

International Scientific Radio Union

U. R. S. I.

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XIIth GENERAL ASSEMBLY

Canadian Radio Science Laboratories

A number of Canadian Laboratories would like to extend a warm welcome to U.R.S.I. delegates who may be able to make a side trip to Canada, either before or after the XIIth General Assembly in Boulder, Colorado. A partial list of some of the main centres is appended, in which an attempt has been made to group them by fields of interest. Space does not permit even a short account of the specific researches going on in each laboratory, but the prospective visitor is invited to write to any of the National Chairmen listed below, who will be pleased to act as informal liaison officers for the laboratories, and to furnish more detailed information.

COMMISSION I. — Radio Measurements and Standards.

Chairman : Dr. J. T. HENDERSON, National Research Council, Ottawa, Ontario.

Dept. of Mines and Technical Surveys, Ottawa.
Dominion Observatory.

Surveys and Mapping Branch.

Defence Research Board, Ottawa.

National Research Council, Ottawa.

Department of Transport, Ottawa.

COMMISSION II. — Radio and Troposphere.

Chairman : Dr. J. S. MARSHALL, McGill University, Montreal, Quebec.

McGill University, Montreal.

Defence Research Board, Ottawa.

National Research Council, Ottawa.

R. C. A. Victor Research Laboratories, Montreal.

Canadian National Telegraphs, Toronto, Ont.

COMMISSION III. — Ionospheric Radio.

Chairman : Mr. J. C. W. SCOTT, Defence Research Board, Ottawa, Ont.

University of Saskatchewan, Saskatoon, Saskatchewan.

Defence Research Board, Ottawa.

National Research Council, Ottawa.

University of Western Ontario, London, Ont.

Department of Transport, Ottawa.

COMMISSION IV. — Radio Noise of Terrestrial Origin.

Chairman : Mr. J. C. W. SCOTT, Defence Research Board, Ottawa, Ont.

Little work in progress.

COMMISSION V. — Radio Astronomy.

Chairman : Mr. A. E. COVINGTON, National Research Council, Ottawa, Ontario.

National Research Council, Ottawa.

Defence Research Board, Ottawa.

Dominion Observatory, Ottawa.

University of Toronto, Toronto, Ont.

Queen's University, Kingston, Ont.

COMMISSION VI. — Radio Waves and Circuits.

Chairman : Dr. George SINCLAIR, University of Toronto, Toronto, Ontario.

University of Toronto, Toronto.

National Research Council, Ottawa.

Defence Research Board, Ottawa.

McGill University, Montreal, Que.

Laval University, Quebec, Que.

Canadian Broadcasting Corporation, Montreal, Que.

COMMISSION VII. — Radio Electronics.

Chairman : Dr. H. P. KOENIG, Laval University, Quebec, Que.

McGill University, Montreal.

Laval University, Quebec.

Defence Research Board, Ottawa.

National Research Council, Ottawa.

University of British Columbia, Vancouver, B. C.

University of Toronto, Toronto.

Dalhousie University, Halifax, Nova Scotia.

The Canadian National Committee of U.R.S.I. is cooperating with the Canadian Associate Committee on Geodesy and Geophysics in connection with the International Geophysical Year. Dr. D. C. ROSE, of the National Research Council, Ottawa, Ontario, is the Coordinator of this programme, and inquiries may be addressed to him.

CHANGES OF ADDRESS

We want to inform our readers :

(a) That Prof. Dr. Balt. VAN DER POL, Honorary President of U.R.S.I. and Chairman of Sub-Commission V.1 on Information and Communication, resigned as Director of the C.C.I.R. on December 31, 1956 ;

(b) that he remains the official C.C.I.R. representative to the International Geophysical Year ;

(c) that his new address is : 10, Zydeweg, Wassenaer, Netherlands.

And that new address of Ir. A. DE VOOGT is : Chief of the Section Ionosphere and Radio-Astronomy, P. T. T. Bazarstraat, 7, The Hague, Nederlands.

COMMISSIONS

Officers and official Members

ERRATA

Inf. Bull., n° 101, read as follows :

p. 17 : Vice-President of Commission II :

« Dr. C. G. P. AURELL, Professor, Chalmers University of Technology, Gothenburg, Sweden. »

p. 18 : Sweden :

« Dr. Martis FEHRM, Director of Department, Research Institute of National Defence, Stockholm 80. »

Commission VII. — On Radio Electronics

BIBLIOGRAPHY

At the request of the French National Committee we are informing our readers that the book « *Les Semi-Conducteurs, Diodes, Transistors et autres applications* » by G. GOUDET and MEULEAU (one vol. 16 × 25 cm, 436 pages, 108 fig. Editions Eyrolles, Paris) is out of press.

The first part of the book contains a review of the principles of mechanics needed to study the atom and conductivity in solids. In the technology of semi-conductors, measurement methods are given the major part. The third and last part is devoted to semi-conductors applications; rectifiers and transistors (triodes and tetrodes), thermistors and varistors, various applications.

Ursigramme Permanent Committee

SUB-COMMITTEE ON EUROPEA URSIGRAMMES

Drs H. P. VAN LOOHUIZEN (Netherlands) will be replaced by Drs L. D. DE FEITER (Netherlands).

IONOSPHERIC STATIONS

Publications

FRANCE

The new Information Bulletin is issued by the « Propagation » Department of the Centre National des Télécommunications (C.N.E.T.), the first number refers to *January* 1956.

Data published in the *Bulletin d'Information du Bureau Ionosphérique Français* (B.I.F.) (monthly recapitulation of the Ursigrams excepted) will be published in the new *Bulletin of the C.N.E.T.* from October 1956 onwards.

