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International Scientific Radio Union

U. R. S. I.

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CONTENTS

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EDITORIAL

In accordance with the decisions adopted by the Executive Committee last September, the Information Bulletin is edited by the Secretary of U.R.S.I. with the cooperation of associated editors nominated by the National Committee ; at present the following were appointed by National Committees :

Australia	Dr. D. F. Martyn
Denmark	Prof. J. Rybner
France	Mr. E. Picault
India	Prof. S. K. Mitra
Italy	Prof. M. Boella
Japan	Prof. Dr. Y. Hagihara
Morocco	Dr. A. Haubert
Netherlands	Eng. M. L. Toppinga
New Zealand	Dr. E. Marsden
Norway	Dr. L. Harang
Portugal	Mr. Amaro Vieira
Sweden	Eng. S. Gejer
Switzerland	Prof. Dr. F. Tank
Union of South Africa	Mr. F. J. Hewitt

In view of coordinating the work, the following letter was sent to the associated editors.

27th. January, 1951.

Dear Colleague,

It was a great pleasure for me to hear that your National Committee had appointed you as Associated Editor of the *U.R.S.I. Information Bulletin.* I am sure that your co-operation will be fruitful and will bring a revival to our Journal.

Nevertheless in order to have a most efficient co-operation, it seems to me that it would be useful that we should draft together a working programme.

It seems to me that besides the matters pointed out by the Publication Committee at the last General Assembly (See *Information Bulletin*, nº 65, p. 8), it would be interesting to publish in the Bulletin the proceedings of the various activities of our National Committees and also lists of stations, observatories and laboratories doing measurements, researches of observations in accordance with the programme put up by our Commissions.

I would very much appreciate to receive your comments and suggestions on the matter.

In thanking you for the co-operation you will give for the drafting of our Bulletin, I remain,

Yours sincerely,

The Secretary.

UNESCO

Reprint from the *Courier*, Vol. III, nº 12, Jan. 1951

FOR A BETTER ORGANIZATION OF SCIENTIFIC RESEARCH

Proposals for a world-wide survey of scientific research and other proposals dealing with scientific research and the improvement of living conditions for mankind are to be presented to the Sixth Session of Unesco's General Conference in Paris next June. Forming part of the Unesco Natural Sciences Department's programme, they are a recognition of the fact that adequate scientific knowledge alone can provide a sure basis for human welfare.

Background to these projects is the uneven distribution of the world's scientific resources and the knowledge that to meet some of science's requirements, research must be conducted on an international scale.

M. Torres Bodet, Unesco's Director-General, stressed this recently at the International Conference of Universities when he said : «The high cost of equipment, the need for highly specialized, and hence very scarce, staff, the very nature of research and the necessity for comparing observations recorded at widely separated points in the world, all alike make for the desirability of establishing centres or laboratories operating on a world basis indispensable for the advancement of such disciplines as astronomy, meteorology, cartography, oceanography or geophysics ».

Certain aspects of the problem have already been studied, following the decision of the Economic and Social Council in 1946 to invite the Secretary-General of the UN to submit a general report on the problem of establishing United Nations Research Laboratories. An extensive investigation was made by the Secretary-General of United Nations in 1947. This inquiry dealt with (a) the current feeling in scientific circles throughout the world,

regarding international action to achieve the most effective organization of research; (b) those fields where international work would be most productive and immediately desirable.

* * *

In August 1949, a committee of experts from Unesco and United Nations examined the results of this inquiry and recommended the following priorities in the Natural Sciences.

First priority : International Computation Centre ; International Brain Institute.

Second priority : International Astronomical Laboratory ; International Institute of Biochemistry ; International Meteological Institute ; International Research Laboratory on Arid Zones.

The committee also studied other proposals concerning problems in the Technical Assistance programme, and drew the attention of the United Nations and specialised agencies to further projects worthy of consideration.

In August 1950, an Ecosoc resolution invited Unesco to prepare a detailed plan for the setting up of an International Computation Centre.

The next session of Unesco's General Conference is to be asked to agree that a worldwide survey of scientific research be carried out, concentrating on those fields outlined by the Expert Committees ; that steps be taken to organise and establish an International Computation Centre ; and that consideration be given to the establishment of a European Regional Physics Laboratory for High Energy Particles and an International Brain Institute.

C. C. I. R.

The sixth Plenary Assembly of the International Radio Consultative Committee is to be held in Geneve from June 5th to July 6th, 1951.

