Bulletin nº 157 Juillet-Août 1966

URSI

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OBITUARY

Dr. W. H. Eccles, F. R. S.

By the death of Dr. W. H. Eccles on 29th April, 1966, the last personal link has been severed with the first General Assembly of URSI. For as will be seen from the photographic frontispiece to the Golden Jubilee Memorial volume, Dr. Eccles was one of the fifteen scientists, from six European countries, who attended the meeting in Brussels in April 1914, under the title « Commission Internationale de Télégraphie Sans Fil Scientifique »; which was later changed to « Union Radio Scientifique Internationale » — or URSI. It was perhaps natural that he should have become closely associated with the Union at an early stage in his career since he was a physicist who, in the first decades of the present century, devoted himself with notable success to some of the scientific problems associated with the developing art of wireless telegraphy — or radio communication, as it is termed today.

William Henry Eccles was born at Ulverston, Lancashire, England on 23rd August, 1875; and he received his main scientific education at the Royal College of Science, London, which he entered in 1894. Three years later he became an Associate of the College; and in 1898 he graduated as a Bachelor of Science at London University, with first class honours in Physics. The following year he joined Mr. Marconi in the laboratory of the Wireless Telegraphy and Signal Company (later named the Marconi Company). Here he became interested in some of the scientific problems of wireless telegraphy, which were to occupy his attention for many years to come. He started with an investigation of the electrical oscillations in coupled circuits, and a study of the existing devices then in use for receiving and detecting wireless signals. A thesis describing the results of his research into the properties of coherers led to his being awarded the degree of Doctor of Science (D.Sc.) at London University in 1901.

Having gained some practical experience, he turned to the teaching of mathematics and physics : and in 1916, he was

appointed to the chair of Professor of Applied Physics and Electrical Engineering at the City and Guilds of London Technical College, Finsbury. He combined his lecturing duties with active research; and it was during this period that Dr. Eccles made some of his greatest contributions to knowledge in the rapidly growing field of radio communication. His work on coherers was extended to a comprehensive study of crystal detectors for radio reception; and later, he became interested in some special applications of the thermionic valve.

It was discovered in the first decade of the century, that wireless waves transmitted round the curved surface of the earth were subject to phenomena resulting in variable signal strength at the receiving station. In 1912, Dr. Eccles presented a paper before the Royal Society of London in which he expanded the theory, advanced some years earlier by Olivier Heaviside, to explain the propagation of radio waves round the earth by reflection in the ionised, and so electrically conducting, regions of the upper atmosphere. He suggested that the ionising influence of the sun's radiation would account for the observed differences in wave propagation by day and by night. This virtually marked the beginning of experimental research on the ionosphere, which has continued to occupy the attention of URSI up to the present day.

It was during the period 1912-1913 also, that Dr. Eccles played a leading part in an investigation organised by the British Association into the characteristics of atmospheric disturbances in radio reception (then termed « Strays »); and he thereby encouraged research in this subject, which has continued throughout the world for the past half-century, under the auspices of URSI and other international organisations. Indeed, Dr. Eccles was himself chairman during the period 1922-1928 of the Commission on Atmospheric Disturbances established by URSI.

During and after the first world war, Dr. Eccles' wide knowledge and experience were much sought after in the development of both civil and military wireless communications. Later, he was vice-chairman of the Imperial Wireless Telegraphy Committee which advised the British Government on the development of world-wide radio communications. He played an important part in the design of the original long-wave high-power transmitting station at Rugby, England; and it was at this time, that his interest in the thermionic

valve led to the invention of the tuning-fork oscillator, which was used for the precise control of the frequency emitted by this station.

Much of his experience and the results of his research were described in scientific published papers, and in the two books entitled : (i) Wireless Telegraphy and Telephony of which the second edition was printed in 1918; and (ii) Continuous Wave Wireless Telegraphy, published in 1921.

Dr. Eccles was a Past-President of the Institution of Electrical Engineers (1926-1927), of the Physical Society of London (1928-1930), and the Institute of Physics (1929-1931). He was also keenly interested in the activities of the radio amateur, was a founder member of the Radio Society of Great Britain, and its President during 1923-1924.

Reference has already been made to Dr. Eccles' connection with URSI from the earliest days of its formation. He served as a Vice-President of the Union during the period 1921 to 1934; and in the latter year was elected as the first Honorary President of the Union. He has survived in this dignified position for a much greater length of time (1934-1966) than any other of the Union's officers. In both the national and international fields, all scientists engaged in the fields of radio and electronics acknowledge with sincere gratitude the great contributions which Dr. W. H. Eccles has made to our knowledge of this branch of science.

R. L. Smith-Rose.

6th June, 1966.

GENERAL INFORMATION

Actions to commemorate the activities of Sir Edward Appleton

All those who have collaborated in one way or another with our Past President and Honorary President will be interested in the following actions taken by the Edinburgh University to commemorate the activities of that great scientist.

The Edinburgh University Physical Society has founded a « Sir Edward Appleton Memorial Lecture », which takes place in January each year. The first Lecture, last January, was given by Mr. J. A. Ratcliffe who also gave, in December 1965, a Memorial Lecture at the Institute of Electrical Engineers.

The University of Edinburgh has named the new 1st Year Science Block the Appleton Tower.

Prof. Ritchie Calder, Professor of International Relations, Edinburgh University, has taken the chairmanship of a small committee which is proposing to launch a Sir Edward Appleton Memorial Appeal. The aim of the Memorial Appeal is to raise funds to make Edinburgh a world-centre for promoting the Settlement Movement, particularly in terms of Student-involvement.

As a result of a successful appeal the Committee express the hope to be able to provide scholarships to bring students from oversea to have living experience of settlement work. « Edward Appleton House » should be established as a residential centre.

XVth GENERAL ASSEMBLY

Scientific programme

Commission I

Tuesday, Sept. 6 :	a.m.	Standard frequency transmission — Dr. J. M. Richardson, C. Egidi.
	p.m.	Velocity of radio waves — R. C. Baird, L. Essen (with Commission VII).
Wednesday, Sept. 7 :	a.m.	Atomic standards of time — J. Bonanomi, M. E. Zhabotinski.
Thursday, Sept. 8 :	p.m.	International comparisons and standard connectors — J. T. Henderson, B. O. Weinschel.
Friday, Sept. 9 :	a.m.	Laser standard measurements — G. Birnbaum.
Monday, Sept. 12 :	a.m.	RF measurements at frequencies $>$ 1 GHz — I. A. Harris, H. E. Bussey.
Tuesday, Sept. 13 :	p.m.	RF measurements at frequencies $<$ 1 GHz including optical techniques — R. W. Beatty, S. Okamura.
Wednesday, Sept. 14 :	p.m.	Business meeting.

Commission II

Tuesday, Sept. 6 :	a.m.	Experimental analysis of the atmosphere — D. Atlas, J. A. Lane.
	p.m.	Models of atmosphere — R. Bolgiano, J. Grosskopf.
Wednesday, Sept. 7 :	p.m.	See Commission VII.
Thursday, Sept. 8 :	a.m.	Theoretical and experimental investigation of propagation in non-ionized media — M. Hirai, J. B. Smyth.
	p.m.	Effects of propagation on the measurements of distance, angle of arrival and Doppler effect — M. C. Thompson, I. Ranzi.
Friday, Sept. 9 :	a.m.	Propagation and radiometry for millimetre and sub-millimetre wavelengths — F. Möller, A. Robert.

Monday, Sept. 12 :	a.m.	Planetary radio and radar astronomical observations (with Commission V).
	p.m.	Business meeting.
Tuesday, Sept. 13 :	a.m.	Review of radio propagation below the Earth's surface — J. T. DE BETTENCOURT.

COMMISSION III

Thursday, Sept. 7 :	a.m.	D-region structure and formation — B. LANDMARK.
	p.m.	D-region, collision frequencies, relation to stratosphere — W. R. PIGGOTT.
Friday, Sept. 9 :	a.m.	The ionospheric F-region and magnetosphere — A. P. WILLMORE, W. E. GORDON (with Commission IV).
Monday, Sept. 12 :	a.m.	Dynamics of the ionosphere, overall picture and E-region in particular — C. O. HINES.
	p.m.	See Commission IV.
Tuesday, Sept. 13 :	a.m.	Dynamics of the ionosphere F-region phenomena, interactions between movements of neutral atmosphere and ionosphere — H. KOHL.
	p.m.	The ionosphere F-region with special reference to subpeak morphology — J. W. KING.
Wednesday, Sept. 14 :	p.m.	Reserved for new topics.

COMMISSION IV

Friday, Sept. 9 :	a.m.	See Commission III.
Monday, Sept. 12 :	p.m.	VLF radio waves and micropulsations — R. A. HELLIWELL, R. GENDRIN (with Commission III and Sub-Commission IVa).
Tuesday, Sept. 13 :	a.m.	New work on the magnetosphere and atmospherics (with Sub-Commission IVa).
Wednesday, Sept. 14 :	p.m.	Effects of nuclear explosions on propagation phenomena — A. M. PETERSEN (with Sub-Commission IV*a*).

SUB-COMMISSION IV*a*

Thursday, Sept. 8 :	p.m.	Atmospherics I : Characteristics of atmospherics at the source and propagation — E. T. PIERCE (with Commission IV).
Monday, Sept. 12 :	a.m.	Whistlers — R. RIVAULT (with Commission IV).
	p.m.	See Commission IV.

Tuesday, Sept. 13 : a.m. See Commission IV.
p.m. Atmospherics II : Atmospheric noise and its influence on communications — F. HORNER (with Commission IV).

Wednesday, Sept. 14 : p.m. See Commission IV.

COMMISSION V

Tuesday, Sept. 6 : p.m. Filled aperture radio telescopes — G. SMITH.

Wednesday, Sept. 7 : a.m. See Commission VI.
p.m. Unfilled aperture radio telescopes — M. RYLE.

Thursday, Sept. 8 : a.m. Radio Techniques — E. J. BLUM.

Friday, Sept. 9 : a.m. Extragalactic observations — A. T. MOFFET.

Monday, Sept. 12 : a.m. See Commission II.
p.m. Radio spectroscopy — J. P. WILD.

Tuesday, Sept. 13 : a.m. New radiotelescopes — CECCARELLI.
p.m. Business meeting.

COMMISSION VI

Tuesday, Sept. 6 a.m. Diffraction and scattering in non-ionized media — H. MEINKE, J. B. KELLER.
p.m. Coding, modulation and signal processing — A. V. BALAKRISHNAN, V. I. SIFOROV.

Wednesday, Sept. 7 : a.m. Antennas — R. C. HANSEN (with Commission V).

Thursday, Sept. 8 : a.m. Non-linear circuits — A. BLAQUIÈRE, E. W. SANDBERG.

Friday, Sept. 9 : a.m. Satellite communications — L. J. CUTRONA, P. COOLEY.

Monday, Sept. 12 : a.m. See Commission VII.
p.m. Linear circuits — S. DARLINGTON, J. O. SCANLAN.

Tuesday, Sept. 13 : p.m. Electromagnetic properties of ionized media I Source free solutions in ionized regions — K. BOCHENEK, N. MARKUWITZ.

Wednesday, Sept. 14 : a.m. Electromagnetic properties of ionized media II — M. P. BACHINSKY, L. FELSEN.

COMMISSION VII

Tuesday, Sept. 6 : a.m. Low noise devices (masers, paramps.) — H. HEFFNER.
p.m. See Commission I.

Wednesday, Sept. 7 : a.m. Laser radar — Non linear optics — R. J. COLLINS.

Thursday, Sept. 8 :	a.m. CW lasers and gas lasers — J. LE MEZEC. Application to holograms — M. CHODOROW.
Monday, Sept. 12 :	a.m. Microminiaturisation — BERTRAIS (with Commission VI). p.m. Solid state plasmas, helicons, Gum effect — R. E. BURGESS.
Tuesday, Sept. 13 :	a.m. Cryogenic coils — D. B. MONTGOMERY. p.m. Business meeting.

NATIONAL COMMITTEES

Australia

MEMBERSHIP

The Council of the Australian Academy of Science has recently reviewed the membership of the National Committee for Scientific Radio and has appointed the following for a period of three years :

Professor W. N. CHRISTIANSEN, FAA (*Chairman*), School of Electrical Engineering, The University of Sydney, Sydney, NSW.

Associate Professor R. E. AITCHESON,

Mr. F. E. COOK,

Dr. W. G. ELFORD,

Prof. G. R. A. ELLIS,

Prof. C. D. ELLYETT,

Mr. A. J. HIGGS,

Associate Professor R. M. Huey,

Prof. A. E. KARBOWIAK,

Dr. D. F. MARTYN,

Dr. B. ROBINSON,

Prof. H. C. WEBSTER.

Hungary

THIRD COLLOQUIUM ON MICROWAVE COMMUNICATION

BUDAPEST, APRIL 1966

This meeting which brought together 500 scientists from widely separated parts of the world was organized by the Hungarian Academy of Sciences in collaboration with the Hungarian Scientific

Society for Telecommunications. After the opening address by Dr. G. Bognar the participants divided themselves according to their particular interests into two groups and over the four days of the Conference some 50 papers were presented to each group. Simultaneous translation enabled speakers to be heard in English, Russian and Hungarian. During each session opportunity was given for discussion of the papers presented and helpful additional information often emerged. As usual much of the value of the Colloquium arose from personal contact between scientists working in similar fields and the social arrangements provided a very pleasant setting for the informal interchange of information in this way.

The writer, who went to the meeting as official URSI delegate, gave the first of the series of scientific papers presented and dealt with millimetre waveguides for long-distance telecommunications. He also took the Chair at one of the later sessions. The Microwave Colloquium on this occasion was much larger than previous ones sponsored by the Hungarian Academy of Sciences and the organisers are to be warmly congratulated on the success of the event.

H. M. Barlow.

26 April 1966.

Sweden

ACTIVITIES OF THE SWEDISH NATIONAL COMMITTEE DURING THE 1963-1966

The Swedish National Committee at present consists of 17 ordinary members and 38 associate members. The activity is divided into seven sections and one subsection, corresponding to the URSI commissions and subcommission, the chairmen of the section and the subsection also being the official members to the URSI commissions.

Since the XIVth General Assembly in Tokyo, 1963, the committee has held 4 full meetings under the chairmanship of the President of the National Committee, Dr. H. Sterky and one under the chairmanship of the Vice-President Professor N. Herlofson. A conference arranged by the National Committee, the

Royal Academy of Engineering Sciences, the Swedish Association of Electrical Engineers and Chalmers University of Technology was held in Gothenburg, March 14-16, 1966.

USA

SPRING MEETING
April 18-21, 1966

The proceedings of the U.S. National Committee Spring Meeting held at the National Academy of Sciences have been issued. The meeting was co-sponsored by six Groups of the Institute of Electrical and Electronics Engineers.

The booklet containing the summaries of papers submitted at the meeting may be ordered, at the price of $2, at the Superintendent of Documents, Government Office, Washington, D.C. 20402.

The papers read at the Combined Session of all Commissions are :

CS-1. Bistatic radar astronomy, summary and prospectus — V. R. Eshleman, Center for Radar Astronomy, Stanford University and Stanford Research Institute, Stanford, Calif.

CS-2. VLF observations and the determination of ion composition — N. M. Brice, Radio Physics Laboratory, Defence Research Telecommunications Establishment, Defence Research Board, Ottawa, Canada, and Faculty of Engineering, Carleton University, Ottawa, Canada, and R. E. Barrington, Radio Physics Laboratory, Defence Research Telecommunications Establishment, Defence Research Board, Ottawa, Canada.

CS-3. Laser standard measurements — G. Birnbaum, North American Aviation Science Center, Thousand Oaks, Calif.

CS-4. E region effective recombination rates from incoherent scatter measurements at Arecibo — L. M. Lalonde, Cornell University, Center for Radiophysics and Space Research, Ithaca, N.Y.

CS-5. Characteristics of the NRAO 140-FT telescope at wavelengths between 11 and 0.95 cm — P. G. Mezger, National Radio Astronomy Observatory, Green Bank, W. Va.

CS-6. Performance descriptors for antennas in the ionosphere — H. Weil and D. Walsh.

The other papers classified according to the various commissions are mentioned hereunder.

COMMISSION I

Measurements

1-1-1. Calibration of receivers by statistical analysis of noise — V. H. GONZALEZ.

1-1-2. Automatic frequency standards in the United States : 1963-1966 — R. C. MOCKLER, National Bureau of Standards, Boulder, Colo.

1-1-3. High precision frequency standards-quartz — E. A. GERBER, Electronic Components Laboratory, U.S. Army Electronics Command, Fort Monmouth, N.J., and R. A. SYKES, Bell Telephone Laboratories, Allentown, Pa.

1-1-4. Scientific aspects of universal and/or atomic time and frequency transmissions — G. E. HUDSON, Radio Standards Physics Division, National Bureau of Standards, Boulder, Colo.

1-1-5. Gain measurements of vertically polarized antennas over imperfect ground — R. G. FITZGERRELL, ITSA-ESSA, Boulder, Colo.

1-1-6. Measurement of diffraction fields of finite cylinders by a light — Modulated scattering technique — A. M. VURAL, Heavy Military Electronics Department, General Electric Co. Syracuse, N.Y., and D. K. CHENG, Electrical Engineering Department, Syracuse University, Syracuse, N.Y.

1-2-1. Triannual USA progress report, standards and measurements at 30 kHz to 1 GHz (January 1963 to January 1966) — M. C. SELBY, National Bureau of Standards, Boulder, Colo.

1-2-2. Progress report (1963-1966) on USA standards and measurement techniques from 1 to 300 GHz — R. W. BEATTY, National Bureau of Standards, Boulder, Colo.

