

INTERNATIONAL ASTRONOMICAL UNION

SYMPOSIUM No. 23

Held in Liège, Belgium, 17 to 20 August 1964

Organized with cooperation of COSPAR

ASTRONOMICAL OBSERVATIONS FROM SPACE VEHICLES

Edited by

JEAN-LOUIS STEINBERG

Observatoire de Paris-Meudon

*Printed for the International Committee of Scientific Unions with financial assistance
from UNESCO*

Reprinted from Annales d'Astrophysique 1964

No. 6 and 1965, No. 1, 2, 3 and 4

U. N. E. S. C. O. Subvention 1965/AVS/414/19*

CONTENTS

SESSION I

Title : *Far ultra-violet radiation : The Sun.*

Chairman : L. GOLDBERG.

- 1) Review paper : R. TOUSEY, W. E. AUSTIN, J. D. PURCELL and K. G. WIDING, The extreme ultra-violet emission from the Sun between the Lyman-alpha lines of H I and C VI 5
- 2) B. EDLÉN (Summary), Laboratory data on atomic spectra for extreme ultra-violet solar spectroscopy. 25
- 3) L. L. HOUSE, Laboratory production of the solar iron lines in the vacuum ultra-violet 27
- 4) H. E. HINTEREGGER (Summary), Experimental determination of absolute intensities in the solar X. U. V. spectrum 29
- 5) W. M. NEUPERT, Intensity variations in the solar extreme ultra-violet observed by OSO-I 31

SESSION II

Title : *X and γ radiation : The Sun.*

Chairman : R. L. F. BOYD.

- 1) Review paper : C. DE JAGER, Solar X radiation 45
- 2) R. L. BLAKE, T. A. CHUBB, H. FRIEDMAN and A. E. UNZICKER, Measurement of solar X-ray spectrum between 13 and 26 Å 53
- 3) J. C. LINDSAY, Comments on X-rays emitted by the Sun 57
- 4) K. A. POUNDS, Recent solar X-ray studies in the United Kingdom 61
- 5) M. LANDINI, M. PIATELLI, G. RIGHINI, D. RUSSO and G. L. TAGLIAFERRI, Some preliminary results from the solar monitoring Satellite N. R. L. 1964 I-D obtained at the Arcetri Station 75
- 6) R. WILSON, First launching of the British stabilized Skylark rocket. 79
- 7) S. L. MANDELSHTAM, On X-ray radiation of the quiet Sun. 81

SESSION III

Title : *Interpretation of the Solar X. U. V. observations.*

Chairman : R. G. ATHAY.

- 1) Review paper : C. W. ALLEN, The interpretation of the Sun's X. U. V. radiation (Summary). 93
- 2) A. BURGESS, Dielectronic recombination in the Corona 95
- 3) R. WILSON, The Zeta/solar lines between 170 Å and 220 Å 101
- 4) S. R. POTTASCH, On the determination of the solar chemical composition from a study of the ultra-violet resonance lines 105
- 5) Z. SUEMOTO and F. MORIYAMA, Spotty appearance of the solar disk as inferred from the comparison between E. U. V. and radio intensities 109
- 6) K. G. WIDING and J. R. PORTER, Silicon in the solar corona 115
- 7) L. GOLDBERG, A. K. DUPREE and J. W. ALLEN, Collisional excitation of auto-ionizing levels. 125

SESSION IV

Title : *Far ultra-violet radiation : Stars and Galaxies.*

Chairman : E. SCHATZMAN.

- 1) Review paper : M. J. SEATON, Far ultra-violet radiation : stars, nebulae and interstellar matter. 133
- 2) J. KIEFFER et N. DAMANY-ASTOIN, Développements récents en spectroscopie des continus atomiques et des raies autoionisées 141
- 3) E. H. AVRETT and S. E. STROM, Comparison between model atmospheres and spectra from early-type stars 147
- 4) D. C. MORTON, Theoretical line profiles in the ultra-violet spectra of early B-type stars. 163
- 5) D. W. O. HEDDLE, The importance of absolute photometry 167

6) A. BOGGESS III, B star colours between 2 000 and 3 000 Å	173
7) E. T. BYRAM, T. A. CHUBB and M. W. WERNER, 1 115 Å far ultra-violet stellar photometry.	177
8) T. P. STECHER, Manuscript not available	180
9) E. M. BURBIDGE, Ultra-violet emission from Galaxies	181
10) T. P. STECHER, An observation of Jupiter in the ultra-violet.	189

SESSION V

Title : *X and γ radiation : Stars and Galaxies.*

Chairman : R. LÜST.