U.R.S.I. has been invited to be represented at this meeting which will allow to extend the co-operation of those two organizations.

Further informations will be given latter on.

COMMISSION III AND JOINT COMMISSION ON IONOSPHERE

List of Ionospheric sounding stations (1)

We are starting in this issue the publication of a provisional list of ionospheric sounding stations. We would be most grateful to National Committees and interested organizations to inform us of errors and gasps in this list and also of the changes which should be brought to the published data.

We beg the National Committees which have not yet provided the requested data to send them as soon as possible to our Central Office in Brussels.

GREAT BRITAIN

Stations sponsored by the Radio Research Board of the Department of Scientific and Industrial Research.

1. — Slough, England

(*a*) Location :

Geographic latitude	51°30′N
Geographic longitude	0°34′W
Geomagnetic latitude	49°N
Magnetic dip	66°

(*b*) Automatic recording; frequency range 0.55 to 16.5 Mc/s; frequency band swept once per hour; time of sweep 5 minutes; approximate peak pulse power 2 kW; rhombic aerials used for both transmitter and receiver; upper height limit of recorder 1000 km.

2. — Fraserburgh, Scotland

(*a*) Location :

Geographic latitude	57°39′N
Geographic longitude	2°6′W
Geomagnetic latitude	55°N
Magnetic dip	71°

(*b*) Automatic recording; frequency range 0.67 to 25.0 Mc/s; frequency band swept once per hour; time of sweep 5 minutes (normally the band 0.67 to 15 Mc/s is used for which the sweep time is 4 minutes); approximate peak pulse power 2 kW; delta aerials used for transmitter and receiver; upper height limit of recorder 1000 km.

3. — Port Stanley, Falkland Islands

(*a*) Location :

Geographic latitude	51°42′S
Geographic longitude	57°51′W
Geomagnetic latitude	27°S
Magnetic dip	46°

(*b*) Automatic recording; frequency range 2.2 to 1.60 Mc/s; frequency band swept once per hour; time of sweep 1 minute; approximate peak pulse power 200 watts; rhombic aerials used for both transmitter and receiver; upper height limit of recorder 850 km.

4. — Singapore, Straits Settlements

(*a*) Location :

Geographic latitude	1°19′N
Geographic longitude	103°49′E
Geomagnetic latitude	8°S
Magnetic dip	16°

(*b*) Automatic recording; frequency range 2.2 to 16.0 Mc/s; frequency band swept once per hour; time of sweep 1 minute; approximate peak pulse power 200 watts; rhombic aerials used for both transmitter and receiver; upper height limit of recorder 1200 km.

JAPAN

Ionospheric observation is at present carried out at four stations in Japan by the Central Radio Wave Observatory, Radio Regulatory Commission.

	longitude	latitude	location	time of beginning
Wakkanai	141°41.1′E	45°23.6′N	Wakkanai-shi, Hokkaido	March,1949
Akita	140°08.2′E	39°43.5′N	Tegata Nishishin-machi, Akita-shi, Akita-ken	Dec. 1949
Kokubunji	139°29.3′E	35°42.4′N	Koganei-machi, Kita-tama-gun, Tokyo-to	Aug. 1943- Dec. 1944. Jan. 1946
Yamagawa	130°37.7′E	31°12.5′N	Yamagawa-machi, Ibusuki-gun, Kagoshima-ken	Dec. 1946

Nole. — Fukaura Observatory was removed to Akita in December 1949.

Location of the station and time of beginning of observation of Fukaura are as follows :

	longitude	latitude	location	time of beginning
Fukaura	139°54.1′E	40°36.6′N	Fukaura-machi, Nishitsugaru-gun, Aomori-ken	April, 1947- Nov. 1949

NORWAY

Kjeller near Oslo (60°N, 11°E) operated by the Norwegian Defence Research Establishment.

Tromsö (69°39′N, 18°56′E) operated jointly by the Aurora Observatory, Tromsö and the Norwegian Defence Research Establishement.

SOUTH AFRICA

Johannesburg (26°10'S, 28°5'E).

Capetown (34°9'S, 18°19'E).

Specification of equipment

Frequency sweep : nominally 0 to 20 Mc/s ; usually set to 1-15 Mc/s, the lower limit being due to the aerials, the upper limit being changed from time to time to suit ionospheric conditions.