1-2-3. Precision coaxial connectors — B. O. WEINSCHEL, Weinschel Engineering, Kensington, Md.

1-2-4. Swept-frequency techniques, 1963-1965 — S. B. COHN, Rantec Corporation, Calabasas, Calif.

1-2-5. Survey of 1963 to 1965 USA progress in measurements of electromagnetic properties of materials — H. E. BUSSEY, National Bureau of Standards, Boulder, Colo.

1-2-6. Use of an interference spectrometer for determining properties of millimeter and submillimeter wave components and materials — K. H. BREEDEN, W. K. RIVERS and A. P. SHEPPARD.

1-2-7. The role of plasma column length in tonks-Dattner resonances — W. D. HERSHBERGER, University of California, Los Angeles, Calif., and F. F. HANNA, Microwave Unit, National Research Center, Cairo, Egypt.

COMMISSION II

2-1. — *Tropospheric propagation*

2-1-1. Meteorological implications of phase and amplitude fading on a forward scatter channel — W. P. BIRKEMEIER, Department of Electrical Engineering, University of Wisconsin, Madison, Wis.

2-1-2. Propagation in a surface duct — I. H. Gerks.

2-1-3. Meshing the lobes in twilight region propagation — T. J. CARROLL, Bendix Radio Division, Baltimore, Md.

2-1-4. Atmospheric propagation limitations at millimeter wave frequencies — L. A. MORGAN, Smyth Research Associates, San Diego, Calif.

2-1-5. Characteristics of two simulated fading channels — A. M. MANDERS, University of Florida — Genesys, Cape Canaveral, Fla.

2-1-6. Spatial and temporal distributions of fields at the receiving end of a long mountain obstacle diffraction path — L. G. HAUSE, Spectrum Utilization Research Tropospheric Telecommunication Lab., Institute for Telecommunication Sciences and Aeronomy, Boulder, Colo.

2-2. — *Propagation and vegetation*

2-2-1. Radio propagation in tropically vegetated environments — L. G. STURGILL and K. G. HEISLER, Ir., Jansky and Bailey Research and Engineering Division, Atlantic Research Corporation, Arlington, Va.

2-2-3. On the calculation of radiation patterns of dipole antennas in dense forests — J. TAYLOR, University of South Carolina, Columbia, S.C., and Communication Laboratory, Stanford Research Institute, Menlo Park, Calif.

2-2-4. Radar cross sections of trees at high frequency — J. G. STEELE, Radioscience Laboratory, Stanford, Calif.

2-2-5. Preliminary results of full-scale pattern measurements of simple VHF antennas in a eucalyptus grove — G. H. HAGN, G. E. BARKER, H. W. PARKER, J. D. HICE, W. A. RAY, Communication Laboratory, Stanford Research Institute, Menlo Park, Calif.

2-2-6. The use of open-wire transmission lines to measure electrical properties of vegetation — G. H. HAGN and H. W. PARKER, Communication Laboratory, Stanford Research Institute, Menlo Park, Calif.

2-2-7. The ground-wave attenuation function for propagation over a highly inductive earth — R. J. KING, Department of Electrical Engineering, University of Wisconsin, Madison, Wis., and G. A. SCHLAK, Department Electrical Engineering, University of Colorado, Boulder, Colo.

2-2-8. Surface waves from a horizontal dipole in stratified antarctic terrain — A. W. BIGGS, Aerospace Group, The Boeing Company, Seattle, Wash., and H. M. SWARM, Department of Electrical Engineering, University of Washington, Seattle, Wash.

2.3. — *Planetary atmospheres and surfaces*

2-3-1. Models for the atmosphere of Mars based on the Mariner IV occultation experiment — G. FJELDBO, W. C. FJELDBO and V. R. ESHLEMAN, Center for Radar Astronomy, Stanford University and the Stanford Research Institute, Stanford, Calif.

2-3-2. Radar observations of Venus at 3.8 and 23 cm wavelength — J. V. EVANS and R. P. INGALLS, Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, Mass.

2-3-3. Atmospheric attenuation at 3.2 Gc/sec — W. J. MEDD, Radio and Electrical Engineering Division, National Research Council, Ottawa, Canada.

2-3-4. Spatial modulation of VHF signals by transatmospheric propagation at low elevation angles — L. R. HUGHES, Smyth Research Associates, San Diego, Calif.

2-3-5. Atmospheric correlation effects in range-rate tracking — G. H. MYERS, New York University School of Engineering and Science, Department of Electrical Engineering, University Heights, Bronx, N.Y.

2-4. — *Surface transmission and inhomogeneous media*

2-4-1. An application of Galerkin's method to the analysis of inhomogeneously filled waveguides — D. A. Ross and W. W. COOLEY, Seattle University Department of Electrical Engineering, Seattle, Wash.

2-4-2. Electromagnetic propagating structures with nonuniform gross perturbations — S. L. RICHTER, P. DIAMENT and S. P. SCHLESINGER, Columbia University, Department of Electrical Engineering, New York, N.Y.

2-4-3. A curvature-dependent impedance boundary condition for good conductors — K. M. MITZNER, Northrop Corporation, Nortronics Division, Newbury Park, Calif.

2-4-4. Propagation in a terrestrial waveguide of variable surface impedance —E. BAHAR, Department of Electrical Engineering, University of Colorado, Boulder, Colo.

2-4-5. Radiation from a line source over an inhomogeneous impedance plane — H. KRITIKOS, California Institute of Technology (on leave of absence from the Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pa).

2-4-6. Diffraction of a creeping wave by a discontinuity in the surface impedance of a smooth body — P. L. CHRISTIANSEN, Dept. of Electrical Engineering, Univeristy of Michigan, Ann Arbor, Mich.

2-4-7. Diffraction by a smooth convex body — D. LUDWIG.

2-5. — *Scattering by surfaces*

2-5-1. HF sea scatter and ocean wave spectra — L. WETZEL, Institute for Defence Analyses, Arlington, Va.

2-5-2. Depolarization of waves by rough surfaces in backscattering — A. K. FUNG, Center for Research, Inc., Engineering Science Division, University of Kansas, Lawrence, Kan.

2-5-3. Measurements of non-rayleigh microwave forward scatter from a random water surface — C. I. BEARD, Boeing Scientific Research Laboratories, Seattle, Wash.

2-5-4. Scattering by a moving statistically rough surface — H. S. HAYRE, Department of Electrical Engineering, University of Houston, Houston, Texas.

2-5-5. A general relation between fields and spectra in mobile radio — R. H. CLARKE, Bell Telephone Laboratories, Inc., Crawford Hill, Holmdel, N.J.

2-5-6. Bistatic radar experiments for the study and mapping of the lunar surface — G. L. TYLER, G. FJELDBO and R. L. KOEHLER, Center for Radar Astronomy, Stanford University, Stanford, Calif.

2-5-7. Scattering from an abrupt change in tickness on a dielectric slab — W. W. COOLEY, Department of Electrical Engineering, Seattle University, Seattle, Wash., and A. ISHIMARU, Department of Electrical Engineering, University of Washington, Seattle, Wash.

2-6. — *Characteristics and effects of the atmosphere*

2-6-1. Attenuation of laser beams by precipitation in the atmosphere — T. S. CHU, Bell Telephone Laboratories, Incorporated, Crawford Hill, Holmdel, N.J.

2-6-2. Preliminary studies of precipitation scatter interference — F. J. ALTMAN.

2-6-3. Coherent pulse transmission through a rain scattering volume — R. K. CRANE, Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, Mass.

2-6-4. High-resolution interference spectrometer measurements of submillimeter atmospheric water vapor absorption — K. H. BREEDEN, W. K. RIVERS, A. P. SHEPPARD.

2-6-5. The measurement of line-integrated refractivity for range parameter corrections — D. LUCZAK, Rome Air Development Center and W. TANK, The Boeing Company, Seattle, Wash.

2-6-6. The feasibility of laser experiments for measuring atmospheric turbulence parameters — J. W. STROHBEHN, Thayer School of Engineering, Dartmouth College, Hanover, N.H.

COMMISSION III

3-1. — *Ionospheric irregularities*

3-1-1. Spectra of 50 Mc/sec radar echoes from equatorial F-region irregularities as a function of direction of observation in the equatorial plane — R. COHEN, ITSA-ESSA, Boulder, Colo.

3-1-2. Gradient instabilities as possible causes of irregularities in the ionosphere — C. H. LIU and K. C. YEH, Department of Electrical Engineering, University of Illinois, Urbana, Ill.

3-1-3. Ionospheric E-region irregularities produced by non-linear coupling of unstable plasma waves — J. P. DOUGHERTY, Cambridge University, Cambridge, England and D. T. FARLEY, Jicamarca Radar Observatory, Apartado 3747, Lima, Peru.

3-1-4. Aurorally-associated ionospheric electron density comparison : topside and oblique backscatter — D. S. LUND and R. D. HUNSUCKER, ESSA/ITSA, Boulder, Colo, and H. F. BATES, Geophysical Institute, University of Alaska, College, Alaska.

3-1-5. Simultaneous 139 and 398 Mc radar auroral wavelength dependence — R. L. LEADABRAND, J. C. HODGES and W. C. CHESNUT, Radio Physics Laboratory, Stanford Research Institute, Menlo Park, Calif.

3-1-6. Regular moving disturbances in the auroral zone F-region — G. M. STANLEY, Geophysical Institute, University of Alaska, College Alaska.

3-2. — *Probe measurements in the ionosphere*

3-2-1. Ion probe measurements on a separating capsule ionospheric experiment — L. C. HALE and D. J. HOFFMAN, Pennsylvania State University, Ionosphere Research Laboratory, University Park, Pa.

3-2-2. Satellite disturbances in the ionosphere — P. KIRCHNER, L. HUMPHREY, C. R. ROBERTS.

3-2-3. Impedance and resonance measurements in the ionospheric plasma — J. HUGILL and W. CALVERT, ITSA, ESSA, Boulder, Colo., and J. A. FEJER, Southwest Center from Advanced Studies, Dallas, Texas.

3-2-4. First-order corrections to D-region probe theory — D. P. HOULT and TA JIN KUO, Pennsylvania State University, Ionospheric Research Laboratory, University Park, Pa.

3-2-5. Results of a multiple ionospheric probe rocket experiment — W. J. HEIKKILA and N. EAKER, Southwest Center for Advanced Studies, Dallas, Texas.

3-2-6. The Langmuir probe as a tool for the measurement of plasma waves E. G. FONTHEIM, Space Physics Research Laboratory, Department of Electrical Engineering, University of Michigan, Ann Arbor, Mich.

3-2-7. Plasma resonances in the topside ionosphere observed by Explorer XX — W. CALVERT and T. E. VAN ZANDT, ITSA-ESSA, Boulder, Colo.

3-3. — *HF propagation*

3-3-1. Ionospheric structure determination from vertical angle measurements — T. A. CROFT, Radioscience Laboratory, Stanford University, Stanford, Calif.

3-3-2. Mode structures over a 3700-km N-S path — J. PIERLUISSI, C. R. ROBERTS, R. MATHER.

3-3-3. Mode loss and focusing characteristics over a 3760-km N-S path — L. HUMPHREY, C. R. ROBERTS, General Electric Company, Electronics Park, Electronics Laboratory, Syracuse, N.Y., and J. SIMONS, Rome Air Development Center, RAISER, United States Air Force, Griffis Air Force Base, Rome, N.Y.

3-3-4. A comparison of long-distance HF radio signal reception at high and low receiving sites — M. R. EPSTEIN, V. R. FRANK, G. H. BARRY and O. G. VILLARD, Jr., Radioscience Laboratory, Stanford Electronics Laboratories, Stanford University, Stanford, Calif.

3-3-5. A test of the mode-averaging diversity combiner — N. KAWACHIKA and O. G. VILLARD, Jr., Radioscience Laboratories, Stanford University, Stanford, Calif.

3-3-6. Recent developments in ionospheric mapping by numerical methods — W. B. JONES, R. P. GRAHAM, M. LEFTIN, ITSA-ESSA, Boulder, Colo.

3-4. — *Topside ionosphere; rocket and satellite measurement*

3-4-1. Temperature and composition measurements at the magnetic equator — D. T. FARLEY, J. P. MCCLURE and J. L. GREEN, Jicamarca Radar Observatory, Apartado 3747, Lima, Peru.

3-4-2. The first mother daughter experiment — J. C. WIDMAIER and J. S. NISBET, Ionosphere Research Laboratory, The Pennsylvania State University, University Park, Pa.

3-4-3. Ion temperature profile in the upper F2 ionosphere — W. C. KNUDSEN and G. W. SHARP, Lockheed Palo Alto Research Laboratory, Palo Alto, Calif.

3-4-4. Correlation of plasma scale height with k_p in the topside ionosphere — T. M. WATT, Stanford Electronics Laboratories, Stanford University, Stanford, Calif.

3-4-5. Seasonal variations in the rate of production of electrons in the ionosphere — F. L. SMITH, III, and O. K. GARRIOTT, Radioscience Laboratory, Stanford University, Stanford, Calif.

3-4-6. Equatorial total electron content — J. P. MCCLURE, Jicamarca Radar Observatory, Apartado 3747, Lima, Peru.

3-4-7. Faraday rotation measurements of electron content near the magnetic equator using the transit IV — A satellite — V. T. NIMIT, Military Research and Development Center, Electronics Laboratory, Bangkok, Thailand, C. L. RUFENACH, Military Research and Development Center, Electronics Laboratory, Bangkok, Thailand, and R. E. LEO, Montana State University, Bozeman, Mont.

3-5. — *Acoustic-gravity waves*

3-5-1. Measurement of the ionospheric acoustic wave from a ground-level explosion — G. H. BARRY, L. J. GRIFFITHS, J. C. TAENZER.

3-5-2. Traveling ionospheric disturbances associated with nuclear explosions — W. J. BREITLING and R. A. KUPFERMAN, Avco/RAD, Wilmington, Mass., and G. J. GASSMANN, Air Force Cambridge Research Laboratories, Bedford, Mass.

3-5-3. The ratio detection of gravity-wave, traveling disturbances at Palo Alto, Calif. — R. A. BARNES, Jr., M. J. BARON, A. F. WICKSHAM, Jr., Radio Physics Lab., Stanford Research Institute, Menlo Park, Calif.

3-5-4. Possible use of gravity waves as a diagnostic technique in the study of ionospheric chemical rates — W. G. CHESNUT, A. F. WICKERSHAM, Jr., and R. L. LEADABRAND, Radio Physics Laboratory, Stanford Research Institute, Menlo Park, Calif.

3-5-5. A gravity wave interpretation of long period waves observed in the Ionosphere over Puerto Rico — G. THOME, Arecibo Ionospheric Observatory, Cornell University, Ithaca, N.Y.

3-5-6. Reflection and transmission of gravity waves in regions of wind shear — C. A. REDDY, High Altitude Observatory, NCAR, Boulder, Colo., and C. O. HINES, Dept. of Geophysical Sciences, University of Chicago, Chicago, Ill.

3-5-7. The role of wave ducting in the propagation of traveling ionospheric disturbances — J. P. FRIEDMAN, University of Chicago, Chicago, Ill.

3-6. — *The D-region*

3-6-1. Mesospheric electron density measurements at Birdling's flat, 43° S — A. H. MANSON, Department of the Geophysical Sciences, University of Chicago, Chicago, Ill.

3-6-2. A preliminary investigation into the latitudinal dependence of the electron density distribution in the lower ionosphere based on observations made at Ottawa, Churchill and Resolute Bay — J. S. BELROSE, I. A. BOURNE and L. W. HEWITT, Radio Physics Laboratory, Defence Research Telecommunications Establishment, Ottawa, Ontario, Canada.

3-6-3. The ionization profile of the D-region from sunrise to noon — R. A. SMITH, R. N. R. COYNE, and R. G. LOCH, University of New England, Armidale, New South Wales, Australia; and I. A. BOURNE, Defence Research Telecommunications Establishment, Defence Research Board, Ottawa, Ontario, Canada.

3-6-4. An interpretation of the winter absorption anomaly at middle latitudes — C. F. SECHRIST, Jr., Aeronomy Laboratory, University of Illinois, Urbana, Ill.

3-6-5. Method of determining electron density profiles from low frequency cw rocket propagation experiments — T. A. SELIGA, Pennsylvania State University, Ionosphere Research Laboratory, University Park, Pa.

3-6-6. Non-reciprocal VLF wave propagation over short paths during sunrise — W. F. MOLER, U.S. Navy Electronics Laboratory, San Diego, Calif.

3-6-7. The effect of frequency on sunrise fading at very low frequencies — F. K. STEELE and D. D. CROMBIE, ITSA-ESSA, Boulder, Colo.

3-7. — *F-region theory and incoherent scatter*

3-7-1. A double pulse method for obtaining good height resolution in the incoherent scatter spectra — F. PERKINS and R. WAND, Cornell University, Ithaca, N.Y.

3-7-2. The effect on unequal ion and electron temperatures on incoherent scattering — D. T. FARLEY, Jicamarca Radar Observatory, Apartado 3747, Lima, Peru.

3-7-3. A comparison between electron density profiles obtained from the main (ion) and plasma line components in ionosphere incoherent scatter — K. O. YNGVESSON, Cornell University, Ithaca, N.Y.

3-7-4. A new method for determining loss and transport in the nighttime F-region —

3-7-5. Estimation of drift and diffusion terms in the nighttime F-region from incoherent backscatter profiles — K. K. Mahajan, Arecibo Ionospheric Observatory, Arecibo, Puerto Rico.

3-7-6. Incoherent scatter measurements of equatorial F-region parameters during the sunrise period — R. COHEN, ITSA, ESSA, Boulder, Colo., and W. B. HANSON, Southwest Center for Advanced Studies, Dallas, Texas.