The *B.I.F. Bulletin* will only be issued until its last number for September 1956.

ATMOSPHERIC STATION MANUAL

5th List

The following informations are given in this manual :

1. Geographical coordinates.
2. Geomagnetic coordinates.
3. Characteristics measured.
4. Type of apparatus.
5. Frequencies and bandwidths.
6. Other stations of the network.
7. Operating schedule.
8. Publication of results.
9. Responsible authority.
10. Date of report.

In the previous lists the following stations have been mentioned (Numbers between brackets are the numbers of the *Information Bulletin*).

Accra (99)	Byrd Station (101)	Fairbanks (102)
Aden (99)		Falkland Is (100)
Akita (100)	Camborne (99)	Fanning Is (100)
Anchorage (102)	Cap Horn (102)	Father Point (102)
Angmassalik (99)	Churchill (100)	Frobisher Bay (100)
	Colombo (99)	Front Royal (101)
Bagneux (99)	Cook (101)	Godhavn (101)
Bangui (99)	Cyprus (99)	Gainesville (102)
Battle Creek (102)		
Bermuda (102)	Delhi (99)	Halifax (100)
Bill (101)	Dourbes (99)	Hanover (102)
Boulder (102)	Dunedin (99)	Hemsby (100)
Brest (99)	Dunstable (99)	Huancayo (102)
Brisbane (99)	Durban (99)	Irvinestown (100)

Ivato (100)	Maui (100)	Poona (101)
Johannesburg (100)	Mayebashi (100)	Port Lockroy (102)
Kerguelen (100)	Narssaq (100)	Potsdam (102)
Knob Lake (101)	Nederhorst den Berg (100)	Pruhonice (101)
Kühlungsborn (102)	Nome (102)	Rabat (101)
Kumamoto (100)	Oohira (100)	Rio-de-Janeiro (101)
Léopoldville (100)	Ottawa (101)	Saskatoon (101)
Leuchars (100)	Panama (101)	Singapore (101)
Mabashi (100)	Panska Ves (101)	Slough (101)
Macquarie Is. (102)	Poitiers (101)	Stockholm (101)
		Tahiti (101)

In this list informations are given on the following stations :

Ellsworth	Stanford	Tunis
Halley Bay	Tatsfield	Unalaska
King's College, London	Thule	Wakkanai
Seattle	Tokyo	Washington
	Toyokawa	Wellington
	Trappes	

We would welcome any informations on gaps or errors in the data we are publishing.

ELLSWORTH

1. S 77°43' W 41°08'.
2. —66.9° 14.7°.
3. Whistlers and dawn chorus.
4. Magnetic tape recording. Absolute time scale good to ± 0.05 sec. provided. Equipment designed by Darmouth College.
5. Three-db bandwidth : 500 c/s to 16 kc/s at 19 cm/s recording speed ; to 20 kc/s at 38 cm/s recording speed (down 9 db at 25 kc/s, 13 db at 30 kc/s).
6. Thule, Godhavn, Frobisher Bay, Knob Lake, Father Point, Hanover, Battle Creek, Washington, Bermuda, Gainesville, Huancayo, Cape Horn, Port Lockroy, Ottawa, Halifax.

Sferics direction-finding provided by U. S. Air Force Air Weather Service stations in New foundland, Washington, Florida, Bermuda and the Azores.

7. 2 minutes per hour commencing at 35 min. past the hour.

8. Subjective results when available as per C.S.A.G.I. manual.

9. C.R.P.L., National Bureau of Standards, Boulder, Colorado, U.S.A.

International coordination : Thayer School of Engineering, Dartmouth College, Hanover, New Hampshire, U.S.A.

10. January 1957.

HALLEY BAY (ANTARCTICA)

1. S 75°31' W 26°36'.

2. -65.8° (1956) 24.3° (1956).

3. Field-strength of slow speed Morse dashes wich are 95 % intelligible through the noise.

4. Vertical aerial (12 m), superhet. receiver (15-500kc/s), electronically keyed signal-generator, aural indication of level using headphones, manual operation.

5. 18, 30, 135, 220, 400 kc/s ; bandwidth 300 c/s.

6.

7.

8.

9. D.S.I.R., Radio Research Station, Slough, Bucks, Great Britain.

10. March 1956.

KING'S COLLEGE, LONDON

1. N 51°32' W 00°06'.

2. +54.3° (1956) 83.7° (1956).

3. (a) Waveform and spectrum of individual atmospherics.

(b) Waveform of sustained disturbances and whistlers.

(c) Grouping of atmospherics.

(d) Propagation phenomena at VLF.

(e) Continuous average level at VLF.

4. (i) Magnetic tape recorder with wide band receiver.
(ii) *Idem* with narrow band receiver.
(iii) Automatic pen recorders.
(iv) Cathode-ray direction finder.
5. (i) 0-16 kc/s.
(ii) 27 channels logarithmically spaced from 40 c/s to 16 kc/s.
(iii) Various frequencies below 10 kc/s.
(iv) 10 kc/s.
Various bandwidths.
6. Operating in conjunction with the British C.R.D.F. stations.
7. At selected intervals in conjunction with the British C.R.D.F. stations. Level recorders continuous.
8. Results in course of publication.
9. Dr. F. W. CHAPMAN, University of London King's College, Strand, London, W. C. 2.
10. April 1957.

