockholm 32.
- Mr. GUSTAF E. SWEDENBORG, Head of Division, Royal Board of Telecommunications, Stockholm 16.
- Mr. SIGVARD TOMNER, Tech. lic., AB Svenka Elektronrör, Lumavägen 6, Stockholm 20.
- Dr. TORSEL J. WALLMARK, Royal Institute of Technology, Valhallavägen 70, Stockholm 70.
- Mr. TORD WIKLAND, Demonstrator, Research Institute of National Defence, Div. 3, Stockholm 80.

OFFICIAL MEMBERS TO U.R.S.I. COMMISSIONS

- Commission I : Mr. HILDING E. BJÖRKLUND, Engineer-in-Chief, Electro-technical Laboratory of Swedish Army Administration, Solna 6.
- Commission II : Mr. MARTIN FEHRM, Head of Division, Research Institute of National Defence, Div. 3, Stockholm 80.
- Commission III : Mr. SVEN GEJER, Head of Division, Royal Board Telecommunications, Stockholm 16.
- Commission IV : Dr. HARALD NORINDER, Professor, Institute of High-Tension Research, Uppsala.

Commission V : Dr. OLOF E. H. RYDBECK, Professor, Chalmers Institute of Technology, Gothenburg.

Commission VI : Dr. ERIK HALLÉN, Professor, Royal Institute of Technology, Stockholm 70.

Commission VII : Dr. HENRY WALLMAN, Professor, Chalmers Institute of Technology, Gothenburg.

U. S. A.

REPORT OF THE NATIONAL COMMITTEE

Since the XIth General Assembly the principal activities of the National Committee have been directed toward preparations for the XIIth General Assembly in Boulder, Colorado. An inspection of the facilities of the University of Colorado and of the National Bureau of Standards revealed the fact that very adequate accommodations were available—both for many simultaneous technical sessions, and for housing all attending scientists.

The National Committee was extremely fortunate in obtaining the services of Dr. J. H. Dellinger as Chairman of the General Arrangements Committee. The National Academy of Sciences aided greatly in the provision of office facilities in Washington, D. C.

The Local Arrangements Committee in Boulder has been extremely active. Under the capable chairmanship of K. A. Norton, the multitude of details involved in preparations for a meeting of this scope has been effectively handled.

The Finance Committee was organized on a national basis by the Chairman, Dr. L. V. Berkner, and an active campaign was initiated at an early date. Contributions were solicited from both Government and Industry. The overall response has been gratifying.

The activities of the Foreign Arrangements Committee, under the chairmanship of Prof. W. E. Gordon have been instrumental in making arrangements for travel via the Military Air Transport Service (M.A.T.S.) and for many other special connections of individuals — such as lecturers, consultants, etc.

The Technical Program Committee, under chairmanship of Prof. A. H. WAYNICK, has been endeavoring to arrange a program

of broad and basic interest to radio science in liaison with the chairmen of the several international commissions.

The U. S. A. National Committee is particularly indebted to Dr. W. W. Atwood and E. Rowan of the National Academy of Sciences for their generous assistance and guidance in many problems of an international nature.

Scientific and technical progress in the areas of Commission I — is reviewed in the reports of commission chairmen in the various sections submitted to the General Assembly.

The usual Spring Meetings were held in Washington, D. C. about May in 1955, 1956 and 1957. Attendance varied from 320 to 535, and all commissions were active. Fall technical sessions were held at the University of Florida (Gainesville) in December 1955, and at the University of California (Berkeley) in October 1956.

MEMBERS OF THE U. S. A. NATIONAL COMMITTEE

Executive Committee :

Chairman : Mr. H. W. WELLS.

Vice-Chairman : Dr. W. E. GORDON.

Secretary-Treasurer : Dr. John P. HAGEN.

Junior Past-Chairman : Dr. A. H. WAYNICK,

Dr. L. V. BERKNER,

Dr. C. R. BURROWS,

Dr. J. Howard DELLINGER,

Dr. Rufus G. FELLERS.

Commission Chairman :

Dr. E. WEBER : Commission 1,

Dr. J. B. SMYTH : Commission 2,

Dr. Millett G. MORGAN : Commission 3,

Mr. A. W. SULLIVAN : Commission 4,

Mr. Fred T. HADDOCK : Commission 5,

Dr. J. B. WIESNER : Commission 6, 6.1, 6.2,

Dr. E. C. JORDAN : Commission 6.4,

Dr. W. G. SHEPHERD : Commission 7.