3-7-7. F-region temperatures and electron densities using incoherent backscatter — P. B. RAO, Arecibo Ionospheric Observatory, Arecibo, Puerto Rico.

3-8. — *The E-region*

3-8-1. Evidence for a nighttime westward current in the equatorial E-region — B. B. BALSLEY, ITSA-ESSA, Boulder, Colo.

3-8-2. Electron density measurements from southern latitude rocket flights — R. E. HOUSTON, and L. E. LARSON, University of New Hampshire, Durham, N.H.

3-8-3. E-region effective recombination coefficients from sunrise electron density profiles — P. PARAMASIVAIAH and S. A. BOWHILL, Aeronomy Laboratory, Department of Electrical Engineering, University of Illinois, Urbana, Ill.

3-8-4. The wind-shear theory of sporadic E — L. J. GLEESON and W. I. AXFORD, Center for Radiophysics and Space Research, Cornell University, Ithaca, N.Y.

3-8-5. Ion temperature measurements below the F-peak from a polar-orbiting satellite — K. K. HARRIS, W. C. KNUDSEN and G. W. SHARP, Lockheed Missiles and Space Company, Palo Alto, Calif.

3-8-6. Recent ion mass composition measurements made with an ion energy analyzer — G. W. SHARP, W. C. KNUDSEN, K. K. HARRIS, Lockheed Palo Alto Research Laboratories, Palo Alto, Calif.

3-8-7. A two-day ionospheric pulse propagation rocket experiment — J. I. VIDEBERG.

COMMISSION IV

4-1. — *Magnetosphere*

4-1-1. Analysis of whistlers received by the OGO-I satellite — J. J. ANGERAMI [1], R. L. SMITH and N. DUNCKEL, Stanford University, Stanford, Calif.

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[1] On leave from Escuola Politecnica, Universidade de Sao Paulo, Brazil.

4-1-2. Ionosphere and exosphere observations by means of the EGO satellite — A. V. da Rosa, O. K. Garriott, S. C. Hall, Radioscience Laboratory, Stanford University, Stanford, Calif. and E. Schiffmacher, National Bureau of Standards, Boulder, Colo.

4-1-3. The composition of the topside ionosphere from Alouette I scale heights and Injun III proton whistler H^+ measurements — M. J. Rycroft, Imperial College, London, England, and NASA Ames Research Center, Calif., and S. D. Shawhan, University of Iowa, Iowa City, Iowa.

4-1-4. Conjugate Ducting in the Topside ionosphere observed by Explorer XX — T. E. VanZandt, B. Loftus, and W. Calvert, ITSA, ESSA, Boulder, Colo.

4-1-5. Exospheric electron density profiles in the equatorial plane — J. P. McClure and J. L. Green, Jicamarca Radar Observatory, Apartado 3747, Lima, Peru.

4-1-6. Conjugate ionospheric heating studied with digitally derived spectral data — F. W. Perkins and H. C. Carlson.

4-1-7. Observation of coherent radio scatter from irregularities 6000 km above the magnetic equator — R. Cohen, ITSA-ESSA, and K. L. Bowles, Applied Electrophysics, University of California, at San Diego, La Jolla, Calif.

4-2. — *Probe measurements in the ionosphere*

See Commission III — 2.

4-3. — *Topside ionosphere; rocket and satellite measurements*

See Commission III — 4.

4-4. — *VLF noise*

4-4-1. Non-Eckersley law whistlers — D. A. Gurnett, R. R. Shaw, S. D. Shwhan and G. W. Pfeiffer, University of Iowa, Iowa City, Iowa.

4-4-2. Ray tracing in the ionosphere at VLF frequencies; an explanation of non-Eckersley law whistlers — S. D. Shawhan, University of Iowa, Iowa City, Iowa.

4-4-3. Whistler and VLF emission intensities observed in the magnetosphere by the OGO-I satellite. — N. Dunckel and R. A. Helliwell, Radioscience Laboratories, Stanford University, Stanford, Calif.

4-4-4. A new relation between periodic and quasi-periodic VLF emissions — R. A. Helliwell and R. B. Flint, Jr., Radioscience Laboratories, Stanford University, Stanford, Calif.

4-4-5. Non-whistler-mode noise bursts observed on OGO-I — L. H. Rorden and L. E. Orsak, Develco, Incorporated, Palo Alto, Calif., and B. P. Ficklin, Stanford Research Institute, Menlo Park, Calif.

4-4-6. A satellite study of very-low-frequency emissions — D. A. GURNETT, University of Iowa, Iowa City, Iowa.

4-4-7. The effects of negative ions on the propagation of an electromagnetic wave in the ionosphere — S. D. SHAWHAN, University of Iowa, Iowa City, Iowa.

4-5. — *Hydromagnetic waves*

4-5-1. Comparison of latitude effect on diurnal occurrence of VLF emissions with that of micropulsation pearls — J. H. POPE.

4-5-2. Attenuation of hydromagnetic emissions in the ionospheric waveguide — L. TEPLEY and R. C. WENTWORTH, Lockheed Missiles and Space Company, Palo Alto, Calif.

4-5-3. Hydromagnetic and radio wave guidance in the magnetosphere along a field-aligned plasma stratum — N. GOTHARD, Pennsylvania State University, Ionosphere Research Laboratory, University Park, Pa.

4-5-4. Propagation of hydromagnetic waves through the ionosphere — M. ABBAS, Department of Electrical Engineering, University of Rhode Island, Kingston, R.I.

4-5-5. Transverse hydromagnetic waves at 1100 km altitude in the auroral region — A. J. ZMUDA, J. H. MARTIN, and F. T. HEURING, The Applied Physics Laboratory of The Johns Hopkins University, Silver Spring, Md.

4-6. — *F-region theory and incoherent scatter*

See Commission III — 7.

4-7. — *Whistlers*

4-7-1. The nose whistler as a tool for study of the magnetosphere; effects of the magnetic field and field-line models in analysis — J. J. ANGERAMI (on leave from Escola Politecnica, Universidade de Sao Paulo, Brazil), Stanford University, Stanford, Calif.

4-7-2. Whistler mode amplification and attenuation — H. B. LIEMOHN, Southwest Center for Advanced Studies, Dallas, Texas.

4-7-3. The upper cutoff frequency of ducted whistlers in the magnetosphere — D. L. CARPENTER, Radioscience Laboratory, Stanford University, Stanford, Calif.

4-7-4. Enhanced landau damping of whistlers in the vicinity of the magnetospheric knee — T. F. BELL, Stanford University, Stanford, Calif.

4-7-5. Non-ducted whistlers in the magnetosphere — R. L. SMITH, Stanford University, Stanford, Calif.

4-7-6. Propagation factors in the fixed-frequency whistler-mode as determined from VLF ground station signals received in the OGO-1 satellite — R. L. HEYBORNE (now at Utah State University, Logan, Utah), Stanford University, Stanford, Calif.

COMMISSION V

5-1. — *Galactic and extra-galactic observations*

5-1-1. Measurement of the 20 to 40 Mc/sec spectra of discrete radio sources using the Arecibo radio telescope — D. A. GUIDICE, Radio Astronomy Branch, Space Physics Laboratory, Air Force Cambridge Research Laboratories, Bedford, Mass.

5-1-2. Sky brightness temperature at 408 Mc-sec — R. M. PRICE.

5-1-3. Microwave observations of the Cygnus-X region — D. DOWNES and R. RINEHART, Harvard Radio Astronomy Station, Fort Davis, Texas.

5-1-4. A survey of radiation from the anticenter region of the galaxy at a frequency of 13.1 Mc/sec — B. H. ANDREW, Radio and Electrical Engineering Division, National Research Council, Ottawa, Canada.

5-1-5. A digital mapping procedure applied to the galactic center — — M. L. MEEKS and J. C. HENRY, Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, Mass.

5-1-6. Lunar occultations of seven radio sources — J. H. TAYLOR, Jr., Harvard Radio Astronomy Station, Fort Davis, Texas.

5-1-7. Variable emission from quasi-stellar sources and a Seyfert galaxy at centimeter wavelengths — W. A. DENT, Radio Astronomy Observatory, University of Michigan, Ann Arbor, Mich.

5-4. — *The solar system*

5-4-1. Type III solar radio noise bursts at hectometer wavelengths — T. R. HARTZ, Radio Physics Laboratory, Defence Research Telecommunications Establishment, Defence Research Board, Ottawa, Canada.

5-4-2. Interplanetary electron density measurements with the Pioneer VI spacecraft — R. L. KOEHLER, Center for Radar Astronomy, Stanford University and Stanford Research Institute, Stanford, Calif.

5-4-3. Cislunar electron content as determined by radar group delay measurements — H. T. HOWARD, Center for Radar Astronomy, Stanford University and Stanford Research Institute, Stanford, Calif.

5-4-4. Interplanetary scintillations — M. H. COHEN, H. E. HARDEBECK, and L. E. SHARP, Center for Radiophysics and Space Research, Cornell University, Ithaca, N.Y.

5-4-5. Observations of planets at a wavelength of 6 cm — M. P. HUGHES, Harvard Radio Astronomy Station, Fort Davis, Texas.

5-4-6. Polarization of the Jupiter radiation — C. H. BARROW, E. E. BAART and D. P. MORROW, Florida State University, Tallahassee, Fla.

5-4-7. Digital radio polarimeter observations of Jovian and Solar decametric emissions — A. FEJFAR, R. V. BHONSLE, and B. B. LUSIGNAN, Stanford Center for Radar Astronomy, Stanford, Calif.

5-4-8. 1414 Mc/sec results of 1963 Jupiter observations — A. C. MILLER and J. GRIFFIN (presently located at Air Force Western Test Range, Vandenberg air Force Base, Calif.), U.S. Naval Research Laboratory, Washington, D.C.

5-5. — *Instruments and techniques*

5-5-1. Atmospheric attenuation at 3.2 Gc/s — W. J. MEDD, Radio and Electrical Engineering Division, National Research Council, Ottawa, Canada.

5-5-2. Reduction of sky-noise fluctuations by switched beams observing technique — J. W. BAARS, National Radio Astronomy Observatory, Green Bank, W. Va.

5-5-3. Antenna characteristics of a 25-meter radiotelescope at 820 Mc/sec L. A. HIGGS, Radio and Electrical Engineering Division, National Research Council, Ottawa, Canada.

5-5-4. The correlation arrays for radio astronomy — Y. L. CHOW.

COMMISSION VI

6-1. — *Diffraction theory*

6-1-1. Scattering of microwaves by hollow dielectric hemicylinders; near-fields, farfields, and wavefront reconstructions — G. TRICOLES and E. L. ROPE.

6-1-2. Transition radiation at a boundary between two dielectrics — E. OTT and J. SHMOYAS.

6-1-3. On the « incomplete airy integral » and its application to certain diffraction problems — L. LEVEY, Department of Electrophysics, Polytechnic Institute of Brooklyn, Brooklyn, N.Y.

6-1-4. The bistatic radar cross section of a parabolic reflector — R. L. EVERETT, D. K. REYNOLDS and H. M. SWARM.

6-1-5. Edge-diffraction of lateral waves — S. Rosenbaum and L. B. FELSEN, Department of Electrophysics, Polytechnic Institute of Brooklyn, Stonybrook, L.I., N.Y.

6-1-6. A new form of diffraction coefficients and its application to a thick conducting wall — JIUNN-SHANG YU and R. C. RUDDUCK, Antenna Laboratory, Department of Electrical Engineering, The Ohio State University, Columbus, Ohio.

6-1-7. Uniform asymptotic theory of edge diffraction — R. M. LEWIS and J. Boersma.

6-3. — *Antennas in plasma*

6-2-1. On the decoupling of field equations in compressible, magneto-ionic media — D. K. CHENG and H. H. C. CHEN, Electrical Engineering Department, Syracuse University, Syracuse, N.Y.

6-2-2. Ray optical techniques in compressible plasmas — F. M. LABIANCA, Electrical Engineering Department and L. B. FELSEN, Electrophysics Department, Polytechnic Institute of Brooklyn, N.Y.

6-2-3. On boundary value problems involving gyrotropic media — E. R. NAGELBERG, Bell Telephone Laboratories, Incorporated, Whippany, N.J.

6-2-4. Longitudinal plasma waves in a bounded region — R. MITTRA, Department of Engineering Science, University of Oxford (on leave of absence from the Antenna Laboratory, University of Illinois, Urbana, Ill.).

6-2-5. Oblique incidence on a warm plasma half-space — V. H. WESTON, The Radiation Lab., University of Michigan, Ann Arbor, Mich.

6-2-6. The scattering of electromagnetic and electrokinetic waves obliquely incident on an inhomogeneously sheathed plasma-immersed cylinder — E. K. MILLER.

6-2-7. Propagation in non-uniform ionospheric media — S. H. GROSS, Airborne Instruments Lab., Div. of Cutler-Hammer, Inc., Deer Park, L.I., N.Y.

6-2-8. Guided waves on an infinite cylindrical cavity in a magnetoionic medium — K. L. BHATNAGAR, Department of Electrical Engineering, University of Toronto, Toronto, Canada.

6-3. — *Antennas in plasmas*

6-3-1. Radiation of an antenna in a compressible magnetoplasma — G. A. DESCHAMPS, Antenna Laboratory, Dept. of Electrical Engineering, University of Illinois, Urbana, Ill., and O. B. KESLER, University of Texas, Austin, Texas.

6-3-2. Ionospheric electron tremperatures from antenna impedance measurements — A. M. DESPAIN, University of Utah, Salt Lake City, Utah, and W. PFISTER, Air Force Cambridge Research Laboratories, Bedford, Mass.

6-3-3. Current distribution and input impedance of an infinite cylindrical antenna in anisotropic plasma — S. W. LEE and Y. T. LO, Antenna Laboratory, University of Illinois, Urbana, Ill.

6-3-4. Radiation from an electric current source in an axially magnetized plasma column — G. L. YIP, Department of Electrical Engineering, University of Toronto, Toronto, Canada.

6-3-5. Impedance of finite insulated antennas in a cold plasma with a longitudinal or transverse magnetic field — J. GALEJS, Applied Research Laboratory, Sylvania Electronic Systems, Waltham, Mass.

6-3-6. Radiation from an electric dipole in a magnetoionic medium — S. R. SESHADRI, Applied Research Laboratory, Sylvania Electronic Systems, Waltham, Mass.

6-3-7. Infinite insulated cylindrical antenna in a simple anisotropic medium- C. L. CHEN, Gordon McKay Laboratory, Harvard University, Cambridge, Mass., and S. R. SESHADRI, Applied Research Laboratory, Sylvania Electronic Systems, Waltham, Mass.

6-4. — *Surface transmission and inhomogeneous media*

See Commission II — 4.

6-5. — *Periodic structures and moving media*

6-5-1. Complex propagation constants in closed, thin-iris loaded, periodic waveguides — D. ROSENBERG, University of Tennessee, Knoxville, Tenn., and D. J. R. STOCK, New York University, New York, N.Y.

6-5-2. Experimental and theoretical k-β diagram of a glide-symmetrically loaded rectangular waveguide — R. C. M. LI and A. HESSEL, Department of Electrophysics, Polytechnic Institute of Brooklyn, Brooklyn, N.Y.

6-5-3. On the wave propagation and mode conversion in a helically corrugated multimode circular waveguide — C. C. H. TANG, Bell Telephone Laboratories, Incorporated, Murray Hill, N.J.

6-5-4. Measurements with an optical beam waveguide — J. R. CHRISTIAN, G. GOUBAU, J. W. MINK.

6-5-5. Cutoff phenomena for guided waves in moving media — L. J. DU and R. T. COMPTON, Jr., Antenna Laboratory, Department of Electrical Engineering, The Ohio State University, Colombus, Ohio.

6-5-6. Radiation due to a dipole over a semi-infinite moving medium — V. P. PYATI, Conductron Corporation, Ann Arbor, Mich., and CHEN-TO TAI, Radiation Laboratory, The University of Michigan, Ann Arbor, Mich.

6-5-7. The time-dependent Green's function for electromagnetic waves in moving media — R. T. COMPTON, Jr., Case Institute of Technology, Cleveland, Ohio.

6-5-8. The influence of moving dispersive media on steady-state and transient guided waves — H. BERGER, Polytechnic Institute of Brooklyn, Department of Electrophysics, Brooklyn, N.Y.

6-6 and 6-7. — *Antennas*

6-6-1. Solution of antenna and microwave problems by digital computer technique — M. G. ANDREASEN and R. L. TANNER, TRG-West, Menlo Park, Calif.

6-6-2. Optimization of supergain ratio of antennas — S. L. SHIH, General Electric Company, Syracuse, N.Y., and L. BERGSTEIN, Polytechnic Institute of Brooklyn, Brooklyn, N.Y.

6-6-3. On the asymptotic decay of coupling for infinite planar arrays — V. GALINDO and C. P. WU, Bell Telephone Laboratories, Whippany, N.J.

6-6-4. Slot antenna arrays on non-planar surfaces — R. W. BURTON, United States Air Force Academy, Colorado Springs, Colo.

6-6-5. Mathieu functions, bandwidth limited signals and antenna synthesis — J. L. YEN, University of Toronto, Toronto, Canada.

6-6-6. Current distribution on a two-arm thin wire planar equiangular spiral antenna — S. R. LAXPATI, Department of Electrical Engineering, Pennsylvania State University, University Park, Pa., and R. MITTRA, Antenna Laboratory, University of Illinois, Urbana, Ill.

6-6-7. Multi-mode log-periodic dipole arrays — R. B. KIEBURTZ, Department of Electrical Sciences, State University of New York at Stony Brook, Stony Brook, L.I., N.Y.