SEATTLE

1. N 47°45' W 122°25'.
2. +53.6° (1956) 294.4° (1956).
3. Whistlers and dawn chorus. Sferics direction finding.
4. Magnetic tape recording. Direction finding data on photographic film. Absolute time scale good to ± 0.05 sec. provided. Equipment designed by Stanford University.
5. 400 c/s to 30 kc/s available. Upper frequency limit may be used as determined by requirements.
6. Boulder, Stanford, Anchorage, Fairbanks, Unalaska, Nome, Wellington, Dunedin, Macquarie Is., Saskatoon, Saskatchewan.
7. 2 minutes per hour commencing at 35 min. past the hour. Other schedules available by arrangements.
8. Summary subjective results periodically.
9. Stanford University, Stanford, California, U.S.A.
International coordination : Radio Propagation Laboratory, Stanford University.
10. January 1957.

STANFORD

1. N 37°26' W 122°10'.
2. +43.7° (1956) 298.4° (1956).
3. Whistlers and dawn chorus. Sferics direction finding.
4. Magnetic tape recording. Direction finding data on photographic film. Absolute time scale good to ± 0.05 sec. provided. Equipment designed by Stanford University.
5. 400 c/s to 30 kc/s available. Upper frequency limit may be lower as determined by requirements.
6. Boulder, Seattle, Anchorage, Fairbanks, Unalaska, Nome, Wellington, Dunedin, Macquarie Is., Saskatoon, Saskatchewan.
7. 2 minutes per hour commencing at 35 min. past the hour. Other schedules available by arrangements.
8. Summary subjective results periodically.
9. Stanford University, Stanford, California, U.S.A.
International coordination : Radio Propagation Laboratory, Stanford University.
10. January 1957.

TATSFIELD

1. N 51°17' 00°00'.
2. 54° 83.7°.
3. Field-strength of slow-speed Morse signal giving 95 % intelligibility through the noise.
4. (a) Thomas equipment : vertical aerial (6 m), preamplifier with 2-20 Mc/s filter, superhet. receiver, signal generator, keying unit.
(b) L. F. equipment : vertical aerial (12 m), superhet. receiver (15-500 kc/s), electronically keyed signal generator.
On both equipments, aural indication of level using headphones ; manual operation.
5. Equipment (a) : 1945, April 1954 : 2.5, 5, 10, 15, 20 Mc/s ;
bandwidth : 6 kc/s.
Equipment (b) : April 1954 up to date : 18, 30, 135, 220,
400 kc/s ; bandwidth : 300 c/s.
- 6.

7. Measurements at the 5 frequencies every hour at the hour.
8. 1945-1951 ; 2-20 Mc/s ; D.S.I.R., Special Report n° 26 (R.R.B.)
1951 onwards : Data available, but not yet published.
9. D.S.I.R., Radio Research Station, Slough, Bucks., England.
10. March 1956.

THULE

1. N 76°33' W 68°50'.
2. +88.5° (1956) 1.1° (1956).
3. (a) Mean power of the atmospheric radio noise.
(b) Whistlers and dawn chorus.
4. (a) U. S. National Bureau of Standards Model ARN-2.
(b) Magnetic tape recording. Absolute time scale good to ± 0.05 sec. Equipment designed by Dartmouth College.
5. (a) Eight frequencies logarithmically spaced from 50 kc/s to 20 Mc/s.
Three-db bandwidth approximately 300 c/s at each frequency.
(b) Three-db bandwidth : 500 c/s to 16 kc/s at 19 cm/s recording speed ; to 20 kc/s at 38 cm/s recording speed (down 9 db at 25 kc/s, 13 db at 30 kc/s).
6. (a) Accra, Bill, Boulder, Byrd Station, Cook, Front Royal, India, Johannesburg, Maui, Panama Canal Zone, Rabat, Rio-de-Janeiro, Singapore, Stockholm, Tokyo.
(b) Godhavn, Frobisher Bay, Knob Lake, Father Point, Hanover, Battle Creek, Washington, Bermuda, Gainesville, Huancayo, Cape Horn, Port Lockroy, Weddell Sea, Ottawa, Halifax.
Sferics direction finding provided by U. S. Air Force Air Weather Service Stations in Newfoundland, Washington, Florida, Bermuda and the Azores.
7. (a) Continuous operations.
(b) 2 minutes per hour commencing at 35 min. past the hour.
8. (a) Quarterly by C.R.P.L.
(b) Subjective results twice a month as per C.S.A.G.I. Manual.
9. Signal Corps Radio Propagation Agency, Fort Monmouth, New-Jersey, U. S. A.

International coordination :

(a) C.R.P.L., National Bureau of Standards, Boulder Colorado, U. S. A.

(b) Thayer School of Engineering, Dartmouth College, New Hampshire, U. S. A.

10. January 1957.

TOKYO

1. N 35°40' E 139°45'.

2. +25.4° 205.6°

3. Three moments of the radio noise plus direction finding.

4. U. S. National Bureau of Standards Model ARN-2.

5. Eight frequencies logarithmically spaced from 15 kc/s to 20 Mc/s.

Three-db bandwidth approximately 300 c/s at each frequencies.

6. Accra, Bill, Boulder, Byrd Station, Cook, Front Royal, India, Johannesburg, Maui, Panama Canal Zone, Rabat, Rio-de-Janeiro, Singapore, Stockholm, Thule.

7. Continuous operation.

8. Quarterly by C.R.P.L.

9. Radio Research Laboratory, Ministry of Postal Services, Kokubunji P. O., Kitatama-gun, Tokyo, Japan.

International coordination : C.R.P.L., National Bureau of Standards, Boulder, Colorado, U. S. A.

10. January 1957.

TOYOKAWA

1. N 34°50' E 137°22'.

2. 24.5° (1956) 203.5° (1956).

3. (i) Strength, wave-form and direction-finding of atmospheric noise in L. F. band.

(ii) Whistler type atmospheric noise.

4. (a) VLF atmospheric noise recorder.