Members :

Mr. E. W. ALLEN, Jr.,
Mr. S. L. BAILEY,
Dr. W. R. G. BAKER,
Dr. H. H. BEVERAGE,
Rear Admiral H. C. BRUTON,
Mr. Frederik H. DICKSON,
Mr. Harold E. DINGER,
Dr. C. C. FURNAS,
Mr. Francis J. GAFFNEY,
Mr. A. G. JENSEN,
Dr. Joseph KAPLAN,
Mr. J. E. KETO,
Mr. George LUKES,
Professor L. A. MANNING,
Dr. Brian O'BRIEN,
Major Gen. James D. O'CONNELL,
Brig. Gen. Alvin L. PACHYNSKI,
Dr. R. M. PAGE,
Mr. Alan H. SHAPLEY,
Dr. Samuel SILVER,
Dr. Ralph J. SLUTZ,
Dr. A. W. STRAITON.

U. S. S. R.

OFFICIAL MEMBERS OF COMMISSIONS

All Union Scientific Advisory Committee of Radio Physics and Radio Techniques AN (Academy of Science) of the U. S. S. R., which represents the National Committee of the International Scientific Radio Union appointed the following Official Members :

Commission I : Candidate of Physics Mathematical Science M. E.

SABOTINSKI.

Commission II : Candidate of Technical Science A. I. KALININ.

Commission III : Candidate of Technical Science N. B. PUSHKOV.

Commission IV : Professor N. M. IZYUMOV.

Commission V : Candidate of Technical Sciences V. V. VITKEVICH.

Commission VI : Professor V. A. ILYIN.

Commission VII : Candidate of Technical Sciences M. F. STELMAKH.

COMMISSIONS

List of Official Members

We would be thankful to readers who would inform us of any gaps or errors in the following lists.

COMMISSION I

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COMMISSION V

ON RADIO-ASTRONOMY

New australian radio telescope in use

A new radio telescope now operating at Fleurs, about 35 miles from Sydney, Australia, is helping scientists to solve some of the mysteries of the solar system, and to study the effects of sun storms on the earth.

The telescope is equipped with 64 discs, 18 feet in diameter, and from these a continuous picture of the sun is fed into a recording machine. A complete record of solar flare-ups is obtainable through cloud and other disturbances, and across hundreds of thousands of miles of solar atmosphere (Unesco).

URSIGRAMS

Japanese Ursigram Broadcasts

From June I.G.Y. trial month onward the Ursigram broadcasts from Japan are carried on in I.G.Y. Interchange Codes and on the following broadcasting schedule.

« URSIGRAMS »

Code « CORAY »

First group : Initial sign CORAY.

Second group :

- | | | |
|---|---|-----------------------|
| 1 | } | Date of observation. |
| 2 | | |
| 3 | } | Apparatus (code 1). |
| 4 | | |
| 5 | | Observatory (code 2). |

Third group : Bi-hourly mean intensity for 0 h.-8 h. U. T. (code 3).

- 1..... Mean intensity for 0 h.-2 h. U. T.
- 2..... Mean intensity for 2 h.-4 h. U. T.
- 3..... Mean intensity for 4 h.-6 h. U. T.
- 4..... Mean intensity for 6 h.-8 h. U. T.
- 5..... Check of the third group.

Fourth group : Bi-hourly mean intensity for 8 h.-16 h. U. T. (code 3).

- 1..... Mean intensity for 8 h.-10 h. U. T.
- 2..... Mean intensity for 10 h.-12 h. U. T.
- 2..... Mean intensity for 10 h.-12 h. U. T.
- 3..... Mean intensity for 12 h.-14 h. U. T.
- 4..... Mean intensity for 14 h.-16 h. U. T.
- 5..... Check of the fourth group.

Fifth group : Bi-hourly mean intensity for 16 h.-24 h. U. T.
(code 3).

- 1..... Mean intensity for 16 h.-18 h. U. T.
- 2..... Mean intensity for 18 h.-20 h. U. T.
- 3..... Mean intensity for 20 h.-22 h. U. T.
- 4..... Mean intensity for 22 h.-24 h. U. T.
- 5..... Check of the fifth group.

Sixth group :

- 1 } ... Mean intensity of the day in unit of 0.1 %,
2 } corrected for the barometer effect.
3 }
- 4..... Classification of phenomena (code 4).
- 5..... Check of the sixth group.

