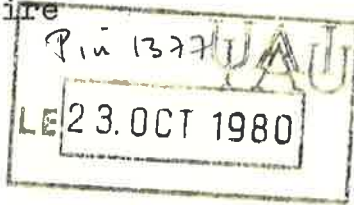


GEODETSKI FAKULTET SVEUČILIŠTA U ZAGREBU  
OPSERVATORIJ HVAR

Prof.P.Wayman  
I.A.U.-U.A.I.  
61,avenue de l'Observatoire  
75014 Paris,France



41000 ZAGREB, Kačićeva 26  
Telefon: (041) 442-600  
Zagreb: 16.X 1980  
Vaša oznaka:  
Naša oznaka: 2818/1-80.

Dear Prof.Wayman,

please find enclosed the Report on the  
XI INTERNATIONAL SCHOOL FOR YOUNG ASTRONOMERS of  
the IAU and UNESCO  
Hvar,SR Croatia,Yugoslavia  
September 17 - October 8, 1980  
and other material concerning the School.

Yours sincerely

*Vladimir Ruždjak*  
Vladimir Ruždjak

cc Prof.D.Wentzel

GEODETSKI FAKULTET SVEUČILIŠTA U ZAGREBU  
OPSERVATORIJ HVAR

Report on the

XI INTERNATIONAL SCHOOL FOR  
YOUNG ASTRONOMERS of the  
IAU and UNESCO

Hvar, SR Croatia , Yougoslavia  
September 17 - October 8, 1980.

41000 ZAGREB, Kačićeva 26

Telefon: (041) 442-600

Zagreb:

Vaša oznaka:

Naša oznaka: 2818/1-80.

The School was properly and in due time announced by a special leaflet / see enclosure / and in the IAU Information Bulletin. A Detailed Program was sent to all the accepted participants and to all the lecturers / see enclosure /. There were only a few small changes in the Program and in the list of participants. Altogether 35 young astronomers from the Balcan and Mediterranean countries participated at the School. Stress in this School was put on practical training each evening and also on Seminars given by the young astronomers themselves. The instruments of the Hvar Observatory were used for practical training in solar physics and UBV - photometry. Most of the practical training was done by means of the Utrecht Observatory instruments.

FINANCES :

Income :	IAU-UNESCO	19 013 swiss francs ....	311 254 din.
	Local	.....	248 000 din.
	Total	.....	559 254 din.

Expenses: Accomodation of all participants and lecturers <sup>x)</sup>

.....	261 000 din.
Travel expenses of lecturers <sup>xx)</sup> ...	116 200 <del>din.</del>
Fees for lecturers <sup>xxx)</sup> ....	30 000 din.
2 Excursions .....	50 000 din.
Rent of the lecture room .....	20 000 <del>din.</del>
Printing of programs, diplomas, announcements, postage, telegrams etc.	20 000 din.
Copying of Exercises and implements for practical training .....	5 000 din.
Pocket money for all foreign young astronomers .....	10 000 din.
Coffee twice a day for all participants .....	12 000 din.
Travel grants <sup>+</sup> ).....	30 000 din.
Opening dinner .....	5 000 din.
Sightseeing .....	1 500 din.
Transport of instruments .....	10 000 din.
Closing Dinner .....	7 000 din.
<hr/>	
Total .....	577 700 din.

<sup>x)</sup> The stay and travel expenses of the Director and the Deputy Director of the School are not included, as they have been covered from other Sources.

<sup>xx)</sup> Some small change is possible, as we do not know the exact amount paid for the accomodation in Split during transit of a few lecturers.

Travel expenses of the Yougoslave and Italian lecturers have been refunded at Hvar in dinars.

xxx) Fees for the lecturers from Yougoslavia, Italy and for Sanchez Magro have been paid in dinars at Hvar. We would appreciate if the following lecturers could receive their fees in dollars from the IAU Secretariat directly:

Ceplecha .....	10	hours .....	100	dollars
van Helden .....	28	hours training ..	140	dollars
de Jager .....	9	hours .....	90	dollars
Kleczek .....	11	hours .....	110	dollars
Müller .....	10	hours .....	100	dollars
Pis̆miš̆ .....	9	hours .....	90	dollars
Schmidt .....	12	hours .....	120	dollars

+) We would appreciate very much if the IAU Secretariat could kindly send an additional travel grant of 100,- US \$ to Alexander Gatt, 13, Stuart Street, Gzira, Malta.

The deficit of the School - about 18 000 dinars - will be covered from the sources of the Hvar Observatory.