(b) LF statistical atmospheric noise recorder.

(c) Waveform recorders (fixed and portable).

(d) Cathode-ray, direction-finders (fixed and portable).

(e) Narrow sector goniometer.

(f) Whistler recorders (fixed and portable).

- (g) Field meter.
 - (h) Light intensity recorder of lightning flashes.
 - (i) Boy's camera (low speed).
 - (j) Chronophotograph for measuring light intensity of lightning flashes.
 - (k) High speed rotating camera (wide angle) for lightning flashes.
 - (l) Local lightning flashes counter (within 20 km).
5. (a) 10, 21, 27 kc/s ; bandwidth : 0.5 kc/s.
(b) 50-535 kc/s ; bandwidth : 1 kc/s.
(c) 50 c/s-300 kc/s ; 100 c/s-100 kc/s.
(d) 10 kc/s ; bandwidth : 300 kc/s.
(e) 12 kc/s ; bandwidth : 0.5 kc/s.
(f) 100-30 000 kc/s.
(l) 1-80 kc/s.
6. Wakkanai, Kumamoto, Akita, Mayebashi.
7. (a), (b), (e) All the year round-continuous operation.
(c) (i) A week in every season : 0010-0013, 0910-0913, 1210-1213, 1510-1513, 2110-2113, JST.
0020-0023, 0920-0923, 1220-1223, 1520-1523, 2120-2123, JST.
(ii) From the middle of July to the end of August : continuous during thunderstorms.
(d) As (c) (i).
(f) All the year round, one minute every half hour.
(g) To (h) as (c) (ii).
8. Proceedings of the Research Institute of Atmospheric, Nagoya University.
9. Prof. A. KIMPARA, The Research Institute of Atmospheric, Nagoya University, Ichida-cho, Toyakawa-shi, Aichi-ken, Japan.
10. July 1956.

TRAPPES

1. N 48°46' E 02°00'.
- 2.
3. Localisation of atmospheric centres.
4. Narrow-beam direction-finder.
5. 27 kc/s.

6. Bagneux, Rabat, Tunis.
7. Continuous recording 0-24 h.
8. Records sent to L.N.R., Bagneux.
9. Laboratoire National de Radioélectricité, Département R.N.
196, rue de Paris, Bagneux (Seine), France.

TUNIS

1. N 36°50' E 10°14'.
2. +37.3° 87.8°
3. Localisation of atmospheric centres, recording of mean level.
4. Narrow-beam direction-finder.
5. 27 kc/s.
6. Rabat, Bagneux, Brest.
7. Continuous recording 0-24 h.
8. Recordings sent to Bagneux.
9. Laboratoire National de Radioélectricité, Département R.N.
196, rue de Paris, Bagneux (Seine), France.
10. August 1956.

UNALASKA

1. N 53°53' W 166°32'.
2. +50.9° (1956) 247.9° (1956).
3. Whistlers and dawn chorus.
4. Magnetic tape recording. Absolute time scale good to ± 0.05 sec. provided. Equipment designed by Stanford University.
5. 400 Mc/s to 30 kc/s available. Upper frequency limit used may be lower as determined by requirements.
6. Boulder, Stanford, Seattle, Anchorage, Fairbanks, Nome, Wellington, Dunedin, Macquarie Is., Saskatoon, Saskatchewan.
7. 2 minutes per hour commencing at 35 min. past the hour. Other schedules available by arrangement.
8. Summary subjective results periodically.
9. Stanford University, Stanford, California, U. S. A.

International coordination : Radio Propagation Laboratory,
Stanford University.

10. January 1957.

WAKKANAI

1. N 45°24' E 141°41'.
2. 35.3° (1956) 206.0° (1956).
3. Recording of whistlers.
4. Whistler recorder (portable).
5. 100-30 000 kc/s.
6. Toyokawa.
7. All year round, one minute every half hour.
8. Proceedings of the Research Institute of Atmospheric,
Nagoya University.
9. Prof. A. KIMPARA, The Research Institute of Atmospheric,
Nagoya University, Ichida-cho, Toyokawa-shi, Aichi-kun, Japan.
10. July 1956.

WASHINGTON

1. N 38°55' W 77°04'.
2. +50.3° (1956) 350.1° (1956).
3. Whistlers and dawn chorus.
4. Magnetic tape recording. Absolute time scale good to ± 0.05 sec. provided. Equipment designed by Dartmouth College.
5. Three-db bandwidth : 500 c/s to 16 kc/s at 19 cm/s recording speed ; to 20 kc/s at 38 cm/s recording speed (down 6 db at 25 kc/s, 13 db at 30 kc/s).
6. Thule, Godhavn, Frobisher Bay, Knob Lake, Father Point, Hanover, Battle Creek, Bermuda, Gainesville, Huancayo, Cape Horn, Port Lockroy Weddell Sea, Ottawa, Halifax.
Sferics direction finding provided by U. S. Air Force Air Weather Service stations in Newfoundland, Washington, Florida, Bermuda and the Azores.
7. 2 minutes per hour commencing at 35 min. past the hour.
8. Subjective results twice a month as per C.S.A.G.I. manual.

9. Naval Research Laboratory, Washington D. C.
International coordination : Thayer School of Engineering,
Dartmouth College, Hanover, New Hampshire, U. S. A.
10. January 1957.