If the 4th figure of 6th group is 0, following groups should be omitted and 5th figure of this group should be replaced by Y or Z (code 5).

Seventh group :

- 1 } ... Time of beginning of unusual phenomena in hours
2 } end ten minutes U. T.
3 }
- 4 } ... Time interval from the beginning to maximum or
5 } minimum in ten minutes.

When the disturbance continues to next day, last two figures of 7th group are expressed by 99.

Eighth group :

- 1 } ... Percentage of maximum or minimum deviation.
2 }
- 3 } ... Time at maximum or minimum in hours and
4 } ten minutes U. T.
5 }

When the disturbance continues to next day, initial two figures of 8th group are expressed by 00.

Ninth group :

- 1 } ... Duration of the effect in hours.
2 }
- 3 } ... Time of ending in hours U. T.
4 }
- 5..... Y or Z (code 5).

CODES

(1) Apparatus.

- 01 = Counter telescope (no shielding, $\pm 70^\circ$).
- 02 = Counter telescope (10 cm Pb, $\pm 70^\circ$).
- 03 = Nishina type ionization chamber (10 cm Pb).
- 04 = Counter telescope (no shielding, $\pm 40^\circ$).
- 05 = Counter telescope (12 cm Pb, $\pm 40^\circ$).
- 06 = Counter telescope (no shielding, $\pm 40^\circ$).
- 07 = Counter telescope (no shielding, $\pm 12^\circ$).
- 08 = Neutron Monitor (12 B¹⁰F₃ Counters).
- 09 = Meson Monitor (10 cm Pb, $\pm 45^\circ$).
- 10 = Counter telescope (no shielding, $\pm 45^\circ$).
- 11 = Counter telescope (10 cm Pb, $\pm 10^\circ$).
- 12 = Counter telescope (10 cm Pb + 110 cm Fe, $\pm 10^\circ$).
- 13 = Counter telescope (10 cm Pb, $\pm 25^\circ$).
- 14 = Counter telescope (10 cm Pb, $\pm 20^\circ$).
- 15 = Ionization chamber (10 cm Pb, 1601).

(2) Observatories.

- 1 = Scientific Research Institute, Tokyo.
- 2 = Meteorological Research Institute, Tokyo.
- 3 = Nagoya University, Nagoya.
- 4 = Mt. Norikura Cosmic-Ray Laboratory (S. R. I.) (2 840 m).
- 5 = Hokkaido Liberal Arts University, Sapporo.

(3) Daily mean value is expressed by the figure 5, and the deviation for the two hours' period from the daily mean value is expressed as follows :

9 = +4 %	4 = -1 %
8 = +3 %	3 = -2 %
7 = +2 %	2 = -3 %
6 = + 1%	1 = -4 %
5 = 0 %	

The scale unit of the deviation for the observational data obtained by apparatus 06, 07 and 08 (code 1) should be doubled.

(4) Classification of unusual phenomena.

- 0 = Calm
- 1 = Increase
- 2 = After-effect of increase
- 3 = Decrease
- 4 = After-effect of decrease

- (5) Y = Data of other observatories will be continued.
Z = End of all kinds of cosmic ray code.

Note : Letter X is used in case of non-observation.

BROADCASTING SCHEDULE OF I.G.Y. MESSAGES

(I) *Warning Messages.*

Time (U. T.)	Frequency (kc/s)
(1) To South :	
20.30	12 000
21.30	15 950
(2) To North-West :	
20.00	12 000
21.00	12 295

(II) *Current Data Summaries.*

Time (U. T.)	Frequency (kc/s)	
(1) To South :		
04.30	23 665	} the same message
05.30	18 180	
08.00	18 785	} the same message
09.00	12 295	
(2) To North-West :		
05.00	18 785	the same as 04.30 message
08.30	18 180	} the same as 08.00 message
10.00	10 415	
(3) Non-directional :		
12.00	8 000	} the same message
15.00	8 000	
17.00	8 000	
19.00	8 000	

JOINT COMMISSION OF RADIO METEOROLOGY

Meeting of August 1957

Resolutions

It was agreed :

That the 1957 meetings had provided a successful forum in which specialists in radio science, meteorology, and physics had a unique opportunity to describe their experiences and exchange knowledge about phenomena in the lower atmosphere in which they had a mutual scientific interest. The following resolutions were adopted unanimously :

1. That the Joint Commission should continue as a forum with a reasonable balance of radioscientists, meteorologists, and as may be necessary other physicists in which the radiometeorologists can exchange knowledge and experience.