I A U

U N E S C O

XI INTERNATIONAL SCHOOL FOR YOUNG ASTRONOMERS

SEPTEMBER 17 - OCTOBER 8, 1980, HVAR, SR CROATIA, YUGOSLAVIA

P R O G R A M

ZAGREB, JULY, 1980

IAU

UNESCO

XI INTERNATIONAL SCHOOL FOR YOUNG ASTRONOMERS  
SEPTEMBER 17 - OCTOBER 8, 1980, HVAR, SR CROATIA, YUGOSLAVIA

PROGRAM

ZAGREB, JULY, 1980

The XI International School for Young Astronomers  
is organized by

-The Faculty of Geodesy, University of Zagreb

under the auspices of

-The International Astronomical Union

-UNESCO

-The Union of the Societies of Mathematicians,  
Physicists and Astronomers of Yugoslavia

and supported by

-The International Astronomical Union

-UNESCO

-The Self-managed Community of Interest for Science III,  
SR Croatia

-University of Split

-Republican Administration for Technical Cooperation  
SR Croatia

-The Peoples Technique, SR Croatia

-The Astronomical Society of SR Croatia

LECTURE COURSES

Z.Ceplecha (Z.C.): "Interplanetary Matter"	10 hours
B.Cester (B.C): "Evolution of Binary Systems"	10 hours
M.Hack (M.H.) : "Spectroscopy"	6 hours
R.van Helden (R.v.H.) : "Practical Astronomy"	28 hours
C.de Jager (C.J.): "Astrophysics from Space"	8 hours
J.Kleczeck (J.K.): "Solar Physics"	10 hours
E.Müller (E.M.): "Astronomical Spectroscopy"	10 hours
G.Munch (G.M.): "Planets and Satellites"	10 hours
P.Pismis (P.P.): "Galaxies"	4 hours
P.Pismis (P.P.): "Interstellar Matter"	4 hours
C.Sanchez - Magro (S.M.): "Astronomical Technics"	14 hours
H.Schmidt (H.S.): "Cosmic Electrodynamics"	12 hours
V.Vujnović (V.V.): "Atomic Physics and Spectra Formation"	4 hours

SEMINARS

A.Cadež (A.Č.): "Black Holes"	2 hours
V.Čadež (V.Č.): "Solar Radio Bursts"	2 hours
M.Dimitrijević (M.D.): "Stark Broadening and its Astrophysical Applications"	3 hours
M.Vukičević-Karabin: "The Photospheric Velocity Fields and Relevant Effects"	2 hours
G.Pichler (G.P.): "Quasistatic Line Wing and Collisional Redistribution of Radiation by Neutral particles"	3 hours
V.Ruždjak (V.R.): "Solar Granulation Metrology via Coherent Optical Fourier Analysis"	2 hours