WELLINGTON

1. S 41°14' E 174°59'.
2. —45.7° 253.7°.
3. Whistlers and dawn chorus, occurrence and dispersion.
4. Large loop aerial, audio-frequency amplifier, magnetic tape recorder. Absolute time scale good to ± 0.05 sec. provided. Equipment designed by Stanford University.
5. 400 c/s to 30 kc/s available. Upper frequency limit used may be lower as determined by requirements.
6. Boulder, Stanford, Seattle, Anchorage, Fairbanks, Unalaska, Nome, Dunedin, Macquarie Is., Saskatoon, Saskatchewan.
7. 8 minutes every 3 hours commencing at 0235 UT, 2 days per week.
8. Summary subjective results periodically. Data available on request.
9. The Secretary, New Zealand National I.G.Y. Committee, D.S.I.R.
International coordination : Radio Propagation Laboratory
Stanford University, Stanford, California, U. S. A. P. O. Box 8018,
Wellington, New Zealand.
10. April 1956 and January 1957.

Errata

The geographic coordinates given for Bill, in *Information Bulletin*, n° 101, p. 39, have to be read :

N 43°15' W 105°18'

The geomagnetic coordinates are :

+52.1° (1956) 315.4° (1956)

URSIGRAMMES

India Broadcasting

Solar and magnetic data obtained in Kodaikanal Observatory are being broadcast in Ursigramme Code from the Sub-continental Meteorological Broadcast Centre, New Delhi (call sign VVD3) twice daily. In connection with the declaration of Alert and SWI by the World Warning Agency, U. S. A., during the I.G.Y., the Kodaikanal Observatory is required to report its observational data to the collecting centres in the « I.G.Y. interchange code ». It has been proposed to use the broadcasts from New Delhi (VVD3) mentioned above for communication of these data as well as for distribution to other centres. In view of this, as well as for the reason that the present Ursigramme broadcasts from New Delhi do not contain all the data which Kodaikanal Observatory is expected to contribute, it is proposed that the broadcasts of the present Ursigramme messages may be discontinued and instead the required observations may be broadcast in the « I.G.Y. interchange code » with effect from 1st June, 1957.

I. G. Y.

A.G.I. News

Scientific Investigation of the Upper Atmosphere Planned in the British Rocket Research Program

Research groups from 5 Universities and University Colleges, working under the auspices of the Royal Society and the Royal Aircraft Establishment of the Ministry of Supply are cooperating in a program of scientific research, using specially designed instruments to be carried to heights up to 90 miles in the «Skylark» rocket. This program will form part of the British contribution to the I.G.Y.

The first of these Skylark rockets, designed at the Royal Aircraft Establishment, was fired at the Australian Department of Supply weapons research rocket range at Woomera on 13 February 1957.

This trial flight was the beginning of a series whose object is to gain experience of the Skylark's performance before the actual research program is commenced. Hence, no scientific observations were made and no attempt was made to reach a maximum height. The 80 ft. rocket launcher was depressed as far as possible so that the rocket flew a long flat trajectory. The reason for this approach is that the rocket has no form of guidance control. It possesses only 3 fixed stabilising fins so that it is, in fact, a simple dart with a motor. Once launched it relies upon the built-in stability of the design to keep it going along the desired trajectory.

The scientific program, to be undertaken when the Skylark has completed its proving flights, is designed to investigate the pressure, density and temperature of the upper atmosphere, winds at very great heights, the ionosphere and night airglow. A variety of methods of measurements of each parameter will be used.

For the measurement of temperature, and horizontal and vertical wind speeds up to heights of 60 miles, a technique is proposed for sound ranging on grenades ejected from the rocket at regular

intervals to explode after about two seconds. The arrival of the sound pulse from each explosion will be timed at an array of microphones on the ground. At the same time the arrival of the flash from the explosion will be recorded by several wide angle cameras, also on the ground. Analysis of the data, using electronic computation, should give not only the required variation with height of the speed of sound, but also the deviation of the downward moving sound waves by the winds at different heights.

The wind distribution will be studied using also the technique of ejecting a cloud of radar reflecting aluminium strips at about 30 and 50 miles height. As the cloud falls, its movement and spread, under the influence of the winds, will be followed by ground radar.

To measure the intensity of the light from the night airglow at different heights it is proposed that the rocket shall carry suitable filters for the selection of the range of wavelengths to be studied. The light intensity will be measured by electrical methods and the information will be transmitted to ground stations by a coded radio signal from the rocket during flight.

In connection with the study of the sodium constituent of night airglow it is proposed to produce sodium yellow fluorescence artificially by the ejection from the rocket of an ignited mixture of sodium and thermite at a chosen height.

In suitable conditions, and using the wide angle cameras of the grenade experiment for observation of the sodium cloud, information can be obtained of the wind at the cloud height. The temperature of the region occupied by the glowing cloud is obtainable from the study of the widths of the sodium spectrum lines emitted. Spectroscopic studies of the glow will also help in the understanding of the different chemical processes which contribute towards the sky airglow emission.

Much information has been obtained of the E and of the two F layers of the ionosphere by the use, as probes, of radio signals transmitted and received at ground level. Certain information can only be obtained by the use of transmitters and receivers at heights attainable by rockets. Special apparatus for this purpose will therefore be carried in the Skylark.

These radio experiments give information about the variation

of the free electron concentration with height. They require extensive equipment and much preliminary testing, so that final measurements will not be made till a somewhat later stage in the program. To supplement the radio experiments, and to determine not only the degree of ionisation but also the types of ion present in the ionosphere, special equipment will be ejected from or projected out of the rocket. This equipment will be capable of collecting and analysing the ions to determine whether they are positively or negatively charged. The results, suitably coded, will be returned continuously to the ground by the radio telemetry link as the rocket ascends through the layers.

Further experiments are planned for the measurement of air pressure, density and temperature at heights up to 80 miles, from readings of gauges mounted on the nose of the rocket itself.