1) Review paper : R. J. GOULD and G. R. BURBIDGE, High energy cosmic photons and neutrinos	195
2) S. BOWYER, E. T. BYRAM, T. A. CHUBB and H. FRIEDMAN, Observational results of X-ray astronomy.	227
3) P. C. FISHER, D. B. CLARK, A. J. MEYEROTT and K. L. SMITH, Observational results on X-rays.	241
4) D. C. MORTON, The X-ray emission of neutron stars	245
5) L. KRAUSHAAR, Cosmic gamma rays : experimental	247
6) C. D. LONG, N. A. PORTER, T. C. WEEKES, J. F. FRUIN and J. V. JELLEY, Upper limits to the flux of high energy rays from selected quasi stellar and other sources using the Čerenkov technique.	251
7) M. LIEBER, S. N. MILFORD and M. S. SPERGEL, Very high energy cosmic gamma rays.	253

SESSION VI

Title : *Visible and infrared radiation : Sun, stars and planets.*

Chairman : M. MIGEOTTE.

1) Review paper : P. SWINGS, Rayonnement visible et infrarouge, Soleil, étoiles, planètes et comètes.	261
2) J. WOOLF, Infrared spectra of stars, planets and the Moon from Stratoscope II	267
3) M. BOTTEMA, W. PLUMMER and J. STRONG, A quantitative measurement of water vapour in the atmosphere of Venus.	275
4) C. SAGAN and J. B. POLLACK, Spacecraft observation of Venus infrared limb-darkening.	279
5) L. D. KAPLAN, Remarks on the Mariner 2 limb-darkening measurements.	285
6) G. NEWKIRK Jr. and J. D. BOHLIN, Coronascope II : observation of the white light corona from a stratospheric balloon	287
7) R. TOUSEY, Observations of the white light corona by rocket	293
8) R. J. GOULD, Infrared emission lines from celestial sources	299

SESSION VII

Title : *Radio frequency radiation.*

Chairman : A. MAXWELL.

1) Review paper : F. G. SMITH, Low frequency radio astronomical observations from rockets and satellites.	305
2) G. R. HUGUENIN and M. D. PAPAGIANNIS, Spaceborne observations of radio noise from 0,7 to 7,0 MHz and their dependence on the terrestrial environment.	903
3) T. R. HARTZ, Observations of the galactic radio emission between 1,5 and 10 MHz from the Alouette Satellite	913
4) C. C. HARVEY, Results from the UK-2 Satellite.	723
5) D. WALSH and F. T. HADDOCK, Antenna impedance in a plasma : problems relevant to radioastronomy measurements from space vehicles.	533
6) J. HUGILL, Some measurements of aerial impedance in the ionosphere	543
7) G. J. DANIELL, Ionospheric focussing	353
8) F. T. HADDOCK, Manuscript not available	553
9) T. R. HARTZ, Solar noise observations from the Alouette Satellite	753
10) J. K. ALEXANDER and R. G. STONE, A satellite system for radioastronomical measurements at low frequencies	363