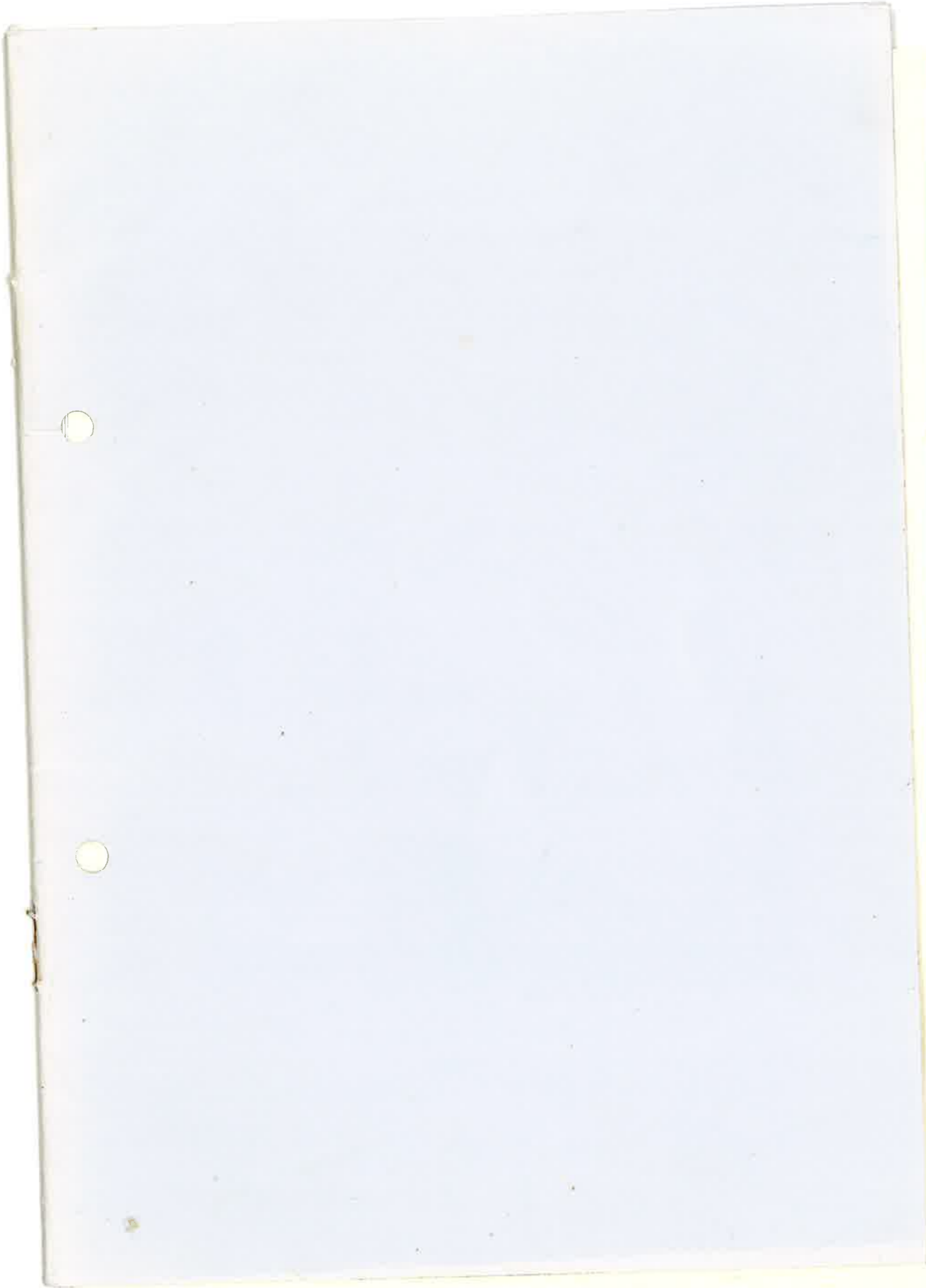
**TIME TABLE**

IAU - UNESCO SCHOOL - TIME TABLE

	7 <sup>00</sup> /8 <sup>30</sup>	10 <sup>00</sup>	10 <sup>30</sup>	12 <sup>00</sup> - 14 <sup>00</sup>	- 15 <sup>45</sup>	17 <sup>15</sup>	17 <sup>30</sup>	19 <sup>00</sup>	20 <sup>30</sup>	22 <sup>00</sup>
	BREAK-FAST		LUNCH / FREE		DINNER					
17.9.			OPENING	S.M.	R.V.H.					PRACTICAL TRAINING
18.	S.M.	H.S.	H.S.	P.P.	H.S.					"
19.	S.M.	H.S.	H.S.	P.P.	S.M.					"
20.	S.M.	H.S.	H.S.							
21.										FREE
22.	M.H.	E.M.	E.M.	P.P.	S.M.					"
23.	M.H.	E.M.	E.M.	S.M.	H.S.					"
24.	M.H.	E.M.	E.M.	P.P.	G.P.					"
25.	B.C.	E.M.	E.M.	G.P./M.D.	H.S.					"
26.	B.C.	E.M.	E.M.	M.D.	H.S.					"

27/28

EXCURSION



29.	B.C.	G.M.	B.C.	V.V.	"
30.	B.C.	G.M.	Z.C.	V.V.	"
1-10.	J.K.	G.M.	Z.C.	A.Č.	"
2.	C.J.	G.M.	J.K.	V.Č.	"
3.	C.J.	G.M.	Z.C.	V.K.	"
4.	C.J.	J.K.	F R E E		
5.	E X C U R S I O N				
6.	C.J.	J.K.	C.Z.	S.E.M.	
7.	J.K.	Z.C.	V.R.	S.E.M.	CLOSING CEREMONY

A B S T R A C T S

XI ISYA, Hvar, 1980

Interplanetary Matter (Zdenek Ceplecha)

1. Different manifestation of interplanetary matter: asteroids, comets, meteorites, meteoroids, meteoric dust, zodiacal light and their interrelations.
2. Meteor phenomenon: four different types depending on the mass of the colliding body: meteoric craters, meteorites, meteors and meteoric dust.
3. Theory of meteoroid penetration through the atmosphere.
4. Observations of meteors: visual, photographic, spectroscopic, TV, fireball networks, meteoric dust, interpretation of meteor spectra.
5. Fireballs and meteorites: classifications and relations to the other sorts of interplanetary matter.