Rocket altitude will be measured with magnetometers, with photo cells which detect the sun's direction, and with cameras. These activities may later be expanded to include work on a sun seeker, a device which homes and fixes on the sun to enable long exposure spectrographs of the sun to be made in flight.

The Skylark is designed to carry a payload of 100-120 lbs. to heights between 70 and 90 miles, reached in about three minutes. It consists of three parts, the nose section, the motor and the fins. The nose section and the motor are cylindrical in shape with a diameter of 17.4 inches. The nose section, which carries the payload is in two parts, the 65 inch long cone and behind it the 30 inch long parallel sided bay, each of which can be pressurised independently of the other. The overall length of the rocket is 25 feet. Propulsion is by the 15 feet long « Raven » solid propellant motor which burns for 30 seconds, giving a thrust of 11 500 lbs. and a top speed of five or six times the speed of sound. The exact variation of thrust during the burning is controlled by the shape of the charge. In later versions of the Skylark a small boost motor will be added to increase the launching speed and so to extend the maximum height reached to 120 miles.

The 80 foot launching tower is supported in a tripod base on gimbals which allow movement about the vertical under the control of a remotely operated electric motor.

Tracking of the rocket to obtain information of its trajectory is by radio and optical instruments.

A micro-wave beacon is carried in the rocket and two widely separated ground receivers lock on to its signal and provide a continuous record of the relative azimuths and elevations. From this information computers calculate the path of the rocket.

A radio Doppler system is also used to give velocity and position information. A ground transmitter sends a continuous wave signal to the rocket, a transponder in the rocket doubles the received signal and rebroadcasts it to the ground. A ground receiver compares this received frequency with the original transmission, suitably doubled, and obtains a Doppler beat frequency which is a measure of the radial velocity of the rocket with respect to the receiver. If three receiving stations are employed the rocket's velocity in space may be computed, and its position can be determined with accuracy after summing the Doppler beats along each radial line.

Optical tracking of the rocket in its flights is done by high speed cameras and by kine-theodolites. The high speed cameras record the rocket's behaviour during the launching phase. Several widely spaced kine-theodolites are used, each of which photographs both the rocket and set of azimuth and elevation dials, so that the rocket position can be calculated using triangulation methods. The method is analogous to the radio beacon technique but is potentially more accurate because misalignment corrections can be made during the reading of the film records.

In addition to the movement of the rocket along its trajectory information is required of its altitude and movements in the rolling, pitching and yawing planes. Gyroscopes and accelerometers in the rocket measure the changes in orientation and the forces causing them, passing the measurements in the form of changes of voltage and inductance to a telemetry sender which transmits the information to the ground.

The standard telemetry sender for transmitting information from the instruments carried in the rocket uses an AM/FM system on 465 Mc/s and will give accurate readings at the rate of 100 times per second for each of 24 instruments.

This summary makes only brief mention of the University experiments, details of which are also available, from the Royal Society.

**Joint C.S.A.G.I./C.S.A. Meeting on the Coordination of
of the I.G.Y. in Africa South of the Sahara**

Bukavu 11-15 February 1957

Twenty-two delegates took part in the joint C.S.A.G.I./C.S.A. meeting on the coordination of the I.G.Y. in Africa South of the Sahara which was held at Bukavu (Belgian Congo) from 11 to 15 February 1957.

Six countries were represented, Belgium, British East Africa, Ethiopia, France, the Federation of Rhodesia and Nyasaland and the Union of South Africa.

C.S.A.G.I. was represented by the General Secretary, Dr. M. Nicolet and the I.G.Y. Secretary Adjoint for Africa South of the Sahara, Dr. T. E. W. Schumann.

Dr. P. J. du Toit, President of C.S.A., and Professor L. van den Berghe, Director of I.R.S.A.C., attended the meeting as representatives of C.S.A.

The delegates examined the report presented by Dr. S. P. Jackson and the programs presented by the I.G.Y. National Committees and by various Institutions.

Recommendations were proposed in each of the C.S.A.G.I. Disciplines, concerning the network of observing stations and particularly on the gaps in this network. These recommendations have been forwarded to all I.G.Y. National Committees through the C.S.A.G.I. General Secretariat ⁽¹⁾.

I.G.Y. World Data Centre Meeting

Uccle 1-4 April 1957

Preliminary Report.

1. This Meeting was convened to discuss outstanding details in I.G.Y.-WDC organisation in accordance with a C.S.A.G.I. Bureau directive (see Item 13).

2. There were thirty delegates representing seven National Committees concerned with the Organisation of WDCs, FAGS, W.M.O. and C.S.A.G.I. Secretariat. They included C.S.A.G.I.

⁽¹⁾ See *Inf. Bull.* n° 102.

Reporters for World Days, Meteorology, Ionosphere, Glaciology, Oceanography and Seismology.

3. Working Groups were formed to discuss General Subjects and certain Disciplines. A number of recommendations were adopted by the Meeting and will appear in a Report to be circulated shortly. These await C.S.A.G.I. Bureau approval and cover inter alia :

- The position of Permanent Services and W.M.O. vis-à-vis I.G.Y.-WDCs ;
 - The Functions and Responsibilities of I.G.Y.-WDCs ;
 - A proposed I.G.Y.-WDC Coordinating Committee ;
 - A proposed Centre C for magnetograms and hourly values in Japan ;
 - Seeking the advice of the Advisory Committee on Nuclear Radiation regarding Centres C ;
 - The finalisation of arrangements in a number of Disciplines.
- Much work was done in Ionosphere.

4. Certain details were referred to forthcoming meetings in Copenhagen and Uccle on Geomagnetism and Earth Tides respectively.