2. That the program for the immediate future should be :

(a) study of vertical and horizontal air movements and refractive index structure including formation of clouds and precipitation and application of the results to radio wave propagation and meteorology,

(b) study of electrical fields in the atmosphere with special reference to thunderstorms.

3. That the constituent Unions be invited to review their representation on the Commission and make fresh appointments where necessary.

4. That the next meeting of the Commission be held in 1960.

5. That the papers for presentation at the next meeting be submitted to the President of the Commission for approval three months before the meeting.

6. That the Commission wishes to convey its warmest gratitude to the President of New York University and his staff, particularly Prof. Morris Kline for the facilities, assistance, and hospitality provided in connection with the Commission's meeting.

I. G. Y.

I.G.Y. News

Flow of IGY Data to the World Data Centres

With the end of the first month of I.G.Y. operations the scientific data from stations and collecting agencies have started to flow to the World Data Centres and a number of copies of the «Transmittal Note for I.G.Y. Data» accompanying them have been received in the Coordinator's office, where a record of them is maintained.

The Transmittal Notes cover data in the disciplines meteorology, geomagnetism, ionosphere, solar activity, longitudes and latitudes, and seismology from stations and agencies in :

Australia	Philippines
Austria	Portugal
Czechoslovakia	Rumania
India	United Kingdom
Japan	U. S. A.

A significant proportion of these Transmittal Notes refer to the despatch of observations on the Standard Forms, nos 1-4 from meteorological stations to the I.G.Y. Meteorological Data Centre established in the W.M.O. Secretariat in Geneva; though the intention, stated in para. 27, Section I of the «C.S.A.G.I. Guide to I.G.Y. World Data Centres» is that the Transmittal Note should be used by stations «except meteorological stations sending data to national meteorological services and W.M.O.... under existing arrangements».

A misunderstanding may have arisen because the W.M.O., in its advice to meteorological services, uses the same expression «a transmittal note» when commenting on the despatch of Standard Forms to the I.G.Y. Meteorological Data Centre, Geneva in the specialised arrangements formulated in Annex II to «Meteorological Data Centre Report n° 4». Mention of this «transmittal

note » also appears in para. 5, Section II of the « C.S.A.G.I. Guide to I.G.Y. World Data Centres » in reference to this step in the W.M.O. arrangements.

With data from their stations reaching meteorological services in a routine manner, the use by them of the « Transmittal Note for I.G.Y. Data » when forwarding data to the W.M.O. becomes cumbersome ; the Note is not considered suitable for the purpose. Nevertheless, when meteorological services transmit their collections of Standard Forms to World Data Centres A and/or B, as well as to Geneva, the Coordinator would be glad to receive a copy of the « supply » or « transmittal » note which accompagnies them, for statistical purposes.

Corrections to the lists of stations in the «C.S.A.G.I. Guide to I.G.Y. World Data Centres » have been received from the Participating Committees of :

Australia	Ireland	Spain
Bolivia	Italy	Sweden
Brazil	Japan	Union of South Africa
Chile	Mexico	United Kingdom
Ethiopia	Portugal	U. S. A.
Guatemala	Rumania	

It is to be hoped that further corrections, or assurances that the details in the lists are correct, will soon be received. It will then be possible to publish the Guide in printed form.

Present statuts of IGY Publications

The following has been received from the C.S.A.G.I. Secretariat.

Volume I of the *Annals of the International Geophysical Year* will contain historical accounts of the first and second Polar Years. Volume II will contain the programme of observations of each Committee participating in the I.G.Y., and also reports of all the C.S.A.G.I. meetings during which the organization and development of this project took place. These two volumes are at present being prepared.

Volume III, the first volume to be completed, was published by the Pergamnon Press in June 1957. One copy of this manual, which contains the four parts of the Ionosphere Manual, has been sent to each I.G.Y. Participating Committee, and further copies

can be obtained from the Pergamnon Press, price £ 4-10-0 or \$ 12.75.

The first part of Volume IV was published at the beginning of September and the second part will be published shortly. When complete one copy of this volume will be sent to each I.G.Y. Participating Committee. This volume contains the Nuclear Radiation Manual; five chapters of the Aurora and Airglow Manual; Geomagnetism parts I and II; the Longitudes and Latitudes, Seismology and Cosmic Radiation Manuals.