References:

Cosmic Dust; edited J.A.M.McDonnell; John Wiley and Sons, Chichester 1978

Comets, Asteroids, Meteorites; edited A.H.Delsemme, The University of Toledo, USA, 1977

### Evolution of Binary Systems

1. Importance of studying binary systems. Old classifications of binary stars.
2. Restricted three bodies problem and the Roche model for binary stars.
3. Evolutionary paradox of Algol-type binaries. Early works on evolution of close binaries.
4. Modern classification of double stars.
5. Evolution of a single star and the behaviour of its radius.
6. Extreme values of the radii and critical periods.
7. Mass exchange in Case A, B, and C.
8. The behaviour of the secondary component.
9. Peculiar groups of binaries: eruptive binaries, symbiotic stars, Planetary nebulae, X-ray sources in binaries.

#### References:

- a) Handbuch der Physik. Bd. 50 - pag. 187-273. Springer Verlag. 1958.
- b) M. Plavec, Mass exchange and evolution of close binaries. *Advances in Astronomy and Astrophysics* 6, 201, 1968.
- c) B. Paczynski, Evolutionary Processes in Close Binary Systems. *Annual Review of Astronomy and Astrophysics*, 9, 183, 1971.
- d) A. Batten, Binary and Multiple Systems of Stars. Pergamon Press, 1973.
- e) H. Thomas, Consequences of Mass Transfer in Close Binary Systems; *Annual Review of Astronomy and Astrophysics*, 15, 127, 1977.
- f) Nonstationary Evolution of Close Binaries. Edited by Anna N. Zytkow. Polish Scientific Pub. - Warszawa 1978.
- g) J. Sahade, F. B. Wood, Interacting Binary Stars - Pergamon Press, 1978.

Spectroscopy

1. Spectral classification
2. Stellar rotation
3. Quantitative analyses. Curve of growth
4. LTE models of atmosphere. Non- LTE effects.
5. Chemical composition of stellar atmospheres.  
Effect of age and galactic rotation.
6. Chemically peculiar stars (Ap, Am).

Bibliography

- 2) Handbuch der Physik. Bd. 50 and 51. Springer VIg. Stellar Surfaces and Stellar Structure.
- b) C.R.Cowle, The theory of stellar spectra
- c) M.Hack, O.Struve, Stellar Spectroscopy. Vol. 1 and 2. Osservatorio Astronomico di Trieste.
- d) Mihalas, Stellar Atmospheres.

Title of the course: Practical Astronomy.

- Topics:
1. The stars around the north pole.
  2. Some autumn constellations.
  3. The daily rotation of the earth.
  4. Simple measurements with an altimeter.
  5. Lunar eclipses.
  6. The position of the planets in their orbits.
  7. The orbit of Mars as determined by Kepler.
  8. The shape of lunar craters.
  9. The rotation of Saturn.
  10. The brightness distribution over the sun's disc.
  11. The solar spectrum.
  12. Profiles of Fraunhofer lines.
  13. Sunspots.
  14. The rotation of the sun.
  15. To draw a constellation.
  16. The atmospheric extinction.
  17. The nearest stars.
  18. Stellar spectra.
  19. The motion of the Hyades.
  20. The observation of double stars.
  21. The dynamical parallax of binary stars.
  22. The observation of star clusters and nebulae.
  23. Open clusters.
  24. The distribution of stars in a globular cluster.
  25. The Milky Way.
  26. The spiral structure of galactic clouds, derived from 21 cm measurements.

Literature:

- M.G.J. Minnaert  
Practical work in elementary astronomy  
Reidel Publishing Company 1969  
Dordrecht
  
- G.O. Abell  
Realm of the universe  
Holt, Rinehart and Winston - Inc. 1976  
London



- E. Smith and K. Jacobs  
Introductory astronomy and astrophysics  
W.B. Saunders Company 1973  
London

Implements:

Slide rule or small electronic calculator  
protactor and ruler  
pair of compasses  
pencil and eraser  
drawing paper  
rectangular co-ordinate paper