World Days and Communications

WW Series Circular Letters

Subsequent to the information in Item 30 the following circular letters in the WW Series have been issued on the dates stated :

- | | | |
|-------|---------------|--|
| WW-8 | 10 April 1957 | First report on the March Trial Week and second report on the January and February Trial Weeks. |
| WW-9 | 19 April 1957 | Letter of despatch accompanying the first supplement to the « Draft Manual for World Days and Communications ». The draft manual, it will be recalled, was circulated under the cover of WW-4 on 12 December 1956. |
| WW-10 | 8 May 1957 | First report on the April Trial Week and second report on the March Trial Week. |
| WW-11 | 14 May 1957 | Notification of daily initiation of I.G.Y. Warning Messages commencing on 1 June 1957. |

The C.S.A.G.I. Guide to I.G.Y. World Data Centres

The Coordinator plans to make the first issue of the Guide to I.G.Y.-WDCs on or about 7 June 1957.

Meetings

1. A meeting on World Days and Communications for the Eastern European Region was held in Moscow during the week commencing 6 May. C.S.A.G.I. was represented by Dr. A. H. Shapley, Reporter for World Days and Communications.

2. C.S.A.G.I. Bureau is to hold a meeting in Uccle from 15 to 17 June 1957.

Additional I.G.Y. National Committees

Information regarding the participation and formation of I.G.Y. National Committees has been received from the C.S.A.G.I. General Secretary as follows :

Cuba : Ing. Jesus Francisco DE ALBEAR, Presidente, Comité Nacional A.G.I., Avenida 26 N° 1608 entre Avenida Puentes Grandes y Avenida Rancho Boyeros, Habana.

Dominican Republic : Senor Juan B. CAMBIASO V., Presidente, Comité Nacional para el A.G.I., Avenida José Trujillo Valdez 28, Ciudad Trujillo.

Ghana : Mr. B. W. McMULLEN, Overseas Secretary, I.G.Y. National Committee, Science and General Studies Department, Kumasi College of Technology, Private Bag, P. O. Kumasi.

Malaya (Provisional address) : Mr. L. HON YUNG SEN, Physics Department, University of Malaya, Singapore.

Mongolian Peoples' Republic : Mrs. S. NINJBADGAR, Secretary, I.G.Y. National Committee, Committee of Sciences of the M.P.R., Ulan Bator.

Viet Nam Democratic Republic : Mr. Nguyen XIEN, Président du Comité National de l'A.G.I., Hanoi.

**Recommendations of the C.S.A.G.I.
Western Pacific Regional Conference
(February 1957)**

V. — IONOSPHERE

The C.S.A.G.I. Western Pacific Regional Conference :

1. Examined the geographical distribution of vertical sounding stations in the Western Pacific Region, notes with satisfaction reports of progress with many of the planned new stations, notably Port Moresby, Hollandia, Kabarovsk, and Cape Schmidt, and the provision of automatic equipment for Wuchang.

Information is lacking on the status of several stations which were earlier mentioned as possible additions to members of the network, for example : Tahiti, Noumea, and Nha Trang, confirms that each of these would be valuable to the I.G.Y. program, points out that a serious gap in the 140° E longitude chain of ionospheric sounding stations would be opened if neither the once planned station at Cebu nor Nha Trang, or equivalent, were to be in operation during the I.G.Y.; in this event,

Recommends that extraordinary steps be taken to fill this gap.

further recognizes that the network in the Western Pacific region during I.G.Y. will allow a far more comprehensive experiment to be made than was heretofore possible, but at the same time notes that according to present plans there are no stations planned to allow important fine structure equatorial experiments in the Western Pacific near the northernmost excursion of the geomagnetic equator and in the Central Pacific near the junction of the geomagnetic and geographical equators to complement the analogous experiments planned in South America and in Africa.

2. *Recommends* that networks not yet having done so, make nominations of Key Stations to the Chairman of the U.R.S.I./A.G.I. Committee on World-wide Vertical Soundings.

The complete list of Key Stations should be published as soon as possible. In order that the distribution of Key Stations in the Western Pacific area be as complete as possible, the C.S.A.G.I. W.P.R.C. urges the networks involved to give serious consideration

to the designation of the following stations as Key Stations ; Singapore or Baguio, Tixie Bay, and Maui. Intentions to nominate the following as Key Stations are acknowledged ;

Australia : Canberra or Brisbane (1).

Chinese People's Republic : Peking.

India : Calcutta and Ahmedabad.

Japan : Kokubunji.

U. S. A. : Okinawa, Adak, Maui.

U.S.S.R. : Irkutsk.

3. Considered the great importance of continuous measurement of field intensity of CW transmissions in the Western Pacific region especially with regard to detection of short-wave fadeouts and other solar and solar flare effects, so necessary to help to provide a basis for the selection of periods of I.G.Y. Alerts and Special World Intervals. The standard frequency broadcasts are becoming unsuitable for this purpose because they interfere with one another.

Therefore urges very strongly that beacon transmitters with controlled or known characteristics and operation be established or designated for this purpose during the I.G.Y., for example :

(a) transmitter on about 8 Mc/s and 12 Mc/s in Japan or a nearby area, for reception in low latitudes and south latitude, respectively ;

(b) a transmitter on about 10 Mc/s in Australia, for reception in Japan and nearby areas.

Recommends that information on such transmitters be communicated to the C.S.A.G.I. Reporter or published. It also believes the present serious problem in the Western Pacific region and the strong need for such beacon transmitters is world-wide and should also provision or designation of beacon transmitters, the possibility of further mutual interference should be avoided.

4. Has seen some results of studies of the occurrence of the intermediate ionospheric layer F1 1/2 from routine vertical soundings. These studies suggest a regular diurnal and seasonal variation in middle latitudes.