Power output : of the order of 1 kilowatt.
Aerials : vertical rhombics.
Time of sweep : 7 seconds.
Pulse length : 70 microseconds.
Recurrency frequency : 100 per second.
Receiver bandpass : 30 kc/s.

Measurements are made every twenty minutes and records of hourly values are tabulated. Frequencies are in Mc/s, and distances are in km.

SWEDEN

	Gothenburg (Askim)	Kiruna	Lulea
Geographic latitude	57°41'22''N	67°51'00''N	65°36'15''N
Geographic longitude ..	11°57'49''E	20°14'30''E	22°07'05''E
Geomagnetic latitude ..	57°41'	65°19'	62°58'
Geomagnetic longitude .	99°17'	115°30'	114°38'
Magnetic dip	71°23'	77°03'	75°34'
Total magnetic force at ground level	0.488 cgs	0.515 cgs	0.510 cgs
Total magnetic force at 300 km	0.415 cgs	0.438 cgs	0.434 cgs
Magnetic latitude	—20°37'	—28°31'	—26°02'

Of these stations the two first ones are operated by the Research Laboratory of Electronics, Chalmers University of Technology, Gothenburg and the last one by the Royal Board of Telegraphs, Sweden.

U.S.A.

Permanent Stations

Baton Rouge, Louisiana (Louisiana State University).

Boston, Massachusetts (Harvard University).

Guam Island (National Bureau of Standards, Central Radio Propagation Laboratory).

Maui, Hawaii (National Bureau of Standards, Central Radio Propagation Laboratory).

Okinawa (United States Army Signal Corps).

San Francisco, California (Stanford University).

San Juan, Puerto Rico (University of Puerto Rico).

Trinidad, British West Indies (National Bureau of Standards, Central Radio Propagation Laboratory).

Washington, D.C. (National Bureau of Standards, Central Radio Propagation Laboratory).

White Sands, New Mexico (National Bureau of Standards, Central Radio Propagation Laboratory).

Solar Eclipse of February 25, 1952

With reference to the list of observing stations published in the *Information Bulletin* nº 65, p. 19 and 20, we are informed of the following intentions :

1. Sweden : to establish an eclipse station on the Isle of Capri in Italy (approx. position 14ºE, 42ºN).

2. Austria : to establish during the control period an eclipse station in Graz (Institute of Meteorology and Geophysics, University of Graz).

3. United Kingdom : to operate a station at Ibadan (7.25ºN, 4.0ºE) in addition to the one at Kartoum already listed.

4. Belgian Congo (Institut de Recherches Scientifiques en Afrique Centrale) : to establish an ionospheric station at Lwiro near Uvira as listed in the original table.

SOUTH AFRICA

In other to keep National Committees and organizations interested in the preparation of the drafted observations for the solar eclipse we are publishing a letter sent to Dr. L. V. Berkner, Chairman of the Eclipse Committee by Mr. F. J. Hewitt Officer-in-charge of the Telecommunications Research Laboratory of Johannesburg.

South African Council for Scientific
and Industrial Research
Telecommunications Research Laboratory
University of the Witwatersrand,
Johannesburg

Dear Sir,

Mr. Meerholz has told me of your discussions with him at the recent U.R.S.I. General Assembly on preparations for observations during the 1952 solar eclipse.

Firstly, I should point out that the Nairobi ionosphere recorder you have shown in your plan as being under our control will not in normal circumstances be under our control. We have built the equipment and are lending it to the East African Meteorological Service who will operate the equipment and undertake preliminary data analysis, although we will be responsible for cheeking the data and for publication, at any rate for the first few years.

It is therefore probable that by February 1952 the East African Meteorological Office would undertake any special measurements provided no modification to the equipment was desirable.

However, if it appears desirable towards the end of the year for an observer from this laboratory to assist in the observations, it may be possible to arrange for the designer of the recorder to be present.

With regard to the equipment available, the recorders at Cape Town and Johannesburg and the one shortly to be despatched to Nairobi are capable of meeting requirements *a*) and *b*) of your page 13 of *Information Bulletin* No. 65.

Requirement *c*) cannot be met without making special provision which we are unlikely to be able to undertake.

Requirement *d*) cannot be met with the equipment as it is at present. Resolution of the order of 1 kilometre might be possible if absolute accuracy is not required and only a limited range of height cover is necessary.

No equipment for measuring solar noise is available.