6-7-1. The determination of accurate values of admittance and effective length of cylindrical antennas — R. W. P. KING, Harvard University, Cambridge, Mass., E. A. ARONSON and C. W. HARRISON, Jr., Sandia Corporation, Albuquerque, N.M.

6-7-2. The current distribution on cylindrical dipoles with non-uniform field excitation — R. L. EVERETT, H. M. SWARM, D. K. REYNOLDS.

6-7-3. Driving-point impedance and current for long resonant antennas — R. W. P. KING, Gordon McKay Laboratory, Harvard University, Cambridge, Mass., and S. S. SANDLER, Northeastern and Harvard Universities.

6-7-4. Radiated power and ohmic loss of the infinitely long cylindrical antenna — LIANG-CHI SHEN and T. T. WU, Gordon McKay Laboratory, Harvard University, Cambridge, Mass.

6-7-5. Surface waves and the admittance of a dielectric-coated antenna — D. W. NORCROSS and G. MELTZ, Sperry Rand Research Center, Sudbury, Mass.

6-7-6. Field of an axially slotted circular cylinder clad with an inhomogeneous dielectric — G. TYRAS, Dept. of Electrical Engineering, University of Arizona, Tucson, Ariz.

RADIO SCIENCE

LIST OF PAPERS PUBLISHED IN *Radio Science*,
VOL. No. 4, APRIL 1966

Time history of the magnetospheric cavity, F. J. F. OSBORNE, M. P. BACHYNSKI and J. V. GORE.

Magneto-ionic coupling in an inhomogeneous anisotropic medium, Yuji INOUE and Samuel HOROWITZ.

Phase height and the ionospheric valley ambiguity, Adolf K. PAUL.

Excitation of the lower hybrid resonance by an antenna in the ionosphere, J. A. FEJER.

Slot admittance for compressible plasma layers, Janis GALEJS.

Theories of prolate spheroidal antennas, James R. WAIT.

On the determination of VLF propagation parameters by field strength measurements over medium distances, J. FRISIUS.

Deterioration of the coherence properties of a laser beam by atmospheric turbulence and molecular scattering, A. CONSORTINI, L. RONCHI, A. M. SCHEGGI and G. TORALDO DI FRANCIA.

Numerical simulation of ionospheric wave interaction experiments (Digest of NBS Technical Note 325), T. M. GEORGES.

USSR

REMARKS AT THE CLOSING PLENARY SESSION OF THE POPOV SOCIETY

(May 1966)

S. SILVER, URSI Representative

Mr. President, Ladies and Gentlemen,

It is may pleasant duty to represent the International Scientific Radio Union and to convey the greetings of the Union on this occasion of the 22nd meeting of the Popov Society. The International Scientific Radio Union or the URSI as it is generally known, is dedicated to the principle that science transcends national boundaries, to the furtherance of international cooperation, and to the free exchange of ideas. That the Popov Society has these same aims is evidenced by the representatives of the many countries whom you have invited and who have gathered for this distinguished meeting. The Soviet Union, through your Academy of Sciences, became a member of the URSI in 1957. Since that time the General Assemblies of the Union and the special scientific symposia, the Union sponsors have been enriched by the contributions of the research conducted by your scientists and engineers. We have had a glimpse of the tremendous vitality and scope of your research laboratories. The Popov Society in the tradition of Popov, one of the great founders of modern radio, clearly is a contributing factor to this vitality. On behalf of the URSI I congratulate you on your outstanding achievements and extend our best wishes for a continuing progress and success in all fields of radio science.

COMMISSIONS AND COMMITTEES

Commission II. — Radio and Troposphere

SYMPOSIUM ON PLANETARY ATMOSPHERES AND SURFACES

Radio Science has devoted a special issue (Vol. 69D, No. 12, Dec. 1965) to the symposium on Planetary Atmospheres and Surfaces, sponsored by URSI (Comimssions II and V) with the collaboration of IAU. The Symposium was held at Dorado, Puerto Rico, May 24 to 27, 1965.

The issue of Radio Science contains the following contributions :

I Session : *Jupiter, as observed at long radio waves.*

A. Invited Paper :
   1. The Decametric Radio Emissions of Jupiter — G. R. A. Ellis.
   2. Discussion following Ellis' paper.

B. Short Contributions :
   1. Results of Recent Investigations of Jupiter's Decametric Radiation — T. D. Carr *et al.*
   2. Discussion following Carr *et al.*, contribution.
   3. Results from CSIRO, Sydney, Australia — O. B. Slee and C. S. Higgins.
   4. Discussion following Slee and Higgins contribution.
   5. Frequency and Polarization Structure of Jupiter's Decametric Emission on a 10-millisecond scale — J. W. Warwick and M. A. Gordon.
   6. Discussion following Warwick and Gordon contribution.

II Session : *Jupiter, as observed at short radio waves.*

A. Invited Paper :
   1. Jupiter, as Observed at Short Radio Wavelengths — J. A. Roberts.
   2. Discussion following Roberts' paper.

B. Short Contributions :
   1. An Interferometric Study of Jupiter at 10 and 21 cm — G. L. BERGE.
   2. Discussion following Berge's contribution.
   3. Dependence of Jupiter's Decimeter Radiation on the Electron Distribution in its Van Allen Belts — K. S. THORNE.
   4. Observations of Jupiter at 8.6 mm — J. E. GIBSON.
   5. Simultaneous Observations of Jupiter on Three Frequencies — I. N. KAZES.
   6. A Report of Measurements — D. BARBER and J. F. R. GOWER.

III Session : *Passive radio observations of Venus, Saturn, Mercury, Mars and Uranus.*

A. Invited Paper :
   1. Passive Radio Observations of Mercury, Venus, Mars, Saturn and Uranus — A. H. BARRETT.
   2. Discussion following Barrett's paper.

B. Short Contributions :
   1. Mars and Venus at 70-cm Wavelength — H. E. HARDEBECK.
   2. Radio Observations of Mercury, Venus, Mars, Saturn and Uranus — K. I. KELLEMANN.
   3. Discussion of Kellermann's contribution.
   4. The Observations of Radio Emission from the Planets Mercury, Mars, and Saturn at wavelength of 8 mm — A. E. SALOMONOVICH.
   5. Discussion following Salomonovich's contribution.
   6. A Search for the 1.36 cm Water Vapor Line in Venus — F. D. DRAKE.
   7. Discussion following Drake's contribution.
   8. Radiation of Venus at the 13.5 mm Water Vapor Line — J. E. GIBSON and H. H. CORBETT.
   9. Observations of the 1.35 cm Water Vapor Line in Venus — W. J. WELCH.
   10. Observation of Mars at 12.5 cm Wavelength — D. O. MUHLEMAN and T. SATO.
   11. On the Nature of the Cloud Layer of Venus — A. E. BASHARINOV and B. G. KUTUZA.
   12. An Analysis of Microwave Observations of Venus — C. SAGAN and J. B. POLLACK.
   13. Discussion following Sagan and Pollack contribution.

IV Session : *Passive radio observations of the Moon.*

A. Invited Paper :
   1. Investigation of the Surfaces of the Moon and Planets by the Thermal Radiation — V. S. TROITSKY.
   2. Discussion following Troitsky's paper.

B. Short Contributions :
   1. Polarization of Thermal Radiation of the Moon at 14.5 Gc/s — P. G. MEZGER.
   2. Discussion following Mezger's contribution.
   3. Linear Polarization of Lunar Emission — R. D. DAVIES and F. F. GARDNER.
   4. The Effect of Roughness on the Polarization of Thermal Emission from a Surface — T. Hagfors and J. MORIELLO.
   5. Measurements of Lunar Radio Brightness and Certain Properties of its Surface Layer — A. E. SALOMONOVICH.

V Session : *Radar observations of the planets.*

A. Invited Paper :
   1. A Review of Radar Studies of Planetary Surfaces — G. H. PETTENGILL.

B. Short Contributions :
   1. Preliminary Venus Radar Results — R. M. GOLDSTEIN.
   2. Preliminary Mars Radar Results — R. M. GOLDSTEIN.
   3. Recent Arecibo Observations of Mercury — G. H. PETTENGILL.
   4. Recent Arecibo Observations of Mars and Jupiter — R. B. DYCE.
   5. Discussion following Dyce's contribution.
   6. Radio Evidence on the Structure and Composition of the Martian Surface — C. SAGAN and J. B. POLLACK.
   7. Radar Scattering from Venus and Mercury at 12.5 cm — D. O. MUHLEMAN.
   8. Application of Planetary Measurements to Planetary Radius and Rotation Rate Determinations — I. I. SHAPIRO.
   9. Radar Observations of Venus in the Soviet Union in 1964 — V. A. KOTELNIKOV.

VI Session : *Radar observations of the Moon.*

A. Invited Paper :
   1. Radar Studies of the Moon — J. V. EVANS.

B. Short Contributions :

1. Decameter-wave Radar Studies of the Lunar Surface — J. R. DAVIS *et al.*
2. Discussion following Davis' contribution.
3. Lunar Mapping by Coherent Pulse Analysis — T. W. THOMPSON.
4. Discussion following Thompson's contribution.
5. Interpretation of the Angular Dependence of Backscattering from the Moon and Venus — P. BECKMANN and W. K, KLEMPERER.
6. Discussion following Beckmann and Klemperer contribution
7. A Note on the Radio Reflectivity of the Lunar Surface — A. GIRAUD.
8. Moon Distance Measurement by Laser — A. ORSZAG.

URSI wishes to express its warmest thanks to Prof. W. E. Gordon, Chairman of the Organizing Committee and to the Editor of *Radio Science* and his collaborators for the speedy publication of the proceedings.

Commission III. — Ionosphere

INDICES D'ACTIVITÉ SOLAIRE POUR LA PROPAGATION IONOSPHÉRIQUE

(Extrait du *Journal des Télécommunications*, Vol. 33, nº 4, avril 1966)

Les tableaux ci-après, contenant les valeurs des indices fondamentaux de la propagation ionosphérique, ont été établis par le secrétariat spécialisé du Comité consultatif international des radiocommunications (CCIR), conformément à la Résolution 4, l'Avis 371 et le Rapport 246 du CCIR.

Remarque : De nombreux détails sur les indices ionosphériques sont contenus dans la publication *Advances in radio research*, volume 2, édité par J. A. Saxton (Academic Press, Londres et New York, 1964). Il s'agit de la contribution de C. M. Minnis, intitulée *Ionospheric indices*, pages 1-36, de l'ouvrage en question

VALEURS OBSERVÉES

● R_{12} (moyenne glissante sur douze mois du nombre de taches solaires) :

Année \ Mois	1	2	3	4	5	6	7	8	9	10	11	12
1964	19	18	15	13	11	10	10	10	10	10	10	11
1965	12	12	12	13	15	15	16	17	19			

● I_{F_2} (indice ionosphérique) :

Mois (année 1965).

1	2	3	4	5	6	7	8	9	10	11	12
7(1)*	5(1)*	20(1)*	18(1)*	10(1)*	15(1)*	17(1)*	12(1)*	9(1)*	6(1)*	6(1)*	–1(1)*

Mois (année 1966).

1	2	3
15(1)*	20(1)*	34(1)*

(*) Les chiffres entre parenthèses indiquent le nombre de valeurs de foF_2 qui ne sont pas encore parvenues au secrétariat du CCIR et dont on n'a donc pas tenu compte dans le calcul de l'indice I_{F_2}. Pour plus de détails, voir *Journal des Télécommunications* (avril 1964, page 119 et janvier 1966, pages 43-47).

Par rapport aux données contenues dans le Rapport 246 du CCIR, une station de sondages ionosphériques a cessé de fonctionner — celle de Porto Rico (en juin 1963). Les valeurs de I_{F_2} contenant entre parenthèses le chiffre (1) sont donc depuis le mois de juin 1963, les valeurs définitives de l'indice I_{F_2}. En outre, la station de Fairbanks (College) n'a pas fonctionné pendant la période août-octobre 1963.

● ∅ (flux du bruit solaire moyen mensuel) ** :

Année \ Mois	1	2	3	4	5	6	7	8	9	10	11	12
1965	78	75	74	72	78	77	74	75	76	80	76	76
1966	88	84	90									

(**) Renseignements obligeamment fournis par le « National Research Council », Ottawa.

PRÉVISIONS POUR LES MOIS A VENIR (1er AVRIL 1966) ***

● R_{12}

Année \ Mois	4	5	6	7	8	9
1966	29	31	33	35	37	39

(***) Renseignements obligeamment fournis par le professeur Waldmeier, Observatoire fédéral de Zurich.

Estimation de l'erreur sur les prévisions, six mois d'avance, de R_{12} : ± 15.

● I_{F_2} ****

Année \ Mois	3	4	5	6	7	8	9
1966	23	27	30	33	36	40	(43)

(****) Renseignements obligeamment fournis par le « Department of Scientific and Industrial Research, Radio and Space Research Station », Slough.

La valeur prévue six mois à l'avance est donnée entre parenthèses.

ESTIMATION DE L'ERREUR SUR LES PRÉVISIONS DE I_{F_2}

Note : Le tableau ci-dessous présente les résultats du calcul de l'erreur de prévision de l'indice I_{F_2} effectué (à partir de février 1966) selon une nouvelle méthode ayant pour but de diminuer l'erreur résiduelle :

Mois (1966)	3	4	5	6	7	8	9
Estimation de l'erreur moyenne	+1,8	+6,2	+6,6	+6,8	+6,0	+5,0	+4,3
Estimation de l'écart type de l'erreur	±7,4	±13,6	±15,4	±16,8	±17,8	±18,8	±18,0

SOLAR INDICES FOR IONOSPHERIC PROPAGATION

(Reprint from *Telecommunications Journal*, Vol. 33, No. 4, April 1966)

The following tables, giving values of the basic indices for ionospheric propagation have been prepared by the Specialized Secretariat of the International Radio Consultative Committee (CCIR) in accordance with CCIR Resolution 4, Recommendation 371, and Report 246.

Note : A considerable amount of information on ionospheric indices will be found in an article by C. M. Minnis, entitled *Ionospheric indices*, on pages 1-36 of the publication *Advances in radio research*, volume 2, edited by J. A. Saxton (Academic Press, London and New York, 1964).

PARAMETERS :

● R_{12} (smoothed mean, over twelve months, of the number of sunspots observed) :

Year \ Month	1	2	3	4	5	6	7	8	9	10	11	12
1964	19	18	15	13	11	10	10	10	10	10	10	11
1965	12	12	12	13	15	15	16	17	19			

● I_F (ionospheric index).

Month (year 1965).

1	2	3	4	5	6	7	8	9	10	11	12
7(1)*	5(1)*	20(1)*	18(1)*	10(1)*	15(1)*	17(1)*	12(1)*	9(1)*	6(1)*	6(1)*	–1(1)*

Month (year 1966).

1	2	3
15(1)*	20(1)*	34(1)*

(*) The figures in brackets represent the number of values of foF_2 which have not yet reached the CCIR Secretariat, and which have not therefore been taken into account in the calculation of I_{F_2}. For further details, see the *Telecommunication Journal*, April 1964, page 119, and January 1966, pages 43-7.

With regard to the data contained in CCIR Report 246, one ionospheric sounding station has ceased to operate — Puerto Rico (in June 1963). The values of I_{F_2}, that include the figure (1) in brackets are therefore, as from the month of June 1963, definitive values for I_{F_2}. Furthermore the sounding station Fairbanks (College) did not operate during the period August-October (1963.

● ∅ (monthly mean value of solar noise flux) ** :

Year \ Month	1	2	3	4	5	6	7	8	9	10	11	12
1965	78	75	74	72	78	77	74	75	76	80	76	76
1966	88	84	90									

(**) Data kindly supplied by the National Research Council, Ottawa.

FORECASTS FOR THE NEXT FEW MONTHS (1ST APRIL 1966) *** :

● R_{12}

Year \ Month	4	5	6	7	8	9
1966	29	31	33	35	37	39

(***) Data kindly supplied by Professor Waldmeier, Federal Observatory, Zurich.

Estimated error in forecasts of R_{12} six months in advances : ± 15.

● I_{F_2} ****

Year \ Month	3	4	5	6	7	8	9
1966	23	27	30	33	36	40	(43)

(****) Data kindly supplied by the Department of Scientific and Industrial Research, Radio and Space Research Station, Slough.

The figure in brackets is the value forecast six months in advance.

ESTIMATE OF THE ERROR I_{F_2} PREDICTIONS :

Note : A new method of calculating the error in prediction of the index I_{F_2} has been introduced (in February 1966) with the object of reducing the residual errors.

The table below shows the results of this calculation :

Month (1966)	3	4	5	6	7	8	9
Estimation of error mean	+1,8	+6,2	+6,6	+6,8	+6,0	+5,0	+4,3
Estimation of the standard deviation of the error	±7.4	±13.6	±15.4	±16.8	±17.8	±18.8	±18.0

Sub-Commission IVa on Radio Noise of Terrestrial Origin

RADIO NOISE AND DISTURBANCES

We call the attention of scientists engaged in investigations on radio-noise and radio disturbances and particularly of ionospheric stations carrying out such investigations on the following project. Fuller details about the project can be found in IQSY Notes No. 16, April 1966, from which the following is a reprint.

The proton flare project

1. The Proton Flare Project (PFP) was proposed by IAU Commission 10 (Solar Activity), and it has been endorsed by the Bureau of the IQSY Committee as an appropriate addition, to the IQSY programme, even though it cannot take place until the initial rising phase of the new solar cycle.