ALPHABETICAL LIST OF AUTHORS

J. K. ALEXANDER	363
C. W. ALLEN	93
J. W. ALLEN	125
R. G. ATHAY	Chairman Session III
E. H. AVRETT	147
W. E. AUSTIN	5
R. L. BLAKE	53
A. BOGGESS	173
J. D. BOHLIN	287
M. BOTTEMA	275
S. BOWYER	227
R. L. F. BOYD	Chairman Session III
G. R. BURBIDGE	195
M. BURBIDGE	181
A. BURGESS	95
E. T. BYRAM	177
E. T. BYRAM	227
D. C. CLARK	241
T. A. CHUBB	53
T. A. CHUBB	177
T. A. CHUBB	227
N. DAMANY-ASTOIN	141
G. J. DANIELL	353
A. K. DUPREE	125
B. EDLÉN	25
P. C. FISHER	241
H. FRIEDMAN	53
H. FRIEDMAN	227
J. F. FRUIN	251
L. GOLDBERG	Chairman Session I
L. GOLDBERG	125
R. J. GOULD	195
R. J. GOULD	299
F. T. HADDOCK	335
F. T. HADDOCK	Manuscript not available
T. R. HARTZ	319
T. R. HARTZ	357
C. C. HARVEY	327
W. O. HEDDLE	167
H. E. HINTEREGGER	29
L. L. HOUSE	27
J. HUGILL	345
G. R. HUGUENIN	309
C. DE JAGER	45
J. V. JELLEY	251
L. D. KAPLAN	285
J. KIEFFER	141
L. KRAUSHAAR	247
M. LANDINI	75
M. LIEBER	253
J. C. LINDSAY	57
C. D. LONG	251
R. LÜST	Chairman Session V
S. L. MANDELSHTAM	81

A. MAXWELL	Chairman Session VII	VII
A. J. MEYEROTT		241
S. N. MILFORD		253
M. MIGEOTTE	Chairman Session VI	VI
F. MORIYAMA		109
D. C. MORTON		164
D. C. MORTON		245
G. NEWKIRK JR.		287
W. NEUPERT		31
M. D. PAPAGIANNIS		309
M. PIATELLI		75
W. PLUMMER		275
J. B. POLLACK		279
J. R. PORTER		
N. A. PORTER		251
S. R. POTTASCH		105
K. A. POUNDS		62
J. D. PURCELL		5
G. RIGHINI		75
D. RUSSO		75
C. SAGAN		279
E. SCHATZMAN	Chairman Session IV	IV
M. J. SEATON		133
F. G. SMITH		305
K. L. SMITH		241
M. S. SPERGEL		253
T. P. STECHER	Manuscript not available	
T. P. STECHER		189
R. G. STONE		363
S. E. STROM		147
J. STRONG		275
P. SWINGS		261
Z. SUEMOTO		109
G. L. TAGLIAFERRI		75
R. TOUSEY		5
R. TOUSEY		293
A. E. UNZICKER		53
D. WALSH		335
T. C. WEEKES		251
M. W. WERNER		177
K. G. WIDING		5
K. G. WIDING		115
R. WILSON		79
R. WILSON		101
J. WOOLF		267

INTRODUCTION

This volume contains the Proceedings of IAU Symposium No. 23, "Astronomical Observations from Space Vehicles" which was held at Liege, Belgium, August 17-20, 1964 under the joint sponsorship of the IAU and COSPAR. The following individuals served as members of the scientific Organizing Committee. The seven IAU representatives also comprised the Organizing Committee of Commission 44, which made the original proposal to hold the symposium.

IAU : L. GOLDBERG, A. G. MASSEVITCH, J. E. BLAMONT, H. E. BUTLER, H. G. KIENLE, P. SWINGS, H. C. VAN DE HULST.

COSPAR : H. FRIEDMAN, J. ROSCH.

The subject matter of the symposium was divided among seven sessions, each with a separate chairman who had full responsibility for the content and organization of his session. The success of the symposium owes a great deal to the chairmen of the sessions, both for the wisdom they displayed in selecting the speakers and for their firmness in holding them to the allotted times.

I know that the participants would also want to join me in expressing warm thanks to the IAU and to UNESCO for providing generous support for travel to the symposium, and to the local Organizing Committee headed by Dr. P. SWINGS, CHAIRMAN, and Mrs. BOSMAN-CRESPIN, Secretary, for the generosity and graciousness of the local arrangements and hospitality. We wish especially to thank the Provincial Governor, M. P. CLERDENT, the Mayor M. DESTENAI, and the Rector of the University, MM. DUBUISSON for the receptions each offered and the Grand Bazar Department Store for the magnificent closing dinner.

Finally, I wish to thank Dr. STEINBERG for serving as Editor of these Proceedings and for the great rapidity with which completed manuscripts were published in the *Annales d'Astrophysique*.

LÉO GOLDBERG.