In addition to the above the recorders are capable of taking multifrequency records (1-20 Mc/s in 7.5 seconds) every fifteen seconds, which may be useful for special purposes.

Yours faithfully,

(*s*) F. J. HEWITT,
Officer-in-Charge,
Telecommunications Research Laboratory, C.S.I.R.

Third International Polar Year

At the Zurich General Assembly, the Joint Commission on Ionosphere of which U.R.S.I. is the Mother-Union submitted a proposal which was adopted concerning the setting up of an International Polar Year.

This proposal read as follows :

« That, for the reasons attached, the 3rd International Polar Year be selected for 1957-58 and that, in view of the length of time necessary for adequate organisation of the complex physical equipment now potentially available, an International Polar Commission be appointed in 1951 to supervise planning.

This resolution is transmitted by the Joint Commission on the Ionosphere for the approval of the Unions affected and sponsoring this Commission, and for action by I.C.S.U. »

We publish below the memorandum giving the reasons for the drafting of this proposal,

Some very valuable studies of the earth's atmosphere were made during the First and Second International Polar Years in 1882-83 and 1932-33 respectively. For example, during the first Polar Year Fritz made a remarkable study of the geographical distribution of auroræ but little has been done to extend this work on the necessary world scale in more recent times ; while, during the second, the

first exploration of the ionosphere in arctic regions by radio sounding methods took place.

Since the Second International Polar Year in 1932-33 there have been many critical developments in the study of the earth's atmosphere from both the technical and theoretical standpoints. In 1932 there were no panoramic or multifrequency ionospheric records. The separation between the E and the F regions had been recognised but not that between F1 and F2. Substantially no data were available on which a world wide study of the ionosphere could be based. High altitude rockets were not available, nor radiosondes capable of ascending to a height of 20 kilometres. The interest in atmospheric exploration has now progressed to the point where the co-operation that would be afforded by a third international polar year could go far towards solving outstanding problems of ionospheric structure, of movements in the high atmosphere, of magnetic and ionospheric storms and of auroræ. Because the last polar year took place at a time of sunspot minimum, it would be beneficial if the next one were associated with a sunspot maximum. This would also be achieved if an interval of 25 years were placed between the second and third polar years, one half of the interval between the first and second. It is in this way that the year 1957-58 comes to be recommended for adoption as the third international polar year.

It should perhaps be explained that the expression « polar year » in the document implies not only a year in which special observations would be made in polar regions, but also one in which observations in all latitudes would cooperate to the maximum extent so as to give as complete a picture as possible of world-wide geophysical phenomena. It is also assumed that the antarctic would receive its full share of attention.

Objectives of the Third International Polar Year

The principal objectives of the third international polar year would be to provide information for understanding :

(i) the physics of magnetic and ionospheric storms and other disturbances peculiar to polar regions (such as magnetic bays and giant pulsations).

(ii) the physics of auroræ.

(iii) the structure and circulation of the atmosphere in the polar regions, where absorption and radiation of the energy by the atmosphere play important roles.

Additional objectives will no doubt be designated by the I.A.U., the I.G.G.U., particularly by its Associations of Meteorology, Oceanography and Hydrology.

There is a particular need for a complete morphology of the disturbances associated with particular storms from the ionospheric, magnetic and auroræ standpoints. Really complete information about one particular disturbance from all standpoints would lead to more progress than quite a large amount of more or less random data from which only statistical conclusions can be drawn.

Types of observations to be made during the Third International Polar Year

A preliminary survey suggests that the types of observations to be made shall include the following :

(i) *Radio.* — Ionospheric sounding by rapid multifrequency or panoramic methods. Accurate height measurements (to say 0.1 km) by special apparatus. Numerical measurements of radio wave absorption, reflection and scattering. Tracking of moving irregularities in Es and F2 regions. All aspects of storms and other anomalous phenomena, auroral echoes, frequency spectrum of auroral noise.

(ii) *Magnetic.* — Measurement of magnetic field at great heights by rockets. Estimation of width, intensity distribution and height of current systems. Development and decay of the current systems of storms over short periods of time. Observations of pulsations and bays by equipment with sufficiently short time constants.

(iii) *Aurorae.* — Cine and still photography of forms and movements. Total radiation and absolute intensity of optical lines. Height variation in intensity of selected lines using modern filters for isolation of the lines. Doppler shifts in selected lines. Morphology of auroral disturbances both on the average and for

particular storms from a large number of stations providing highly objective data.