Since the end of the IGY, astronomers, geophysicists and space scientists have all been deeply interested in those solar flares which produce high-energy particles and which are often called « proton flares ». Fuller details about the characteristics of these flares and the terrestrial phenomena which are caused by them are contained in an Appendix. When we take into account the fact that proton flares are the most powerful phenomenon of solar activity, that

they exert an important influence on physical conditions in interplanetary space and in the Earth's surroundings, and that they constitute a life hazard for living organisms in space ships, our knowledge of these phenomena is far from being satisfactory. Many proton flares and their consequences on the Earth have been described in astronomical and geophysical journals, but very few of them have been observed more or less completely, and most papers are concerned only with isolated problems in this very complex phenomenon.

Therefore, the IAU Commission 10 (Solar Activity) proposed the organization of a broad international cooperative study of the proton flares which are expected to appear during the early ascending phase of Solar Cycle No. 20 and this proposal has been generally accepted. The planned cooperative study, now called the Proton Flare Project, will start on 1 May 1966.

2. — The PFP will have two main objectives :

(*a*) to obtain detailed observations of at least one selected proton flare event (and possibly of more such events) from all possible aspects;

(*b*) to publish all the results of this cooperative study in one series of papers and thus prevent scattered publication of the details of the PFP.

We believe that the best period for performing this project is the ascending phase of the solar cycle; during this phase, some proton flares can already be expected, but the solar activity still remains low and thus it does not cause extremely complex situations in interplanetary space. Bearing in mind the present trend of the solar activity, and the bad weather conditions in the winter months in the northern hemisphere, we consider 1 May 1966 as an appropriate date for the start of the project.

3. — A full discussion resulting from such a cooperative study should ideally be based on information of the types outlined below :

(*a*) A description of the development of the solar active region concerned, before appearance of the flare in the region, giving particular emphasis to the development of the local magnetic field;

(*b*) A description of the flare itself, including Ha and whitelight observations, spectra, radio-noise measurements, SID records. and observations made outside the Earth's atmosphere;

(*c*) Measurements, made in space vehicles, of the changes in the physical conditions in interplanetary space and in the Earth's surroundings after the appearance of the flare;

(*d*) Descriptions of effects caused by the proton flare as recorded by ground-based stations in the polar cap regions (PCA), and also by cosmic-ray stations if the proton energy is high enough (GLE);

(*e*) Descriptions of magnetic and cosmic-ray storms, if occurring in the later phase, and of auroral observations.

It is clear that such information and results can only be obtained as a result of wide international cooperation. While in 3*a*, *c*, *d*, and *e* above, all observing stations throughout the world can participate, the participation in 3*b* will probably be limited to solar observatories in Europe only; this is because the number of observing stations in Europe within a longitude interval of less than 4 hours is extremely high, and hence the probability of rich simultaneous observations is much higher than in other parts of the world.

4. — The PFP will be coordinated by a team of experts at the Meudon Observatory in France, with one leading scientist (Dr. P. Simon) as the chief coordinator of the project. This coordinating group will maintain contact with several experienced forecasters in various parts of the world; it will announce PFP alerts, based on the forecasters' instructions, if the appearance of a proton flare in an active region becomes very probable.

The detailed plans for the organization of the PFP are described in a circular letter which will be sent, at the end of March 1966, to all the observing stations which took part in the preparatory work and also to some stations, institutions, and individuals who seem likely to be interested in participating in the PFP. We are sure that there are many additional stations, particularly geophysical observatories, which have not received copies of the circular letter, but which would be willing and able to participate actively in the PFP. We ask them to excuse our omission and invite them to write for a copy of the PFP Circular Letter No. 1 to Dr. C. M. Minnis, IQSY Secretariat, 6 Cornwall Terrace, London, NW1, England.

SERVICE INTERNATIONAL DES URSIGRAMMES ET JOURS MONDIAUX

Rapport sur les activités de 1965

Le service International des Ursigrammes et Jours Mondiaux (IUWDS) est un *service permanent* de l'Union Radio Scientifique Internationale (URSI) en association avec l'Union Astronomique Internationale (UAI) et l'Union Internationale de Géodésie et de Géophysique (UIGG). L'IUWDS adhère à la Fédération des services d'Astronomie et de Géophysique (FAGS) : par son intermédiaire, il reçoit des subventions de l'Unesco pour une partie de ses activités et de ses publications.

* * *

Au point de départ de l'IUWDS, il y a l'*activité solaire* et la multiplicité de ses manifestations et de ses conséquences. L'IUWDS cherche à rendre possible une *coopération immédiate et permanente* entre tous les scientifiques qui s'intéressent à ce domaine.

* * *

Cette coopération se manifeste tout d'abord par une *collecte rapide des observations* : l'ambition de l'IUWDS est que dans chacun de ses centres régionaux et mondiaux toute manifestation importante de l'activité solaire soit connue dans les *minutes* qui suivent son observation.

Cette mise à jour permanente des informations lui permet de rendre deux services :

— *une diffusion rapide* des observations à tous ceux, scientifiques ou non, qui en ont besoin.

— ensuite la *prévision*, à plus ou moins long terme, soit de l'activité solaire soit de certaines conséquences de cette activité.

Ces services répondent à des demandes de plus en plus nombreuses et variées et peuvent même se traduire par une *véritable assistance* apportée à un groupe scientifique pour une expérience qui lui est propre.

* * *

De ce fait l'IUWDS a une situation privilégiée de lien entre des *disciplines astronomiques, géophysiques et même cosmiques* liées plus ou moins étroitement à l'activité solaire. Ceci lui permet de mettre ses services à leur disposition soit avant soit après les observations.

Pour certaines de ces disciplines, principalement celles qui étudient l'atmosphère et l'ionosphère, les observations ne peuvent se faire que de façon discontinue par rapport au temps et à l'espace bien que l'on puisse penser qu'il y a des relations entre des phénomènes observés par des techniques ou dans des disciplines différentes. L'IUWDS établit chaque année depuis 1957 un *Calendrier de Jours Mondiaux* destiné à favoriser une plus grande densité d'observations simultanées.

Après les observations, l'IUWDS publie *depuis quelques* années dans les *IQSY Notes*, un relevé abrégé des événements solaires et géophysiques observés chaque jour (Abbreviated Calendar Record) Les relevés définitifs « Final Calendar Record » sont en cours de publication dans les annales de l'IQSY.

* * *

Enfin, l'IUWDS, étant l'un des rares services scientifiques *permanent*, peut se mettre à la disposition de certaines organisations scientifiques pour assumer des tâches de routine qui ne justifieraient pas par elles-mêmes l'existence de nouveaux services permanents. Par exemple, à ce titre il est chargé par le COSPAR. d'attribuer une désignation internationale à chaque nouveau satellite et par l'UAI d'assurer la transmission des télégrammes astronomiques.

Voyons comment les différents points de ce programme se sont trouvés réalisés en 1965.

* * *

1. — Observations et Ursigrammes.

Les observations solaires sont limitées soit par des conditions météorologiques, soit par la *complexité des instruments* nécessaires aux mesures (mesure des champs magnétiques solaires, radiospectrographie des sursauts, radiohéliogrammes, etc.) de sorte que la surveillance permanente et la description instantanée de l'activité solaire ne peut être réalisée que par une coopération internationale.

C'est celle que réalise heure par heure l'IUWDS en organisant la collecte rapide des observations réalisées dans cent soixante observatoires répartis entre quarante-quatre nations. Ces observations sont groupées dans chacun des six centres régionaux ou des cinq centres associés et font l'objet de messages codés appelés Ursigrammes qui sont échangés entre centres ou diffusés soit à des observatoires, soit à des institutions soit même à des utilisateurs inconnus par l'intermédiaire de six stations radioémettrices.

Il est impossible dans un rapport aussi court de donner la liste de tous ces observatoires ou de tous ceux qui nous fournissent des moyens de communications, mais nous devons reconnaître ici l'importance du travail des centres régionaux et des organismes qui apportent gracieusement leur concours à l'IUWDS.

— Instituts pour les Sciences des télécommunications et l'aéronomie, ESSA, USA (Fort Belvoir, Virginia);
— PTT Netherlands (NERA);
— CNET et Observatoire de Meudon, France (Paris);
— PTT, République Fédérale d'Allemagne (Darmstadt);
— Institut du Magnétisme Terrestre, Ionosphère et Radio Propagation, URSS (Moscou);
— Service des Prévisions Ionosphériques, Australie (Sydney);
— Laboratoire National de Physique, Inde (New Delhi);
— PTT Suède (Stockholm);
— Département Ionosphère de l'Institut de Géophysique de l'Académie des sciences tchécoslovaque (Prague);
— Institut Sibérien du magnétisme terrestre, Ionosphère et pro pagation Radio, URSS (Irkutsk).

Le comité de direction de l'IUWDS précise les observations à recueillir et la place à leur donner dans les messages (compte tenu

du développement des techniques d'observation et des connaissances ou simplement de la période du cycle solaire).

Par ailleurs, il établit des codes chiffrés qui précisent les informations à transmettre et permet leur transcription dans n'importe quelle langue. Cette année précisément, d'une part les ordres de priorité ont été tenus à jour à l'occasion de la réunion à Madrid du comité directeur pendant la 3e assemblée de l'IQSY, d'autre part le secrétaire a publié avec l'aide financière de l'Unesco une nouvelle édition des 40 codes en usage (l'édition précédente remontait à 1963). A noter qu'au cours de l'année, suivant les besoins, des circulaires sont diffusées pour opérer les mises à jour nécessaires (5 en 1965).

* * *

2. — Prévisions.

Elles portent soit sur l'activité solaire elle-même, soit sur ses conséquences. Elles peuvent se faire à long ou à court terme. Enfin elles peuvent prendre l'allure d'une assistance pour le déroulement d'une expérience déterminée.

La prévision à court terme des conditions de propagation radioélectrique a été le besoin le plus immédiat, qui explique la part prise par les postes et télécommunications dans le développement de l'IUWDS : beaucoup de centres régionaux sont des émanations des services des télécommunications. Actuellement les géophysiciens, ceux qui utilisent des moyens de transmission ou de détection dans les régions aurorales, les cosmiciens, les astronautes et les astronomes sont intéressés par les *éruptions à protons* : ce phénomène a certainement donné une impulsion nouvelle aux recherches dans le domaine des relations solaires terrestres. A Madrid, en mars 1965, le comité de direction de l'IUWDS s'est donné pour tâche pendant le prochain cycle d'activité solaire de fournir une prévision des éruptions à protons. Par cet exemple on voit l'évolution du niveau des exigences : d'une prévision globale de l'activité solaire pour des problèmes de transmission, nous sommes passés à celle d'un *phénomène jusqu'ici assez peu fréquent* (cinquante par cycle) et ceci soit à des fins scientifiques soit pour répondre à des nécessités pratiques aussi nouvelles que celle d'assurer la sécurité des astronautes.

Prévision à long terme.

En 1965, dans le cadre de l'IQSY, l'IUWDS a émis chaque semaine une circulaire faisant la prévision de l'activité solaire pour les 30 jours suivants. Cette prévision était envoyée à 150 institutions ou organismes et était réalisée grâce à la collaboration des observatoires de Mac Math, Meudon et Sydney suivant les avis des Docteurs Helen Dodson Prince, Raymond Michard et Ron Giovanelli. A partir de 1966, c'est le centre mondial de Fort Belvoir qui continuera seul cette prévision.

Prévision à court terme.

Chaque jour à 0400 UT le centre mondial de Fort Belvoir, sur avis des huit centres régionaux ou associés, émet des Geoalerts qui sont diffusés sur le réseau Météo (WMO) et par les réseaux régionaux de l'IUWDS. Les alertes relatives à des situations solaires ou géophysiques calmes ont été peu nombreuses cette année : 10 « Solcalme exists » et 8 « Magcalme exists ». Par contre, la croissance de l'activité solaire a fait l'objet de 76 alertes « Solactivity exists » et de 5 « Magstorm expected ». Enfin au voisinage des équinoxes 45 « Stratwarm exists » ont été diffusés pour la météo. De plus, les centres régionaux ont émis, chacun pour leur compte de nombreux avis d'alerte, plus complets et immédiats mais à diffusion, plus limitée.

* * *

Assistance pour une expérience particulière.

Le SPARMO (Solar Particles and Radiations Monitoring Organization) est le type même de l'organisme utilisant les services de l'IUWDS lors de ses campagnes de lancers simultanées de ballons. Les ballons sont coûteux et sont pratiquement perdus à la fin de leur vol ainsi que le matériel de mesure qu'ils emportent : il faut donc les lancer de façon utile. Les bases de lancement sont dispersées mais reliées au Secrétariat du SPARMO, par télex ou radio. Ce dernier étant en France à Meudon, c'est le RWC de Paris qui a fourni la collaboration de l'IUWDS. Du 26 juillet au 17 septembre 1965, 41 bulletins d'information et de prévision ont été envoyés aux trois bases de lancement et aux deux centres administratifs. Au début de 1966, une nouvelle campagne touchant deux bases antarctiques, une base australe, trois bases aurorales

arctiques, et faisant coopérer des groupes de cinq nations, a fait l'objet de prévisions et d'ordres de lancement pendant chacun des 35 jours de la campagne soit au total 167 messages distincts. Dans deux circonstances des observatoires lointains ont accepté d'apporter une contribution temporaire rendue possible par le réseau de l'IUWDS. Ces expériences permettent d'établir des contacts immédiats avec les utilisateurs et de mieux répondre à leurs besoins.

* * *

3. — Jours Mondiaux et relevé d'événements géophysiques.

Chaque année un calendrier est publié d'avance et diffusé auprès des organismes intéressés. Alors que l'astronomie, habituée aux observations permanentes, dès que le temps le permet, montre jusqu'ici peu d'intérêt pour les jours Mondiaux, les météorologistes, ionosphéristes et cosmiciens semblent les utiliser et y tenir. Selon un plan systématique, plusieurs catégories de jours différents sont proposés : chaque mercredi est un *jour géophysique régulier* (RGD), chaque mois trois jours consécutifs comprenant un mercredi forment les *jours mondiaux réguliers* (RWD) et chaque mois un mercredi est un jour mondial de Haute Priorité (PRWD). Chaque trimestre a son jour mondial trimestriel (QWD), et chaque saison son intervalle géophysique de quatorze jours mondiaux consécutifs (WGI). Des indications précises donnent des consignes pour les personnes intéressées à ces différentes disciplines. Cette année a vu la publication du calendrier 1966.

Le « Abbreviated Calendar Record » se propose de réunir pour *chaque jour* les observations des événements *solaires et géophysiques remarquables*. A côté d'indices donnant une indication générale sur l'activité solaire et géomagnétique, ce document fournit pour chaque jour une description soignée à la fois des événements solaires et géophysiques. Le dernier portant sur les mois de mai et juin 1965 est paru dans les *IQSY Notes* de décembre 1965.

* * *

4. — Service permanent.

a) COSPAR.

L'IUWDS apporte son concours au COSPAR pour l'identification des satellites. Toute organisation lançant un satellite doit en

avertir le COSPAR. En fait c'est le centre mondial de l'IUWDS de Fort Belvoir agissant au nom de COSPAR qui a été ainsi appelé pendant l'année 1965 à donner une désignation internationale aux satellites provenant de 112 lancements. A la demande du COSPAR l'IUWDS a aussi mis au point pour l'année 1966 de nouvelles circulaires : elles font deux fois par mois une mise à jour complète des derniers satellites lancés (désignation et caractéristiques) et des satellites en fonctionnement pouvant faire l'objet d'une coopération internationale : elles donnent aussi les éléments d'orbite d'un certain nombre de satellites.

b) *UAI.*

1965 a été la première année de distribution par les soins de l'IUWDS des télégrammes astronomiques. Ces télégrammes, irréguliers et peu nombreux (19 pour 1965) annoncent aux observateurs qui y ont souscrit la découverte des comètes, novæ, supernovæ et de tous les objets imprévus. C'est le type même du service qui ne justifierait pas un service permanent mais qui peut bénéficier des facilités de l'IUWDS. Cette année a été l'occasion d'un succès spectaculaire : le 19 septembre un télégramme annonçait la découverte de la comète Ikey Seki. Grâce au grand nombre d'observateurs ainsi alertés, l'intérêt exceptionnel de cette comète était reconnu dès le 30 septembre : on avait pu très rapidement calculer une trajectoire précise et prévoir son passage très près du soleil pour le 21 octobre. Enfin, dès le 7 novembre les astronomes étaient alertés sur l'éclatement de son noyau.

* * *

Conclusion.

L'AGI et l'IQSY ont été des époques privilégiées de coopération internationale; l'IUWDS en a tiré bénéfice mais actuellement il continue cette coopération. Il le fait dans l'intérêt de la communauté scientifique et avec des ambitions et des moyens plus restreints, mais cela n'empêche pas son évolution pour s'adapter aux besoins nouveaux : on peut prévoir qu'avec le développement rapide des expériences spatiales, c'est-à-dire l'introduction de laboratoires et d'hommes dans des régions de l'espace totalement soumis à l'activité solaire, ceux-ci ne feront que se développer. Il ne peut en résulter qu'un développement plus grand de ces activités.

P. Simon.
Secrétaire suppléant de l'IUWDS.

THE INTERNATIONAL URSIGRAM AND WORLD DAYS SERVICE

Report on Activity in 1965

The International Ursigram and World Days Service (IUWDS) is a *permanent* service of the International Radio Scientific Union (URSI) in association with the International Astronomical Union (IAU) and the International Union of Geodesy and Geophysics (UGGI). The IUWDS adheres to the Federation of Astronomical and Geophysical Services (FAGS); through this federation it receives funds from Unesco for a part of its activity and its publications.

* * *

Fundamental to IUWDS work is *solar activity* and its numerous manifestations and consequences. IUWDS seeks to make possible an *proximate permanent cooperation* between all scientists interested in this field.

* * *

This cooperation first appears in the *rapid collection of observations* : IUWDS would like that in each one of its world and regional centers every important manifestation of the solar activity be known a few *minutes* after it is observed.