C. de Jager

ASTROPHYSICS FROM SPACE

SOLAR OBSERVATIONS

1. Solar Active Regions
2. Solar Flares

STELLAR ASTROPHYSICS

3. The Brightest Stars
4. Stellar Spectroscopy; Types of Stars
5. Evolution of Massive Stars
6. Atmospheres of Supergiants
7. Stellar Winds
8. Supergiant Variability

SOLAR PHYSICS (selected topics)

J.Kleczek

1. THE SUN - geometry (distance, shape, size, rotation);  
matter (chemical composition, physical properties);  
energy (rotational, heat, radiative);  
as a star (location in the HR diagram, position in  
the Galxy, age).
2. ORIGIN AND EVOLUTION
3. STRUCTURE - forces shaping and evolving the Sun (gravitation,  
weak, electromagnetic, nuclar);  
atmosphere and interior.
4. SOLAR ACTIVITY - solar magnetic fields, their structure and  
evolution, interaction with solar plasma.
5. PHOTON RADIATION - in the interior and in the atmosphere,  
solar spectrum (its formation, variability, and  
enery eontent),  
history of solar photons (in general, incident  
on the Earth, in terrestrial atmosphere, on li-  
thosphere, hydrosphere and biosphere).
6. CORPUSCULAR RADIATION - solar wind, interplanetary storms,  
solar cosmic radiation.
7. SOLAR-TERRESTRIAL RELATIONS - magnetosphere, ionosphere,  
troposphere, biosphere, the Sun in the service  
of Mankind.
8. SOLAR RESEARCH - methods, observatories, publications,  
recommended literature for further studies of  
solar physics.

Introductory literature:

- D. Menzel: Our Sun, 2nd edition, Cambridge 1959  
(also in Russian translation Naše Solnce, Moskva 1963).  
/for complete beginners in solar physics/  
C.de Jager: Structure and Dynamics of the Solar Atmosphere, in  
Handbuch der Physik, Band LII, Springer 1959.  
(also in Russian translation Strojenije i dinamika  
atmosfery slonca, Moskva, 1962).

## ASTRONOMICAL SPECTROSCOPY

### SYNOPSIS.

Observational and theoretical aspects of stellar spectra will be discussed with the aim to show what stellar spectra can reveal. Both the continuum and the spectral lines of a stellar spectrum will be studied. Particular emphasis will be given to the possible mechanisms which may broaden stellar spectral lines or which may affect their shapes. The quantitative analysis of a stellar spectrum leads to the deduction of the physical state and the chemical composition of the stellar gas which produces the observed spectrum.

It is expected that the participants are familiar with elementary spectroscopy and atomic structure.

### LITERATURE.

- G. Athay: Radiation Transport in Spectral Lines. (Reidel, Dordrecht, 1972)
- B. Baschek, W. H. Kegel, G. Traving (editors): Problems in Stellar Atmospheres and Envelopes. (Springer, Berlin, 1975)
- Ch. R. Cowley: The Theory of stellar Spectra. (Gordon & Breach, New York, 1970)
- A. Dalgarno, F. Masnou-Seeuws, R. W. P. McWhirter: Atomic and Molecular Processes in Astrophysics. (Cours Saas-Fee 1975, Observatoire de Genève)
- D. G. Gray: The Observation and Analysis of Stellar Photospheres. (John Wiley & Sons, New York, 1976)
- M. Hack (editor): High Resolution Spectroscopy. (Osservatorio Astronomico di Trieste, 1978)
- J. T. Jefferies: Spectral Line Formation. (Blaisdell, Waltham, 1968)
- D. Mihalas: Stellar Atmospheres, 2nd. edition. (Freeman, San Francisco, 1978)
- D. Mihalas, B. Pagel, P. Souffrin: Theorie des Atmosphères Stellaires. (Cours Saas-Fee 1971, Observatoire de Genève)
- Ch. Pecker-Wimel: Introduction à la Spectroscopie des Plasmas. (Gordon & Breach, New York, 1967)
- G. B. Rybicki, A. P. Lightman: Radiative Processes in Astrophysics. (John Wiley & Sons, New York, 1979)

1980 I A U - UNESCO<sup>15</sup> SUMMER SCHOOL

HVAR, Yugoslavia

-----

Course Title: PLANETS AND SATELLITES

Lecturer: Guido Münch  
Max-Planck-Institut für Astronomie  
Heidelberg

Abstract

The course will offer a fundamental introduction to the physical study of the planets. An emphasis will be given to the interpretation of results recently derived, in regard to the

- 1) Internal Structure
- 2) Atmospheres
- 3) Magnetospheres
- 4) Satellites
- 5) Rings

of Jupiter and Saturn, from the experiments performed in the Pioneer 10-11 and Voyager spacecraft.