(iv) *Rockets.* — Measurement of upper air winds using artificial meteor trails. Measurement of magnetic fields at high altitudes in the auroral zone during storms. Measurements of ion-electron ratios, particularly on the dark side of the earth. Detection of « windows » in the high atmosphere at optical frequencies.

(v) *Ozone.* — Effect of magnetic and meteorological storms on the spatial and height distribution of ozone. Observation by the Dobson method and direct observations by radiosondes.

(vi) *Cosmic Rays.* — Effect of solar flares and magnetic storms on the intensity of cosmic rays. Variation with height and with latitude near and within the auroral zone. Recording of increases associated with solar flares especially associated with polar high altitude stations.

(vii) *Troposphere.* — Observations of the zonal semi-diurnal pressure oscillation and any other features proposed by the Association of Meteorology of U.G.G.I.

(viii) *Astronomical.* — A highly organised programme of solar observations will be needed to provide all possible information on associated solar phenomena during the intensive Polar Year observations.

Recommendations

Great advances in our understanding of the physics of the earth's atmosphere are to be expected by combining special observations in the north and south polar regions with observations of a similar nature carried out at lower latitudes. It is therefore recommended that :

(i) The year 1957-58 be designated an International Polar Year.

(ii) A Commission be set up by I.C.S.U. similar to that established for previous polar years to encourage, through the various Unions and their National Committees, the establishment of a proper network of observing stations.

(iii) In view of the complexities of the apparatus needed to exploit the potentialities of modern technique, the above Commission be established in 1951, so as to give at least five full years of preparation and trial.

(iv) A permanent secretariat should be formed to operate during the most active period of the Commission's work, from about two years prior to the polar year until about three years after the polar year.

* * *

The General Secretarial of U.R.S.I. will wellcome any suggestions and comments concerning the above subject.

COMMISSION V

Radio-Astronomy

Attention of the members of Commission V is called on the following letter.

16th. February, 1951.
Dr. R. v. d. R. Woolley,
President, Commission 40,
International Astronomical Union,
Commonwealth Observatory,
Mt. Stromlo, A.C.T.

Dear Dr. Woolley,

At the recent Assembly of the International Scientific Radio Union in Zurich Commission V gave considerable attention to the nomenclature and units employed in radio astronomy. A Committee set up under Mr. Laffineur drafted a report on this subject for consideration by Commission V. After considerable discussion this Report (1) (in English and French) was adopted as suitable to submit for consideration by other interested bodies such as your Commission. It will come up again for consideration and final adoption by our Commission in 1952.

I should draw your attention in particular to the definitions on p. 6 of the Report. It is suggested in some quarters that in the first column of the table on this page : « Radiance » should be replaced by « Radiant Emittance », and « Brightness » should be replaced by « Radiance ».

And at the bottom of the second column « surface brightness, or surface fluance per projected unit » should be replaced by « Surface brightness, or fluance per projected area ».

(1) This Report wil lbe published in the Proceedings of the IXth. General Assembly.

In the meantime I would be very glad if your Commission cared to consider this document at its forthcoming Assembly in Leningrad, and if you would advise me of any modifications suggested. In a new subject like radio astronomy, which forms a meeting ground for radiophysicists and astronomers, it is inevitable that there will be at first some clash of terminologies and units, and it will be the common desire to reach general agreement on these important matters at the earliest moment.

I enclose 22 copies of our Committee's report in case you would care to circulate them to members of your Commission before it assembles.

Very cordially yours,

(*s*) D. F. MARTYN,
President Commission V, U.R.S.I.

World-wide Survey

At the General Assembly in Zurich, Commission V appointed a Sub-Commission to report on continuous observation of solar radio emission by a chain of observatories.

The Sub-Commission consists of the following members :

1. Dr. Joseph L. Pawsey, Physicist, Assistant Chief of the Division of Radiophysics, Commonwealth Scientific and Industrial Research Organization, University Grounds, City Road, Chippendale (New South Wales), Australia.
2. Dr. M. Martin Ryle, Cavendish Laboratory, Free School Lane, Cambridge, England.
3. Mr. Laffineur, Ingénieur, 21, Boulevard Brune, Paris XIV^{e}, France.
4. G. Righini, Observatoire Astrophysique, Arcetri (Firenze), Italy.
5. Prof. Dr. Y. Hagihara, Tokyo Astronomical Observatory, Chairman of the Japanese National Committee for the U.R.S.I., Mitaka near Tokyo, Japan.
6. A. H. de Voogt (Chairman), Engineer-in-Chief, Chief Radio Service P.T.T., 6, Scheveningseweg, The Hague, The Netherlands.
7. Gunnar Eriksen, Civ. Ing. (Research in Radio Astronomy), The Institute of Theoretical Astrophysics, Oslo-Blindern, Norway.