Keeping permanently the information up to date allows IUWDS to do two services :

— a distribution by rapid means of observations to all those scientists or others, who require them;

— then the more or less long-term forecasting of either the solar activity or some consequences of this activity.

These services respond to more and more different requests and can even be shown to have provided important assistance to a scientific group for a particular experiment.

* * *

Therefore IUWDS holds a unique situation of serving as a bond between *astronomical, geophysical and even cosmic disciplines* more or less related to solar activity. This allows IUWDS to put its services at their disposal either before or after the observations.

For some of these disciplines, especially those which concern atmosphere and ionosphere, observations cannot be done but in a discontinuous way in respect to time and space although one might think there are relationships between phenomena observed with different techniques or in different disciplines. Every year since 1957, IUWDS has established a World Days Calendar intended to increase the density of simultaneous observations.

After the observations, IUWDS has been publishing for the last few years an Abbreviated Calendar Record in *IQSY Notes* of the daily observed solar and geophysical events. Final Calendar Records for publication in the Annals of IQSY are in progress.

* * *

Finally IUWDS being one of the few permanent scientific services can be put at the disposal of scientific organizations in order to assume routine business that would not justify the existence of new permanent services. For example, on this basis COSPAR has charged IUWDS to give each new satellite an international designation, and IAU has asked IUWDS to assume the transmission of astronomical telegrams.

Let us see how the different points of this program have been achieved in 1965.

* * *

1. — Observations and Ursigrams.

The solar observations are limited either by meteorological conditions or by the complexity of the instruments necessary for measurements (measurement of the solar magnetic fields, radio spectrography of bursts, radio heliograms, etc.) so that permanent

watching and an instantaneous description of the solar activity cannot be carried out unless by an international cooperation.

This cooperation is realized hour after hour by IUWDS by organizing the rapid collection of the observations made in 160 observatories belonging to 44 nations. These observations are collected in each one of the six regional centers or of the five associated centers and make the subject of coded messages called Ursigrams which are interchanged between centers or broadcast through six transmitting stations either to observatories, or to institutions or even to unknown users.

It is impossible in a short report to list the hundreds of cooperating observatories or those who assist with communications. But one should here acknowledge the essential work of the regional warning centers and the organizations which provide their services at no cost to IUWDS :

— Institute for Telecommunication Sciences and Aeronomy, Essa, USA (Fort Belvoir, Virginia);
— PTT Netherlands (Nera);
— CNET and Observatoire de Meudon, France (Paris);
— FTZ, Federal Republic of Germany (Darmstadt);
— Institute of Terrestrial Magnetism, Ionosphere and Radio Propagation, USSR (Moscow);
— Radio Research Laboratories, Ministry of Posts and Telecommunications, Japan (Kokubunji);
— Ionospheric Prediction Service, Australia (Sydney);
— Royal Board of Swedish Telecommunications, Sweden (Stockholm);
— National Physical Laboratory, India (New Delhi);
— Geophysical Institute Ionosphere Department of Czechoslovakia Academy of Sciences (Prague);
— Siberian Institute of Terrestrial Magnetism, Ionosphere and Radio Propagation, USSR (Irkutsk).

The Steering Committee of IUWDS determines the kinds of observations to collect and the priority to give them in the messages (taking into consideration the development of the techniques of observation and of the knowledge or simply of the period of the solar cycle).

Additionally, the Steering Committee sets up the codes which state precisely the information to transmit and allows their transcription in any language. As a matter of fact this eyar, on one hand the priorities were kept up to date at the occasion of the meeting in Madrid of the Steering Committee during the 3rd Assembly of IQSY, and on the other hand the secretary published, with a grant from Unesco a new edition of the 40 codes actually used (the former edition was in 1963). We must note that all through the year circular letters were sent to keep the data up to date (6 in 1965) according to the needs.

2. — Forecasting.

It concerns either solar activity, or its consequences. It can be long-term or short-term forecasting. Finally it can take the form of assistance to the development of a specific experiment.

The short-term forecasting of the conditions of radio electrical propagation was the most urgent need which makes clear the part taken by postal and telecommunication services in the development of IUWDS : many regional centers are part of telecommunication services. Now the geophysicists, those who use radio means of communication or detection in the auroral regions, the cosmic physicists, the astronauts and astronomers are interested in *proton flares* : this phenomenon definitely has given an impulse to researches in the solar and terrestrial relationship field. In Madrid, in March 1965, the Steering Committee of IUWDS undertook to provide a forecasting of proton flares during the next cycle of solar activity. Through this example, we can notice the rise of level of the requirements : from a forecasting of the whole of solar activity for problems of radio transmission, we have arrived at forecasting a phenomenon that has rarely occurred up to now (fifty per solar cycle), and this either for scientific purposes or to answer practical necessities as new as the necessity of strengthening the security of astronauts.

Long-term forecasts.

In 1965, in the framework of IQSY, IUWDS issued a weekly circular forecasting solar activity for the next 30 days. These forecasts were sent to 150 instuittions or organizations and were accomplished with the collaboration of the observatories of

McMath, Meudon and Sydney with the advice of Drs. Helen Dodson Prince, Raymond Michard and Ron Giovanelli. Since 1966, the World Warning Agency at Fort Belvoir is preparing these forecasts.

Short-term forecasts.

Every day at 0400 UT the World Warning Agency at Fort Belvoir, with the daily advice of the 8 regional or associated centers, issues « Geoalerts » which are distributed through the meteorological telecommunication network (WMO) and through the regional telecommunication networks or IUWDS. There have been few alerts related to quiet solar or geophysical situations this year : 10 « Solcalme exists » and 8 « Magcalme exists». Nevertheless the increase of solar activity was the cause of 76 alerts « Solactivity exists » and 5 « Magstorm expected ». Finally at the approach of the equinoxes 45 « Stratwarm exists » were distributed for meteorological workers. Moreover, the regional centers have broadcast, each one for its own purposes, many prompt warnings of alerts as « Advances Alerts », more complete and timely but with a limited distribution.

Assistance for a specific experiment.

SPARMO (Solar Particle and Radiations Monitoring Organization) is a typical organization which uses the services of IUWDS during its simultaneous balloon launching campaigns. Balloons are expensive and effectively lost after the flight as well as the measuring instruments they carry : so they have to be launched for useful purposes. The launching sites are spread out geographically but connected to the secretary of SPARMO by teletype or radio. The latter being at Meudon, France, it is the Regional Warning Center at Paris that provides collaboration from IUWDS. From July 26 to September 17, 1965, 41 bulletins of observations and forecasts were sent to the three launching sites and to the two administrative centers. At the beginning of 1966, a new campaign concerning two Antarctic bases, an Austral base, three Arctic auroral bases and bringing into cooperation groups of five nations, has made the object of forecasts and of orders for launching during the 35 days of the campaign, which meant 167 separate messages in all. In both of these cooperative projects, some remote observatories sent contributions for a temporary period made pos-

sible through the IUWDS telecommunication network. Thus knowledge of events reaches users immediately and answers their requirements in a better way.

3. — Worlds Days and statement of geophysical events.

Each year a Calendar is published in advance and distributed to the interested organizations. While astronomy, used to continual observations, as long as the weather permits them, has shown up to now little interest for World Days, now the meteorologists, ionospherists, and cosmic physicists seem to need them and use them. According to a systematic schedule, several catgeories of days are designated : each Wednesday is a Regular Geophysical Day (RGD), each month three consecutive days including a Wednesday are the *Regular World Days* (RWD) and each month a Wednesday is a *Priority Regular World Day* (PRWD). Each quarter of the year has a *Quarterly-World Day* (QWD) and each season its *World Geophysical Interval* (WGI) of fourteen consecutive World Days. Specific recommendations give instructions for observers and workers of the various interested disciplines. This year saw the publication of the Calendar for 1966.

The « Abbreviated Calendar Record » intends to collect in published form the observations of outstanding solar and geophysical events for each day. Besides indices giving a general indication of solar and geomagnetic activity, the document provides for every day a careful description of both solar and geophysical events. The latest compilation covering May and June 1965 was published in the *IQSY Notes* in December 1965.

* * *

4. — Permanent service.

(*a*) *COSPAR.*

IUWDS lends its aid to COSPAR for the identification of the satellites. Any organization launching a satellite must advice COSPAR. Actually it is the World Warning Agency of IUWDS at Fort Belvoir acting on behalf of COSPAR that in 1965 gave international designations to the satellites coming from 112 launchings. As requested by COSPAR, IUWDS also expanded its satellite circulars in 1966 : these circulars twice a month keep up to date

the latest satellite launchings (designation and characteristics) and the working satellites which can be used in an international co-operation; they also give the orbital elements of a certain number of satellites.

(*b*) *IAU.*

1965 was the first year of distribution of astronomical telegrams by IUWDS. These rather few and irregular telegrams (19 in 1965) inform the observers who subscribe to the service of the discovery of comets, novae, supernovae and all unexpected objects. It is the very pattern of service that would not justify a permanent service by itself but that can benefit by IUWDS facilities. This year was the occasion of a spectacular success : in September a telegram told of the discovery of the comet Ikeya Seki. Owing to the great number of observers thus warned, the exceptional interest of this comet was recognized from September 30 onward; it was possible to calculate rapidly an accurate trajectory and to forecast its passage very near the earth on the 21 st of October. Finally, after November 7, the astronomers were warned of the bursting of its nucleus.

CONCLUSION.

IGY and IQSY were privileged years of international cooperation. IUWDS and its forebear organization took benefit of it, but this kind of cooperation goes on continuously. IUWDS acts in this way for the interest of the scientific community and with more restricted means, but this does not hinder its ability to adapt to new requirements : it can be foreseen that with the rapid development of space science, i.e., the introduction of laboratories and men in the regions of space entirely exposed to solar activity, the result can only be progress.

P. SIMON,
IUWDS Acting Secretary.

Reorganization of WDC-A

The following information concerns important changes in the organization of WDC-A and is based on a letter dated 5 May 1966 from the Director, Dr. H. Odishaw. Recipients are kindly asked to pass on the information or to publish it in their bulletins or journals.

The Geophysics Research Board of the U.S. National Academy of Sciences has approved an arrangement for gradual consolidation of those discipline centres of WDC-A which are concerned with the upper atmosphere. This is the culmination of several years of study as to how WDC-A can most effectively serve the scientific community in the international data exchange provided for in the CIG Guide.

The consolidated centre will be in Boulder, Colorado, under the aegis of the Environmental Science Services Administration (ESSA), a new agency of the U.S. Department of Commerce which merged the Weather Bureau, the Coast and Geodetic Survey, and the Central Radio Propagation Laboratory (CRPL) of the National Bureau of Standards. The ESSA already has responsibility for WDC-A discipline centres for meteorology and nuclear radiation at Asheville, for geomagnetism, seismology and gravity in Washington, and for ionosphere, airglow and parts of solar activity at Boulder. The activity at Boulder will be expanded to cover aurora, cosmic rays and the remainder of solar activity as from the dates given below.

WDC-A for Cosmic Rays will be transferred to Boulder on 1 July 1966, from the University of Minnesota, Minneapolis. This does not represent a change in the University's plans for activity in cosmic ray and geophysical research.

WDC-A for Aurora (Instrumental) will be transferred to Boulder about 1 January 1967, from the Geophysical Institute, University of Alaska, at College. This does not represent a change in the Institute's plans for research in aurora or related phenomena and, if necessary, there will be duplication of data archives at College and Boulder. However, after the date given, requests concerning instrumental aurora data and the flow of new data should be to Boulder.

WDC-A for certain solar activity programmes will be moved from the High Altitude Observatory in Boulder to ESSA-Boulder on 1 July 1967. These groups have worked very closely on data as well as research matters since even before the IGY, and it is expected these contacts will continue.

The plans for including the WDC-A for Aurora (Visual) in the consolidation have not been completed since the group at Cornell University is still in the midst of a large analysis of the IGY and

IQSY data already collected in the centre. It is envisaged that the data holdings will ultimately be serviced by the Boulder centre.

It is expected that closer ties will be developed between the Boulder centre and the centres for the related disciplines of geomagnetism and certain topics in Meteorology, since all three are within a single organization, ESSA.

Summary.

1. — The following subcentres will be transferred to ESSA in Boulder. Data and letters for the centres that are being moved should be sent to the new address according to the following schedule :

Subcentre	*Location at present*	*Transfer to Boulder*
Airglow	Boulder (ESSA)	(no change)
Ionosphere	Boulder (ESSA)	(no change)
Cosmic Rays	Minneapolis, Minnesota	1 July 1966
Aurora (Instrumental)	College, Alaska	1 January 1967
Solar Activity	Boulder (HAO)	1 July 1967
Aurora (Visual)	Ithaca, New York	plans are indefinite

2. — The address of the expanded centre in Boulder is : World Data Centre A, (Upper Atmosphere Geophysics) Environmental Science Services Administration Boulder, Colorado, 80302. USA.

Coordination of all WDC-A activities remains as before with the Geophysics Research Board of the U.S. National Academy of Sciences, Washington D.C.

6 Cornwall Terrace,
London, NW1.
17 May, 1966.

C. M. MINNIS,
Secretary,
C.I.G.

CIG 13(66).

COSPAR

Report to the IXth COSPAR Assembly,

Vienna, Austria, May 18, 1966

by

Samuel SILVER, URSI Representative

The International Scientific Radio Union has a major interest in space research. The programs of its seven commissions and of its committee on space radio research deal with a wide range of topics : solar-terrestrial physics, the interplanetary medium, radio- and radar-astronomy, satellite and deep-space communications, and also measurements and standards which are of fundamental importance to space exploration missions. The Union reorganized the commissions at the 1963 Assembly to strengthen its work in space radio research. The terms of reference of Commission II dealing formerly with the troposphere of the earth's atmosphere were extended to cover the non-ionized regions of the atmospheres of the planets and the propagation of radio waves over and around the surfaces of the planets.

The 1963 General Assembly of the Union dealt very largely with space radio research. The technical programs have been published as a series of volumes (I-VIII) of Progress in Radio Science. The volumes cover many new developments and point the the way to new areas of study.

One of the important activities of the Union is the organization of symposia during the period between assemblies. During the past triennium we held three symposia. You will recall that the URSI arranged a special symposium on the Optimum Design of Instrumentation for Space Experiments from the Standpoint of Data Processing as a component of the scientific program of the 1965 COSPAR Assembly held in Mar Del Plata, Argentina. The papers and the report on the very animated and fruitful discussions will appear in the proceedings of the assembly — Space Research, vol. VI.

URSI convened a symposium (sponsored by its Commissions II and V) on Planetary Atmospheres and Surfaces in Puerto Rico in May, 1965, following directly the close of the COSPAR assembly. While the substance of the program was in the main the study of the planets from ground-based telescopes the presentations and discussions point toward the need for a comprehensive program of studies of the planets from space vehicles and I would propose that URSI, COSPAR, and the IAU join in organizing a coordinated international project in this field. The proceedings of the Puerto Rico symposium appear as a special issue of the U.S. journal *Radio Science*, vol. 69D, No. 12, Dec., 1965.

A third symposium of interest to this body was the Electromagnetic Theory Symposium sponsored by the URSI (Commission VI) and held in Delft, The Netherlands, in August-September, 1965. The subjects which were particularly pertinent to space research were the propagation of waves in plasmas and the characteristics of antennas imbedded in a plasma. The latter is especially important for the proper interpretation of the data of those space experiments which make use of antennas as r.f. plasma probes. The papers of this symposium have not yet been published.

Your attention has been called by the COSPAR bulletins to the forthcoming symposium on solar-terrestrial physics to be held in Belgrade in August, 1966. This joint union symposium has been convened by the URSI just prior to the regular General Assembly of the Union in Munich. The program of the symposium will be an especially rich one and will cover every aspect of solar-terrestrial physics concerned with the sun, the interplanetary region, the magnetosphere and the atmosphere of the earth down to the D-layer. The regular assembly in Munich which, according to the rules of the Union has a limited attendance, will likewise deal with many areas of space research.

The URSI is pleased to be a co-sponsor of the symposium on the interaction between the neutral and the ionized atmosphere which is being held at this COSPAR meeting. The processes of energy exchange and mass transport between the ionosphere and the lower layers of the atmosphere have long been due for special consideration. The program of this symposium very nicely complements the program projected for the Belgrade symposium.

I have already made reference to the content of the Belgrade meeting and the Munich section of the next General Assembly of the URSI. The Union has on its agenda the question of participa-

tion in the international program of science education. You will recall that one of the early steps taken toward this ICSU project was at a special session called by Prof. Kaplan at a COSPAR assembly several years ago. The involvement of the scientific unions in this activity is, in my opinion, a proper development and a major contribution to the fulfillment of the objectives of the program.

The URSI is also giving special consideration to the proposal on the reorganization of the solar-terrestrial physics commission. This, of course, involves the future of several inter-union committees under the purview of the URSI. These are matters of great import to the future course of international programs in space research. I am sure that I am expressing the general view of the members of URSI when I say that our response will be guided by the consideration of the most effective development of the science and international cooperation.

As this is to be my last year as the URSI representative on the Executive Council of COSPAR I wish to make several personal observations and remarks. The past three years have been marked by increasing cooperation between COSPAR and the URSI and the development of greater mutual understanding and support. We owe special thanks to our COSPAR president, Professor Roy, for these developing relationships. Overlap of interests and programs among the Unions and an inter-union committee such as COSPAR are not merely inevitable but are, in fact, desirable for the vitality of the scientific programs. I believe that the overlap can be used to maximum advantage by integrating some of the organizational structure. Each of the three unions, the IAU, the IUGG and the URSI, has a committee on space research. I would suggest that steps should be taken to tie these committees into the working group structure of COSPAR as recognized joint efforts. Although some members of the committees are already members of the working groups the sense of joint responsibility is missing. I suggest that the establishment of a real partnership between COSPAR and the Unions will add strength to all our bodies and further our progress in our common purpose.