Therefore urges that stations designated as Key Stations in all latitudes include in their reduction program by *f*-plot an indication

(1) *Note* : If New Zealand Key Station is Christchurch, Brisbane would be the most desirable Australian location.

of the occurrence of F1 1/2 in order that its latitude variation can be studied.

5. Suggests to C.S.A.G.I. that the Reporter's lists of I.G.Y. ionosphere stations ought to include the following information :

(a) For vertical sounding stations, the calculated difference in critical frequency of ordinary and extraordinary components for E and F region heights and characteristic frequencies. The assumptions on which these calculations are based should be uniform. World maps of these quantities would be a valuable accessory ;

(b) For existing and potential stations for whistling atmospherics, the approximate geomagnetic conjugate points calculated on one or more of the assumptions indicated by modern whistler propagation theory.

6. Having reviewed the I.G.Y. program for Atmospheric Whistlers in the Western Pacific region and the draft I.G.Y. Manual which has been prepared,

Makes the following *recommendations* :

(a) Those stations which can make more observations than in the recommended program, should make these for a two-minute period beginning at 05 m 00 s after each hour ;

(b) Stations in the Western Pacific region should use WWVH for calibration of the station standard clock, in preference to other standard time broadcast, inasmuch as WWVH is receivable throughout the region ;

(c) Wherever possible, there should be measurements of the frequency of lightning flashes by automatic counter at or near the conjugate point, for each of the I.G.Y. whistlers stations, such as are tentatively planned for Watheroo, Darwin and several places in Japan ;

Has also the following comments to make :

(a) Some stations have made provisions for recording on the same tape not only audio frequency RF and time marks but also direction finding information.

(b) The observation and theory of whistlers have progressed such that it is desirable to make measurements over the whole range of latitude, in addition to the conjugate pair experiment. Thus all additional stations in the Western Pacific region possible are desirable with perhaps slight preference to locations of vertical

sounding stations. It has thus become even more desirable to develop the cooperation and coordination previously recommended by C.S.A.G.I. among U.S.S.R., Japan and Australia in the Western Pacific region.

7. Reviewing the information available on the program for measurement of atmospheric noise, notes that information seems to be incomplete about the radio frequencies on which measurements will be made, the receiving antennas and the characteristics of receivers such as IF bandwidth and the time constant of the detector.

Urges that this information should be sent promptly to the C.S.A.G.I. Reporter so that it can be made available to all participants in this program.

Further notes that there should be calibration *in situ* of absolute field intensity for each receiver.

8. Notes with satisfaction the progress being made in the establishment of the World Data Center « C » for ionospheric data in Tokyo.

Urges that the C.S.A.G.I. organization accelerate further the work of defining and outlining the data exchange criteria.

VIII. — LONGITUDE AND LATITUDE

The C.S.A.G.I. Western Pacific Regional Conference :

considering that it is very important to determine the travel time of signals by receiving them almost simultaneously at a pair of observatories for the precise comparison of time with high accuracy,

suggests that efforts should be made to establish some adequate pairs among observatories in the Western Pacific region, for example as follows :

Pairs of Observatories	Available Signals	Times (UT)
Tokyo-Zi-Ka-Wei	JJY XSG	0240-0320
Tokyo-Hawaii	JJY WWVH	1000-1040
Tokyo-Canberra	JJY VHP	0020-0040
Tokyo-Irkutsk	JJY or JJC RBT	0155-0206
Tokyo-Philippines	JJY DUM	0240-0320

Daily broadcast of I.G.Y. Warning Messages

1. Beginning on 1 June 1957, the advance trial month for the I.G.Y. programme including communications, I.G.Y. Warning Messages will be initiated on each and every day from the World Warning Agency.

2. On those days when there is no substantive warning notice to be issued regarding the start, continuation or termination of an «Alert» or «Special World Interval», the warning message will read as indicated in the «First Supplement to the Draft Manual for World Days and Communications» i. e. «A.G.I. Geophysical Year Warning NO... No Alert».

3. This arrangement, which has been made in consultation with the World Meteorological Organization, will continue throughout the period of the International Geophysical Year.

A. DAY,
I.G.Y. Coordinator,
6, Avenue den Doorn,
Uccle, Belgium.

A. H. SHAPLEY,
C.S.A.G.I. Reporter for World Days
and Communications, National Bureau
of Standards, Boulder Laboratories,
Boulder, Colorado, U.S.A.

Documents received at the General Secretariat

First supplement to the Draft Manual for World Days and Communications, by A. H. SHAPLEY.

Programme Météorologique. Rapport d'ensemble.

I.G.Y. World Data Centers Meeting, Uccle, April 1957, Report and Recommendations.

Report from the Western Pacific Regional Warning Center presented to I.G.Y. Western Pacific Regional Conference, February 1957.

Recommendations of the C.S.A.G.I. Western Pacific Regional Conferences.

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Symposium n° 3 : Non Stable Stars, issued by G. H. HERBIG, Cambridge University Press.

World Meteorological Office

Année Géophysique Internationale 1957-1958. — Programme Météorologique.

International Electrotechnical Commission

The following publications have been issued :

- n° 85 : First edition. — Recommendations for the classification of materials for the insulation of electrical machinery and apparatus in relation to their thermal stability in service.
- n° 88 : First edition. — Standard rated currented (2 to 63A) of fuse links for low voltage fuses.

These publications are on sale at the Central Office of the I.E.C., 1, rue de Varembe, Geneva, Switzerland, at the price of Sw. Fr. 5, per copy plus postage, for Publication n° 85, and Sw. Fr. 1.50 per copy, plus postage, for Publication n° 88.