Volume V will appear later in the year and will probably contain the Solar Activity and Ozone Manuals; Radiation Handbook; Antarctic Radio Communications Manual; Chapter 6 of Aurora and Airglow; the papers presented at the C.S.A.G.I. Working Group meeting on Nuclear Radiation at Utrecht, January 1957 and the revised Manual for World and Days Communications. It is expected that Volume VI will be devoted to the Rockets and Satellites Manual.

In addition, the Ionosphere Manual has been translated into French and has been duplicated at the C.S.A.G.I. General Secretariat. A French version of the Seismology Manual was duplicated and distributed by the Secretariat. A few copies of this version are still available. Certain parts of the Geomagnetism Manual have been translated into English, duplicated and distributed. Copies of this and also of a duplicated version of the Cosmic Radiation Manual are available from the General Secretary. English and French versions of the Solar Activity Manual were duplicated at the General Secretariat but all copies of this manual have been distributed. However, a few copies of the supplement on Radio Emission are still available. One chapter of the Aurora and Airglow Manual, Visual Auroral Observation, is being translated into French and will be duplicated at the General Secretariat. This will be available in early October 1957. It would be appreciated if requests for this version could be sent to the General Secretary immediately.

U. S. Artic Programme

(Extracted from the *U. S. National Academy of Sciences' I.G.Y. Bulletin* of July 1957.)

ARCTIC DRIFT ICE STATION PROGRAM

Two drifting stations in the Arctic ice pack have now been established to study oceanography, meteorology, aurora, gravity, ionospheric physics, and ice physics.

Station A is located at approximately 80° N, 159° W, on a section of sea-ice which averages about seven feet in thickness and is about two miles in both width and length. Station B (Fletcher's Ice Island), composed of shelf ice, is about ten miles long, up to four miles wide, and 140-160 feet thick. It is drifting in the area of 82°46' N, 99°30' W, about 510 miles from Thule Air Force Base.

The normal complement of Station A, including nine scientists, will be about 20 persons. The I.G.Y. Station Scientific Leader is Maurice Davidson of the Lamont Geological Observatory, Columbia University. At Station B the normal complement will be approximately the same as at Station A. I.G.Y. Station Scientific Leader has been Norman Goldstein, Geophysics Research Directorate, A.F.C.R.C.

IGY Publications

After September 1, 1957 all reprints of material published in *I.G.Y. Annals* should be ordered from C.S.A.G.I. General Secretary. The minimum number that can be ordered will then be one; it is hoped that the price will be reduced. I.G.Y. Participating Committees are requested to send orders as soon as possible to ensure obtaining the numbers required.

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International Astronomical Unions.

Symposium n° IV of the I.A.U.-Radio-Astronomy, edited by H. C. VAN DE HULST (Cambridge University Press).

Part I : Spectral line investigation.

Part II : Point sources : individual study and physical theory.

Part III : Galactic structure and statistical studies of point sources.

Part IV : The quiet sun.

Part V : The active sun.

Part VI : Meteors and planets.

International Electrotechnical Commissions :

No. 89. — First edition — Recommendations for the characteristics of audio-apparatus to be specified for application purposes.

No. 90 — First edition — Recommendations for the dimensions of polarized plugs for hearing aids.

No. 94 — First edition — Recommendations for magnetic tape recording and reproducing systems : Dimensions and characteristics.

No. 87. — First edition — I.E.C. Specification for glass insulators for overhead lines with a nominal voltage of 1000 volts and upwards.

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CALENDAR OF INTERNATIONAL SCIENTIFIC MEETINGS

Date	Place	Meeting	Address queries to
1957 November 2-10	Dusseldorf, Germany	International Congress and Exhibition on Measuring Instruments at Automation.	Nordwest Deutsche Ausstellungen, Gesellschaft M.B.M. (Nowea), Ehrenhof, 4, Dusseldorf, Germany.
Nov. 11-Dec. 1	Caracas, Venezuela	World Meteorological Organization, Regional Association III (South America, 2nd Session)	Dr. F. J. Pinkerton, Suite 230, Alexander Young Building, Honolulu 13, Hawaii.
Nov. 18-Dec. 9	Bankgok	9th Pacific Science Congress, Pacific Science Association.	Dr. Charng Ratanarat, Secretary General, 9th Pacific Science Congress, Department of Science, Ministry of Industry, Roma IV Road, Bangkok.
December	Paris, France	International Advisory Committee on Bibliography of Unesco, 4th Session.	Unesco, 19, avenue Kléber, Paris 16 ^e , France.
1958 January 21-February 14 (Tentative)	New Delhi India	World Meteorological Organization, Commission for Synoptic Meteorology, 2nd Session.	W.M.O., Secretariat, avenue de la Paix, Campagne Rigot, Geneva, Switzerland.