Thank you Mr. President and members of the Bureau of the COSPAR for your consideration and whole-hearted cooperation. I regret that overlap of duties has made it necessary for me to miss the opening plenary session and the first part of the scientific meetings. My best wishes for a most successful meeting.

CONSEIL INTERNATIONAL DES UNIONS SCIENTIFIQUES (CIUS)

Résolutions de la Onzième Assemblée Générale

Les résolutions reproduites ci-après intéressant l'URSI ont été adoptées par la Onzième Assemblée Générale tenue à Bombay du 6 au 11 janvier 1966.

I. — Comité permanent des Finances.

d'adopter le rapport du Comité permanent des Finances, sous réserve d'une nouvelle rédaction, par le Comité Exécutif, de la résolution 5, relative à la remise aux Unions du montant de leurs cotisations annuelles, si les revenus du CIUS pour l'année 1966 le permettent. (Le nouveau rapport est donné dans l'Annexe 4.)

IV. — 2. Membres nationaux.

d'*admettre* au CIUS, à titre de Membres nationaux, l'Académie des Sciences de Cuba et le Centre Scientifique de Monaco, et, à titre d'associé national, le Conseil national de la Recherche de la Jamaïque.

VI. — IQSY.

d'approuver les modifications suivantes dans les règlements I et V du Comité de l'IQSY :

Règlement I. — Après « 1er août 1967 », ajouter : « jusqu'à une date antérieure au 31 décembre 1967, de manière à permettre la préparation d'un rapport des comptes-rendus de la quatrième Assemblée de l'IQSY en 1967, et l'achèvement de toute affaire qui relève du Comité et qui peut se présenter en dehors de l'Assemblée. »

Règlement V. — Après « 1er août 1962 », ajouter : « pour une prolongation de cette période indiquée dans le règlement I ».

VII. — Physique Soleil-Terre.

d'adopter la résolution et les recommandations de l'Assemblée et du Comité *ad hoc* sur la Physique Soleil-Terre, comme il suit :

considérant que de nombreuses organisations à l'intérieur du CIUS sont intéressées par les problèmes de la Physique Soleil-Terre,

notant que le Comité Spécial de l'IQSY propose de prendre fin en 1967, l'Assemblée Générale décide :

1. que l'IUCI (Commission Inter Unions de l'Ionosphère) et l'IUCSTR (Commission Inter Union des Relations entre les Phénomènes Solaires et Terrestres), prendront fin en 1966.

2. qu'une petite Commission Inter-Union de type inter-disciplinaire, comprenant des représentants des autres organismes intéressés, sera constituée en 1966, avec les termes de référence suivants :

a) de promouvoir, d'organiser et de coordonner la recherche internationale dans les disciplines de Géophysique régies par le Soleil.
b) de coordonner tous les symposiums du CIUS dans le domaine de la Physique Soleil-Terre.
c) de déterminer le type de données à échanger par l'intermédiaire des WDCs.
d) de fournir les services de consultation demandés par l'International Ursigram and World Days Service.
e) de rendre effectif le programme de publication de l'IQSY.

L'Assemblée *recommande* que la Commission dispose des services d'un petit Secrétariat appointé, et donne pouvoir au Comité Exécutif d'organiser immédiatement un noyau de cette Commission pour entreprendre la coordination des symposiums indiquée ci-dessus dans (*b*) et plus tard d'accroître la Commission de manière qu'elle puisse exercer ses autres fonctions, à la dissolution en 1967 du Comité Spécial de l'IQSY.

L'Assemblée *note* également l'utilité éventuelle d'avoir des représentants nationaux dans la Commission et charge le Comité Exécutif de prendre les mesures nécessaires s'il en est requis par la Commission.

VIII. — Sciences de l'Atmosphère.

de *noter* avec satisfaction la manière dont a débuté le travail du Comité et la rapidité avec laquelle il s'est développé.

IX. — Enseignement des Sciences.

d'*adopter* le rapport du Comité de travail sur la Commission de l'Enseignement des Sciences du CIUS (Annexe 33) et de le *soumettre* au Comité Exécutif pour étude et mise en action appropriée.

X. — CIG.

de *différer* toute décision concernant l'avenir du CIG, comme l'a proposé le Bureau du CIG, jusqu'à ce que les vues de l'IUGG aient été formulées.

XI. — FAGS.

de demander au Conseil de la FAGS d'inviter des représentants du CIG et de l'IQSY à discuter la coopération entre la FAGS et les WDCs.

XIII. — Données pour la Science et la Technologie.

d'*approuver* (1) le rapport du Groupe de travail sur les Tables Critiques et la constitution adjointe pour le Comité proposé sur les Données scientifiques et technologiques sous réserve de légers changements aux articles 29 et 30, (2) la représentation proposée qui pourrait être complétée par un représentant du Conseil du CIUS chargé des résumés et (3) la demande de subvention destinée à couvrir partiellement les dépenses du Comité pendant la période initiale de deux ans du projet (Annexe 39) et de *prier* le Comité Exécutif de rendre effectives les propositions, de déterminer le montant de l'allocation à prélever sur les fonds du CIUS.

XIV. — Système d'Information scientifique mondial.

d'*autoriser* le Comité Exécutif à créer un Comité pour un Système d'Information scientifique mondial, conformément aux propositions de l'Annexe 40.

XV. — Pays en voie de développement.

d'*autoriser* le Comité Exécutif à créer un Comité spécial du CIUS pour l'encouragement de la Science et de la Technologie dans les

pays en voie de développement et d'assurer au Comité spécial une représentation appropriée des scientifiques des pays en voie de développement.

XVIII. — Libre Circulation des Scientifiques.

de *maintenir* le Comité sur la libre circulation des scientifiques, et d'autoriser le Comité Exécutif à effectuer les modifications appropriées dans sa composition.

ICSU

Eleventh General Assembly

Bombay, 6-11 January 1966

We are quoting from the Minutes of the ICSU Eleventh General Assembly distributed in April 1966 the following abstracts concerned with actions interesting URSI activities.

Officers

The General Assembly elected the following Officers :

Dr. J. M. Harrison (*President*).
Prof. H. W. Thompson (*Past President*).
Prof. H. Boesch (*Vice-President*).
Prof. H. Brown (*Vice-President*).
Prof. R. V. Garcia (*Vice-President*).
Prof. W. Klemm (*Vice-President*).
Prof. K. Chandrasekharan (*Secretary General*).
Ing. Gen. G. R. Laclavère (*Treasurer*).

Future structure of ICSU

The General Assembly resolved to adopt the report of the Committee on Future Structure of ICSU, adopted by the Executive Committee with minor changes.

The main items of this report are as follows :

(1) There should be no changes in the main objectives of ICSU.

(2) New Unions should be admitted to membership of ICSU only when there is no possibility for an existing Union to accommodate the new discipline by modification of its own structure.

(3) A National Member should not normally be considered as ready for full membership unless it can fulfil the obligations imposed by full membership, and has a national body representing its scientific activities which has been in existence for six years.

(4) Each Union should have a Representative on the Executive Committee, and one additional National Representative should be elected to the Executive Committee for every two additional Union Representatives above the present number of fourteen.

(5) An interval of two years should be maintained between General Assemblies.

(6) The President should be eligible for re-election for a second term of two years, and the Secretary-General and Treasurer should be eligible for not more than three successive terms of office.

(7) A Standing Committee for Organization and Admissions should be set up, consisting of the President and eight other members not necessarily Members of the Executive Committee.

(8) ICSU should bear the expenses of meetings of Special or Scientific Committees only during the formative stages of such Committees.

(9) Greater publicity should be given in ICSU publications to actions taken in the general interests of the world community, and the feasibility of an identity card for bona fide scientists engaged on ICSU business should be explored.

Statutes

In accordance with the decisions of the second Meeting of the Executive Committee in London in June 1964 and the third Meeting of the Executive Committee in Munich in April 1965, and with the conclusions of the Committee on Future Structure, some modifications to the Statutes were adopted by the General Assembly.

The English text of the Statutes, incorporating all the changes adopted by the 11th General Assembly, will be published in the 1966 Yearbook of ICSU.

New Scientific Members

The General Assembly resolved :

(*a*) To *admit* the International Organization for Pure and Applied Biophysics and to *assure* that it would in the future be known as the International Union for Pure and Applied Biophysics.

(*b*) Not to admit to ICSU the International Union of Nutritional Sciences.

New National Members

The General Assembly unanimously approved the admission of the Academy of Sciences of Cuba and the Centre Scientifique of Monaco as National Members, and of the National Research Council of Jamaica as a National Associate.

Finances

The General Assembly resolved to adopt the following recommendations of the Standing Finance Committee :

(2) that grants, loans, donations and Unesco subventions for 1966 should be allocated as recommended by the Treasurer in SFC No. 43(65) with the understanding that increases may be made should money become available.

(4) that the allocation of the Unesco Subvention to Unions remain unchanged for 1966. It follows, therefore, that new Unions cannot be considered for allocations from the Unesco Subvention in 1966, but they can apply for financial assistance for specific activities which they may undertake.

(5) that the annual dues of the Unions be returned to them as soon as the income for 1966 makes it possible to do so.

Relations with Unesco

The Unesco representative stated that Unesco attaches great importance to its relations with non-governmental organizations.

However, he said that Unesco represents the governments of 120 countries and deals not only with science but other aspects, and therefore, cooperation with scientific non-governmental organizations such as ICSU was essential to Unesco. He mentioned several items of interest to Unesco in fields where cooperation with ICSU and the Unions and Committees had been progressing satisfactorily, such as IQSY, the World Magnetic Survey, Upper Mantle Project, Seismology, International Hydrological Decade, International Biological Programme etc. He spoke of the progress made in cooperation between ICSU and Unesco since the establishment of the Unesco-ICSU Coordinating Committee, and said that the help and advice of ICSU would be very useful in the field of application of science to development. He said that formal contracts would become the method more and more frequently used from the financial point of view for the implementation of activities included in the Unesco programme.

Comité international de Géophysique (CIG)

The General Assembly resolved to refer any decision on the future of CIG as proposed by the Bureau of CIG until the views of IUGG have been formulated.

Solar-Terrestrial Physics

An *ad hoc* Committee on solar terrestrial physics was appointed D. F. Martyn (*Chairman*), W. Allen, W. J. C. Beynon, G. Garland, J. Kaplan, M. Roy, R. L. Smith-Rose, E. A. Lauter, T. F. Malone, J. C. Pecker and V. A. Sarabhai were asked to participate in the work of this Committee.

The General Assembly resolved to adopt the resolution and recommendations of the *ad hoc* committee formulated as follows :

considering that many organizations within ICSU are concerned with problems of solar-terrestrial physics,

noting that the IQSY Special Committee proposes to terminate in 1967, th General Assembly resolved

(1) that IUCI and IUCSTR be terminated in 1966;

(2) that a small Inter-Union Commission of inter-disciplinary type, including representatives from other interested bodies, be set up in 1966 with the following terms of reference :

(i) to promote, organize, and coordinate international research in the solar-controlled disciplines of geophysics;

(ii) to coordinate all ICSU symposia in the field of solar-terrestrial physics;
(iii) to determine the type of data to be exchanged through the relevant WDCs;
(iv) to provide the advisory services requested by the International Ursigram and World Days Service;
(v) to provide such advisory services as may be requested by the WDC organization;
(vi) to implement the IQSY publication programme.

The Assembly *recommended* that the Commission should have the services of a small salaried secretariat; and empowered the Executive Committee to set up immediately a nucleus of this Commission for the purpose of taking over the coordination of symposia referred to in (ii) above, and later to enlarge the Commission so that it may assume its other functions when the IQSY Special Committee dissolves in 1967.

The Assembly also *noted* the possible importance of having national representatives on the Commission, and *empowered* the Executive Committee to take appropriate action in this respect when requested by the Commission.

IUGG Committee on Atmospheric sciences

The General Assembly considering the following report resolved to *note* with satisfaction the way in which the work of the Committee has begun and the speed in which it has developed.

Report of the IUGG Committee on Atmospheric Sciences (T. F. Malone)

At its Tenth General Assembly in Vienna in November, 1963, ICSU appointed an Inter-Union Commission, with IUGG as a parent union, to prepare a suitable response from ICSU to United Nations' Resolution 1802 dated 14 December 1962 which invited ICSU through its Member Unions and National Academies to develop an expanded programme of atmospheric science research which would complement the programmes fostered by the WMO.

Representatives of IUGG, URSI, IAU, IUPAP and IUPAC, COSPAR, and IUB, IUBS and IUPS were appointed. The Inter-Union Commission met in Florence in May, 1964 and agreed that a programme of research in the general circulation of the lower

atmosphere coordinated by a small working group of COSPAR would constitute an appropriate response to the United Nation's Resolution. The Inter-Union Commission recommended that upon acceptance of this recommendation by ICSU, the Commission be dissolved.

At its meeting in London on June 15-17, 1964, the ICSU Executive Committee endorsed the programme, but directed that it should be developed and implemented under the general aegis of IUGG, in active collaboration with COSPAR and in close cooperation with WMO. The Executive Committee accepted the recommendation of the Inter-Union Commission that it be dissolved.

After considerable discussion among the organizations involved, a Committee on Atmospheric Sciences was appointed in January of 1965 and, with financial assistance from ICSU, convened in Geneva in April, 1965. The meeting was held at a time that permitted joint sessions with the WMO Advisory Committee. At the Geneva meeting, it was agreed that the functions of the Committee would include, but not be restricted to, the following :

(*a*) To identify and to formulate atmospheric research problems which are particularly amenable to global treatment in view of developments in outer space.

(*b*) To stimulate the interest of existing committees, commissions and working groups of IUGG, the other Unions, and ICSU Scientific and Special Committees in these research problems and to arrange for their participation and cooperation in an international programme addressed to these problems.

(*c*) To seek such support as may be required to ensure the effectiveness of the participation of the above groups in these programmes.

(*d*) To invite national committees of IUGG to develop research programmes directed towards the solution of these atmospheric problems of a global nature and to submit proposals for programmes that would require cooperative effort among several countries. Similar invitations would be extended to the national committees of other Unions and Special Committes with an interest in the atmosphere.

Coordination of responses with the national committees of IUGG, if necessary, would be an internal matter within each country.

(*e*) To serve as a focal point for bringing together these research activities and proposals into a coherent programme which would be recommended to ICSU as appropriate for its continuing responsiveness to the United Nations' Resolution 1802. The scientific requirements for observations from the World Weather Watch (WWW) would be developed in cooperation with WMO and close liaison with WMO would be maintained on new and promising techniques for obtaining observations essential for research purposes.

(*f*) To encourage scientists and engineers not presently concerned with atmospheric research to participate in the new research opportunities opened up by developments in the atmospheric sciences and in outer space.

(*g*) To arrange symposia on these programmes at regular meetings of relevant ICSU bodies and to arrange special symposia as may be necessary.

Furthermore, the Committee agreed that its principal scientific activity should be mounting a major international research and development programme directed at observing, understanding and predicting the general circulation of the troposphere and lower stratosphere. It was agreed that the specific details of the entire programme would be developed during 1966 and 1967 in consultation with individual scientists and with international and national organizations, both governmental and non-governmental. It was clearly recognized that this research programme would interact in intimate fashion with the World Weather Watch being developed by the WMO, with the International Hydrological Decade, with international oceanographic programmes, with programmes in aeronomy and physics of the upper atmosphere and with the International Biological Programme.

A First Report of the Committee was prepared and submitted to the Executive Committee of ICSU at its meeting in Munich in April, 1965. This report was received with favour and encouragement by the ICSU Executive Committee, and the Committee on Atmospheric Sciences is now proceeding with implementation of the programme.

Copies of the First Report have been circulated to the adhering national bodies of ICSU, IUGG and IAMAP with covering letters from the President of ICSU, the Secretary-General of IUGG, and

the Secretary-General of IAMAP respectively. The programme proposed in this Report is now under review by these adhering bodies, and it is expected that no later than the General Assembly of IUGG in 1967, plans for a fully developed programme will have been completed.

Meanwhile, a research programme recommended by the Committee on Atmospheric Sciences has been the subject of discussion at two international meetings :

(*a*) At the COSPAR meeting in Mar del Plata, Argentina, in May, 1965, a full day's session was devoted to scientific problems of the atmospheric circulation. There was widespread interest for the research programme proposed by the Committee. In consonance with the action of the ICSU Executive Committee, COSPAR expressed interest in the future work of the Committee on Atmospheric Sciences and a desire to participate in this work to the fullest extent consistent with its charter, and established a new Working Group VI for Scientific Space Experiments concerned with properties and dynamics of the troposphere and stratosphere, under the chairmanship of Dr. Morris Tepper, to further collaboration among COSPAR, the Committee on Atmospheric Sciences and WMO.

(*b*) At the International Symposium on Dynamics of Large Scale Processes in the Atmosphere, held in Moscow in June 1965, under the auspices of the International Commission on Dynamical Meteorology of IAMAP (IUGG), the programme was again considered and enthusiastically endorsed. The Commission on Dynamical Meteorology undertook responsibility for developing certain aspects of the programme.