8. Dr. R. Lindquist, Wave Propagation Observatory, Chalmers University of Technology, Göteborg, Sweden.
9. A. H. Shapley, National Bureau of Standards, Washington 25 D.C., U. S.A.

The Sub-Commission for the « World-wide Survey » of the radio-radiation of the sun has the intention to start on 1 January 1951 with a continuous watch of the sun's radio-radiation, preferably on 200 Mc/s and 3000 Mc/s.

In the countries mentioned, where the necessary apparatus are not available on that date a start will be made with the set, which is available.

To the participating members copies of the schemes of connections, diagrams and calibrating measurements of the apparatus used will be sent as soon as possible.

It is sufficient to send one copy to the address of Mr. A. H. de Voogt, P.T.T. Radio Service, The Hague, where copies will be made and distributed to the other members.

Monthly the members will send a short report to the Hague of the observations made during the preceding month. This report may be put in ursigram-code.

The reports will be copied and sent to the other members and to Dr. C. W. Allen, Commonwealth Observatory, Mount Stromlo, Canberra (A.C.T.).

The Sub-Commission will take steps to arrive at a 24-hour-survey of the sun ; for this purpose it will be necessary to establish an observation-station in India, Hawai and San Francisco (or Mexico).

The Sub-Commission has proposed to the President of Commission V that U.R.S.I. should take the necessary steps to free the following frequencies in the spectrum for the reception of solar and galatic noise :

40 Mc/s	: bandwidth	10 to 20 kc
80 Mc/s	: bandwidth	15 to 25 kc
200 Mc/s	: bandwidth	140 kc
320 Mc/s	: bandwidth	500 kc
640 Mc/s	: bandwidth	1 Mc
1280 Mc/s	: bandwidth	2 to 3 Mc
3000 Mc/s	: bandwidth	2 to 3 Mc

DOCUMENTATION - BIBLIOGRAPHY

In its last meeting the Dutch National Committee discussed documentation affairs and thought desirable that each National Committee of U.R.S.I. should collect every year per Commission the titles of all the publications published in that field by their countrymen ; if necessary with a summary in one of the U.R.S.I. standard languages. The lists should be sent to the General Secretariat which could publish every year a world covering litterature list classified in accordance to U.R.S.I. commissions and per country.

Such work needs active co-operation of the National Committees and may be useful to develop the activities of our Commissions, therefore we would very much appreciate to receive any comments and suggestions concerning this matter.

The Secretary.

COMMISSION IV

The following document has been distributed to the National Committees :

N° 585 — *The measurement of atmospheric radio noise in South Africa in the low frequency band*, by D. Hogg.

Reprint from *The Transactions of the S.A. Institute of Electrical Engineers.* July 1950, pp. 209-227.

Summary : This paper is designed to present the results of 100-kc/sec atmospheric noise measurements made by Telecommunications Research Laboratory of the Council for Scientific and Industrial Research. A brief description of the various types of noise encountered by receiving equipment is given and the problems associated with atmospheric-noise recording are discussed. The most commonly used recording method is described.

The history of low-frequency recording by the Telecommunications Research Laboratory is given and the equipment at present in use is described in some detail.

The results recorded during 1949-50 are presented in graphs of various types.

Information on thunderstorms in the Witwatersrand area is presented and an attempt is made to correlate these storms with the noise records.

Noise levels measured over the past year are compared with values obtained from other sources.

The application of the year's recordings to radio navigational aid equipment is discussed.

CALENDAR

1951

July 11-14 : Copenhagen. General Assembly of the International Union of Pure and Applied Physics.

23-25 : Liverpool. Conference on Dielectrics.

August 1-8 : Leningrad. Eight General Assembly, International Astronomical Union.

16-18 : Brussels. Meeting of the Joint Commission on Radio-meteorology.

August 21-September 1 : Brussels. Ninth General Assembly of the International Union of Geodesy and Geophysics.

1952

Australia. Meeting of the Joint Commission on Ionosphere.

Australia. Xth. General Assembly of U.R.S.I.