Date	Place	Meeting	Address queries to
January or February	Undecided	European Meteorological Telecommunications Meeting, International Civil Aviation Organization (I.C.A.O.) and World Meteorological Organization.	International Civil Aviation Organization, International Aviation Building, Montreal, Canada.
5 May	Moscow, U. S. S. R. (Tentative)	International Advisory Committee on Research in the Natural Sciences (Unesco), 5th Session.	Dr. Raymond Zwemer, Chief, Division of International Cooperation for Scientific Research, Department of Natural Sciences, Unesco, 19, avenue Kléber, Paris 16 ^e , France.
May 19-23	London, U. K.	International Convention on Microwave values.	Institution of Electrical Engineers, Savoy Place, London, W.C., 2, U.K.
June 2-7	Brussels, Belgium	International Conference on Solid State Physics in Electronics and Telecommunications,	General Secretary, Société Belge de Physique, 18, rue de Philippeville, Loverval, Belgium.
June 9-13	New York	4th International Automation Congress and Exposition; 1st Military Automation Exposition and International Conference on Cybernetics.	International Automation Exposition and Congress, c/o Richard Rimbach Associates, Management, 845 Ridge avenue, Pittsburgh 12, Pennsylvania.

June 9-21 (Tentative)	Harrogate, U. K.	International Standardization Organization, General Assembly.	I.S.O. General Secretariat, 1, rue de Varembe, Geneva, Switzerland.
June 10-13	Namur, Belgium	1st International Congress on Video Techniques.	Société Royale Belge des Ingénieurs et des Industriels, 3, rue Ravenstein, Brussels, Belgium.
	Paris, France	Colloquium on Atoms from Radioelectric Research (A.M.P.E.R.E.).	Prof. R. Freymann, University of Rennes, Rennes, France; or Dr. J. G. Powles, Physics Department, Queen Mary College, London, E. 1.
	Grenoble, France	Colloquium on Magnetism, I.U.P.A.P. (by invitation)	Prof. L. Neel, Department of Experimental Physics University of Grenoble, Grenoble, France.
July 8-18 (Tentative)	Stockholm, Sweden	International Electrotechnical Commission, General Meeting	I.E.C., 1, rue de Varembe, Geneva, Switzerland.
August 11-13	St Andrews, Scotland	International Mathematical Union, 3rd General Assembly.	Mr. F. Smithies, Mathematical Institute, 16, Chambers Street, Edinburgh, Scotland.
August 13-20	Moscow, U. S. S. R.	International Astronomical Union, 10th General Assembly.	Prof. P. Th. Oosterhoff, General Secretary, I.A.U., Leiden Observatory, Leiden, Netherlands.

Date	Place	Meeting	Address queries to
August 15-23	Rochester, New York	International Conference on Semi-Conductors.	Dr. M. H. Hebb, Conference Secretary, General Electric Research Laboratory, P.O. Box 1088, Schenectady, New York.
August 20-27	Adelaide, South Australia	Australian and New Zealand — Association for the Advancement of Sciences (A.N.Z.A.A.S.), 33rd Congress.	Dr. R. S. Burdon, Department of Physics, University of Adelaide, Adelaide, South Australia.
September 1-6	Vienne, Austria	4th International Congress of Biochemistry, I. U.B.	O. Hoffmann-Ostenhof, Währingerstr, 42, Vienne, Austria.
Sept. 25-Oct. 5	Washington, D. C.	I.C.S.U., 10th Meeting of the Executive Board, 19th Meeting of the Bureau, and 8th General Assembly.	Secretariat of I.C.S.U., Nordpaleis, The Hagen, Netherlands.
November 16-23	Idem	International Conference on Scientific Information.	Secretariat International Conference on Scientific Information, N.A.S./N.R.C., 2101, Constitution Avenue, Washington 25, D.C.
	Paris, France	Unesco, General Conference, 10th Session.	Unesco, 19 Avenue Kléber, Paris 16 ^e .