With the financial assistance provided by a grant of $10.000 which the WMO Executive Committee proposes to make available to the Committee on Atmospheric Sciences, it is planned that a second meeting will be held in Geneva in April 1966 to develop further the programme and to consider suggestions and recommendations from other international bodies and from national adhering organizations. Present membership of the Committee on Atmospheric Sciences includes :

B. R. Bolin (*Chairman*).

T. F. Malone (*Secretary-General*).

O. M. Ashford (WMO Observer).

P. D. Astapenko (WMO Representative).

J. E. Blamont.

J. G. Charney.

H. Charnock.

R. V. Garcia.

W. Godson (IAMAP Representative).

D. Johnson (COSPAR Representative).

J. Kaplan (Ex Officio).

K. Ya Kondratjev.

M. Nicolet.

A. M. Oboukhov.

E. Palm (Representing IUTAM).

C. H. B. Priestley.

F. Sargent (Representing IUBS, IUPS and IUB).

P. A. Sheppard.

M. Tepper (COSPAR Representative).

J. Voge (URSI Representative).

It is anticipated that more members and representatives of organizations will be named.

Proposed constitution for the International Committee on data for science and technology

I. — *Establishment and name of the committee*

1. — The compilation of critically selected numerical and other quantitative scientific data is a definable and important part of the larger problem of the evaluation, storage and retrieval of scientific information. Because of the need for international collaboration and effort in this field, the International Council of Scientific Unions (ICSU) has established a committee to supply the leadership necessary to deal with this problem. The name of this committee shall be the International Committee on Data for Science and Technology, herein-after called The Committee.

II. — *Purpose and objectives*

2. — The general purpose of the Committee is to promote and encourage on a world-wide basis, the production and distribution

of compendia and other forms of collections of critically selected numerical and quantitatively expressed values of properties of substances of importance and interest to science and technology. To do this, the Committee should include the following points in its mission :

(*a*) to increase awareness among all scientists of the importance of the problem, and, in particular, to encourage young scientists to appreciate and participate in compilation work;

(*b*) to point out the need for improved status, salaries, working conditions, and facilities for compilers;

(*c*) to point out that evaluation and publication of numerical and other quantitative data is inherently expensive and that subsidies from various sources may be required to promote both their production and fullest utilization;

(*d*) to increase personal contacts among workers in this area by encouraging and arranging periodic meetings of specialists in the various fields and exchange visits between related compilation centres; and

(*e*) to encourage programmes of precise experimental determination to fill in gaps in knowledge and to extend and complete compilations in important areas.

3. — To accomplish the foregoing aims the Committee shall direct its attention to the following tasks :

(*a*) To ascertain on a world-wide basis through the appropriate Unions and national bodies (i) that work on critical compilation of evaluated numerical data is being carried on in each country; (ii) what work is being sponsored by each Scientific Union of by other international groups; and (iii) what the needs of science and industry are for additional compilations of evaluated data.

(*b*) To achieve coordination among, and strengthening of, existing programmes in such a way as to maximize their effectiveness, to minimize unintentional or undesirable overlap, and to recommend new compilation programmes when necessary.

(*c*) To encourage the support of needed work by appropriate private, governmental, and intergovernmental agencies; and to encourage needed experimental work.

(*d*) To encourage the use of nomenclature, symbols, and constants advocated by the responsible Unions; and, when desirable, uniform editorial policy and procedures for presentation of information.

(*e*) On a world-wide basis, (i) to stimulate wider distribution of compilations of high quality; (ii) to maintain and distribute a directory of continuing data compilation projects and related publications; and (iii) to encourage adequate indexing of the substances and properties covered by all such compendia.

(*f*) To encourage and coordinate research on new methods for the preparation and dissemination of tables of numerical data.

III. — *Administration*

4. — The administration of the numerical data programme shall be by :

(*a*) The International Committee on Data for Science and Technology,

(*b*) The Bureau (See Article V, Section 17).

IV. — *The Committee*

5. — The Committee shall be composed of three kinds of Members :

(*a*) Members representing international scientific unions;

(*b*) Members representing countries with substantial programmes in numerical data compilation,

(*c*) Members coopted because of their special competence in the area.

6. — The initial number of Members shall be not more than sixteen to eighteen. In making appointments to The Committee, attempts shall be made to achieve a reasonable balance among the scientific disciplines represented on The Committee.

7. — Each international scientific union federated in ICSU which expresses an interest in the numerical data programme and a desire to participate in the work of The Committee, may designate a representative following consultation with the Chairman of The Committee. Each Union Representative should avail himself of advisory help from the appropriate bodies or persons of his union.

8. — Each country in which there exists a substantial programme for evaluating numerical and other quantitative data may have a National Representative on The Committee. The nomination of the National Representative shall be made by the national adhering body to ICSU, in consultation with the appropriate national groups and with the Chairman of The Committee. In fulfilling his responsibilities as a Committee Member, the National Representative shall avail himself of advisory help from the appropriate bodies or persons in his country.

9. — One person may serve as both a Union and a National Representative on The Committee.

10. — Individual coopted members, who are experts in the field, may be recommended for appointment to The Committee by the Officers of ICSU.

11. — The terms of office for all members of The Committee shall be four years, with one renewal permissible. Members may not serve for more than eight consecutive years. Appointments should be so arranged that not more than one-half the members' terms of office expire at one time.

12. — The Committee shall be convened for a General Meeting at least once a year by its Chairman. One-half of the membership of The Committee shall constitute a quorum. Decisions of The Committee shall be by a simple majority of the affirmative and negative votes of those present and taking part in the vote. Each Member of The Committee is entitled to cast one vote, with the Chairman, in addition, having a casting vote.

13. — On approval of the Officers of ICSU, international organizations interested in numerical data compilation work may be invited to nominate liaison representatives.

14. — Special and Scientific Committees of ICSU, as well as any other interested ICSU body, on request to the Chairman, may be invited to send a representative to meetings of The Committee.

15. — Persons expert in various disciplines, whose presence may from time to time be of special benefit to the activities of The Committee may be invited to act as consultants.

V. — *Bureau and Officers*

16. — The Committee shall elect from among its members a Chairman, two Vice-Chairmen, and a Secretary-Treasurer whose

appointment shall be subject to confirmation by the Executive Committee of ICSU.

17. — The above officers shall constitute the Bureau of the Committee, together with the Executive Director of the Central Office (see Article VI, Section 22) who shall be a non-voting member.

18. — The officers shall serve four year terms, which terms shall not be limited by rules for the terms of Committee Members, i.e. an officer elected in his sixth year of service may continue in that office for the four year term.

19. — The Bureau shall meet at least twice a year.

20. — Between meetings of The Committee, the responsibility for transacting urgent business of The Committee is vested in the Bureau. All decisions of the Bureau shall be submitted for approval to The Committee at its next meeting.

VI. — *The Central Office*

21. — A central office for The Committee shall be established for the purpose of implementing the decisions of The Committee.

22. — The Central Office shall be headed by a salaried Executive Director, who shall be a non-voting member of The Committee and of the Bureau. The Executive Director shall be nominated by The Committee subject to the confirmation of the Executive Committee of ICSU.

23. — The Executive Director shall keep the Secretary-General of ICSU fully and promptly informed of the activities of The Committee.

24. — The Committee may appoint such other staff as it considers necessary.

VII. — *Finances*

25. — The Committee shall submit its budget to ICSU.

26. — To assist The Committee in this submission, a Finance Committee of three members shall be appointed consisting of the Treasurer of ICSU, ex-officio, and two members of The Committee, who shall not be members of the Bureau. The Secretary-Treasurer of The Committee and the Executive Director of the Central Office shall act as advisers to the Finance Committee.

27. — Funds for the administration and activities of The Committee may be received from ICSU, Unesco, other international organizations on the approval of the Executive Committee of ICSU, the national institutions and international scientific unions who nominate members, foundations or other sources. Such funds shall be deposited with ICSU for allocation or expenditure in accordance with approved budgets.

28. — The travel expenses of the Bureau shall be defrayed by The Committee. The travel expenses of specially coopted members of The Committee shall be paid by The Committee also.

29. — Travel expenses of Union representatives shall be defrayed by each Union.

30. — Travel expenses of representatives of national members shall be met from national sources.

VIII. — *Task Groups*

31. — The Committee may appoint *ad hoc* task groups for the examination of special problems.

IX. — *Amendments to Constitution*

32. — Resolutions for the amendment of this constitution, adopted by two-thirds majority of The Committee, shall be submitted to the Executive Committee of ICSU for ratification.

X. — *Interpretation*

33. — The English text of the constitution shall be considered as authoritative.

* * *

Mr. B. Decaux, Vice-President of URSI agreed to serve in The Committee as URSI representative.

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY (IUPAC)

Meetings

The XXIVth Conference of the IUPAC will be held in Prague from August 27th to September 3rd, 1967; it will be followed from Sept. 4th to 10th by the XXIst International Congress of Pure and Applied Chemistry organized under the auspices of the Government of the Czechoslovak Socialist Republic.

All correspondence concerning the XXIst International Congress should be addressed to : The Chairman, Organizing Committee, XXIst International Congress of Pure and Applied Chemistry, P.O.B. 139 Praha 6 - Dejvice, Czechoslovakia. Cable address : IUPAC PRAHA.

All correspondence concerning the Conference should be addressed to : Dr. Rudolf Morf, Secretary General of IUPAC, c/o F. Hoffmann-La Roche and Co., 4002 Basle, Switzerland.

UNESCO

Rapport du Directeur général sur l'activité de l'organisation en 1965

RAPPORT PRÉSENTÉ AUX ÉTATS MEMBRES ET AU COMITÉ EXÉCUTIF

(Extraits)

Relation avec les autres organisations internationales

EXÉCUTION DE PROJETS PARTICULIERS.

En vue de l'exécution de projets particuliers de son programme, l'Unesco a conclu des contrats avec 72 organisations compétentes pour un montant total de 477.665 dollars. Ces contrats se répartissent de la façon suivante :

	Nombre de contrats	Nombre d'ONG	Montant en $
Education	19	13	52.900
Sciences exactes et naturelles	53	32	156.100
Sciences sociales	19	6	103.065
Activités culturelles	36	18	115.180
Information	4	3	7.420
Echanges internationaux	1	1	43.000

SUBVENTIONS.

Conformément à une décision du Conseil exécutif, à sa 69e session, des subventions, d'un montant global de 718.500 dollars, ont été accordées pour l'année 1965 à 32 organisations non gouvernementales en catégories A et B qui par leurs propres activités apportent une contribution particulièrement efficace à la réalisation des objectifs de l'Unesco.

Ces subventions sont ainsi réparties :

	Nombre d'ONG	Montant en $
Education	8	34.000
Sciences exactes et naturelles	3	227.000
Coopération interdisciplinaire dans les domaines de la philosophie, des sciences humaines et des sciences sociales	2	204.000
Sciences sociales	8	92.500
Activités culturelles	10	141.000
Information	1	20.000
	32	718.500 (1)

(1) Non compris la somme de 39.592 dollars que représente la valeur locative des bureaux occupés par 9 organisations non gouvernementales à la Maison de l'Unesco.

Exécution du programme

Sciences exactes et naturelles et application de ces sciences au développement

A. — Sciences fondamentales.

1. — *Coopération avec les organisations scientifiques non gouvernementales.*

Des subventions ont été accordées en 1965 aux organisations ci-après :

Conseil international des unions scientifiques (CIUS) dont 22.000 dollars pour la Fédération des services astronomiques et géophysiques (FAGS) 207.000

Conseil des organisations internationales des sciences médicales (CIOMS) 10.000

Union internationale pour la conservation de la nature et de ses ressources (UICN) 10.000

2. — *Amélioration de la documentation et de l'information scientifiques et techniques.*

Dans le cadre du programme à long terme visant à améliorer la documentation scientifique et technique, on a pris contact avec les organisations compétentes pour : (*a*) créer un comité permanent de terminologie et de lexicographie ; (*b*) établir un centre de traduction en Amérique Latine ; (*c*) faire paraître un guide mondial des centres, services et sources de traductions scientifiques ; (*d*) établir un centre d'échanges de textes se prêtant à la lecture mécanique (cartes et rubans perforés, bandes magnétiques, etc.) et pouvant être exploités par ordinateur.

Le Groupe de travail sur la documentation des sciences exactes et naturelles, organe subsidiaire du Comité consultatif international de bibliographie, documentation et terminologie, a tenu sa troisième session à la Maison de l'Unesco, les 22 et 23 mars. Le rapport de cette session a été ensuite examiné au cours de la troisième session du Comité consultatif international de bibliographie, de documentation et de terminologie, qui s'est tenue à Moscou du 6 au 9 avril.

Une réunion internationale a été organisée à la Maison de l'Unesco du 9 au 11 décembre, en collaboration avec le CIOMS, pour examiner les principes de la rédaction et de la mise au point rédactionnelle d'un manuel sur la planification des réunions scientifiques internationales, qui sera publié ultérieurement par le CIOMS.

Une aide technique et financière a été fournie au Bureau des résumés analytiques du CIUS, pour lui permettre de poursuivre ses activités concernant les revues analytiques de physique, de chimie et de biologie.

B. — Sciences de la terre.

Astronomie et géophysique.

Le groupe de travail de l'Unesco sur les météorites, dont on a élargi la composition de manière à y inclure des représentants de l'Union internationale des sciences géologiques et de l'Union astronomique internationale ainsi qu'un observateur de l'Agence internationale de l'énergie atomique, a tenu sa deuxième réunion au Siège de l'Unesco du 18 au 20 cotobre. Il a examiné les résultats d'une étude sur les collections de météorites et a passé en revue les travaux de recherche que le Secrétariat a effectués conformément

à la recommandation de ce groupe de travail (première session). Il a demandé à l'Unesco et à l'AIEA d'examiner la possibilité d'organiser en 1967, en coopération avec les unions et associations scientifiques intéressées, une conférence scientifique internationale sur les météorites. Le groupe a examiné également les problèmes juridiques que posent les météorites et qui avaient fait l'objet d'une étude préliminaire du Secrétariat.

Une aide administrative et financière a été fournie au Conseil du Levé magnétique mondial pour l'organisation d'une mission consultative de géomagnétisme en Amérique du Sud, analogue à celle que l'Unesco avait envoyée dans des pays africains en 1964.

UNESCO

Report of the Director General on the activities of the organization in 1965

REPORT COMMUNICATED TO MEMBER STATES AND THE EXECUTIVE BOARD

(Extracts)

Relations with other International Organizations

EXECUTION OF GIVEN PROJECTS.

For the execution of given projects in its programme. Unesco concluded contracts with 72 appropriate organizations, involving a total sum of $477,665, made up as follows :

	Number of contracts	Number of NGOs	Amount in $
Education	19	13	52,900
Natural Sciences	53	32	156,100
Social Sciences	19	6	103,065
Cultural Activities	36	18	115,180
Mass Communication	4	3	7,420
International Exchanges	1	1	43,000

SUBVENTIONS.

In accordance with a decision taken by the Executive Board at its 69th session, subventions totalling $718,500 were granted for 1965 to 32 non-governmental organizations in categories A and B whose work makes a particularly effective contribution to the achievement of Unesco's aims.

These subventions were made under the following headings :

	Number of NGOs	Amount in $
Education	8	34,000
Natural Sciences	3	227,000
Interdisciplinary cooperation in the fields of philosophy and the human and social sciences	2	204,000
Social Sciences	8	92,500
Cultural Activities	10	141,000
Mass Communication	1	20,000
	32	718,500 (1)

(1) Not including the sum of $39,592, representing the rental value of offices occupied by 9 non-governmental organizations at Unesco House.

Execution of the Programme

NATURAL SCIENCES AND THEIR APPLICATION TO DEVELOPMENT

A. — BASIC SCIENCES.

1. — *Co-operation with non-governmental scientific organizations.*

In 1965 subventions were allocated to the following three organizations :

	$
International Council of Scientific Unions (ICSU) (including $22,000 for the Federation of Astronomical and Geophysical Services (FAGS))	207,000
Council for International Organizations of Medical Sciences (CIOMS)	10,000
International Union for Conservation of Nature and Natural Resources (IUCN)	10,000

2. — *Improvement of scientific and technical documentation and information.*

Within the framework of the long-range programme for the improvement of scientific and technical documentation, contacts were established with appropriate organizations, for the purpose of : (*a*) setting up a permanent committee on terminology and lexicography; (*b*) establishing a translations centre in Latin America; (*c*) publishing a world guide to scientific translation centres, services, and sources; (*d*) establishing a clearing house for machine-readable texts (punched-cards and tapes, magnetic tapes, etc.) suitable for processing by computers.

The working group on documentation in the natural sciences, a sub-committee of the International Advisory Committee on Bibliography, Documentation and Terminology held its third session, 22-23 March, at Unesco House. A report on the meeting of the working group was issued and later discussed at the third meeting of the International Advisory Committee on Bibliography, Documentation and Terminology held in Moscow, 6-9 April.

In collaboration with CIOMS, an international meeting was held at Unesco House 9-11 December. The purpose of the meeting was to consider the principles of drafting and editing a manual on the planning of international scientific meetings, to be published later by CIOMS.

Technical and financial assistance was given to the ICSU Abstracting Board for the continuation of the Board's activities relating to abstracting journals, in physics, chemistry and biology.

EARTH SCIENCES.

Astronomy and geophysics.

The Unesco Working Group on Meteorites, enlarged to include representatives of the International Union of Geological Sciences and of the International Astronomical Union, as well as an Obersver of the International Atomic Energy Agency, held its second meeting at Unesco Headquarters on 18-20 October. It examined the results of a survey of meteorite collections and research activities carried out by the Secretariat in accordance with a recommendation adopted at its first meeting. It requested Unesco and IAEA to study the possibility of organizing in 1967, in co-operation with the

interested scientific unions and associations, an international scientific conference on meteorites.

The Working Group also discussed the problem of the legal status of meteorites, of which a preliminary study had been made by the Secretariat.

Administrative and financial assistance was provided to the World Magnetic Survey Board for the organization of a geomagnetic advisory mission to South America, similar to that which was sent by Unesco to African countries in 1964.

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