References

Elementary level: Moons and Planets, W. K. Hartmann,  
Wadsworth Pub. Co., Belmont, CA, 1973

Advanced level: Jupiter, T. Gehrels, Edit. Part 1  
Univ. of Arizona Press, 1976

Spacecraft Results:

SCIENCE Vol. 204, No. 4396, 1 June 1979  
Vol. 207, No. 4479, 25 Jan. 1980  
NATURE Vol. 280, No. 5725, 30 Aug. 1979

**Galaxies (Paris Pismis)**

**Overview of the observational material**  
**Velocities of stars and gas clouds**  
**Proper motions and radial velocities**  
**Solar motion and the definition of standard of rest**  
**Ellipsoidal description of random motions**  
**Rotation of the Galxy**  
**Derivation of the Oort formula**  
**Kinematics of spiral galaxies**  
**Total mass and mass distribution of spiral galaxies**  
**Global characteristics of galaxies**  
**Classification of galaxies**

**Interstellar Matter**

**Gas and dust**  
**H II regions**  
**Fabry Perot interfereometry and motions of H II regions**

TITLE : ASTRONOMICAL TECHNICS:

List of Topics:

- 1.- Introduction
- 2.- Telescopes and flux collector
- 3.- Detectors in Astronomy
- 4.- Photometers
- 5.- Bidimensional detection
- 6.- Spectrophotometers and Interferometers

Recommended literature:

- 1970 .- Born & Wolf. Principles of Optics.
- 1970 .- Meaburn. Astronomical Spectrometers.
- 1972 .- Rackham. Astronomical Photography.
- 1974 .- Gehrels. Planets, Stars and Nebulae, studied with photopolarimetry.
- 1976 .- Meaburn. Detection and Spectrophotometry of Faint Light.
- 1976 .- Meeks. Methods of experimental physics. Vol. 12 Part.A.
- 1977 .- Fazio . Infrared and submillimeter astronomy.
- 1978 .- Setti. Infrared Astronomy.

selected topics:

1. single particles in a magnetic field,  
related phenomena: van Allen-belt, Crab nebula.
2. frozen-in fieldlines,  
related phenomena: solar prominences, magnetic fields of  
compact stars.
3. magnetohydrostatic equilibria,  
related phenomena: prominences, sunspots, magnetopauses.
4. the Dynamo problem and Cowling's theorem,  
related phenomena: expulsion of magnetic flux by convection  
and by vortices in general.
5. dynamos with Lorentz-forces,  
related phenomena: solar dynamo, comets in the solar wind,  
double radio sources, SS 433.
6. waves in a plasma,  
related phenomena: penumbral waves, coronal waves, Faraday  
rotation and pulsar drifts in the inter-  
stellar medium.
7. instabilities in a plasma,  
related phenomena: stability of sunspots, instability of  
magnetic fields in disks (galactic and  
accretion).

literature:

- T.G. Cowling: Solar Electrodynamics in G.P. Kuiper: The Sun  
Chicago 1953
- T.G. Cowling: Magnetohydrodynamics, Interscience New York 1957
- R. Kippenhahn, C. Möllenhoff: Elementare Plasmaphysik, B.I.  
Wissenschaftsverlag Mannheim 1975
- L. Mestel, N.O. Weiss: Magnetohydrodynamics, Swiss Society of  
Astronomy and Astrophysics, Geneva Observatory 1974
- L. Spitzer jr.: Physics of Fully Ionized Gases, Interscience  
New York 1962
- theoretical reviews of solar activity:
- E.N. Parker: Origin of Solar Magnetic Fields, Ann. Rev. Astron.  
and Astrophysics 8, 1 (1970)
- E.N. Parker: Origin of Solar Activity, Ann. Rev. Astron. and  
Astrophysics 15, 45 (1977)



ATOMIC PHYSICS AND SPECTRA FORMATION

Vladis Vujnović  
Institute of Physics of the University, 41000 Zagreb,  
P.O.B.304 Yugoslavia

Abstract

Mechanical model of atom, magnetic dipole moment and precession in outer magnetic field. Quantization of angular momenta and their components. Application in Stern-Gerlach experiment, Zeeman effect and Stark effect.

Systematics of atomic spectra and selection rules.

Continuum radiation of plasmas: bremsstrahlung, recombination radiation and other continua.

Line radiation: Einstein probability coefficients and oscillator strengths, line intensities in local thermal equilibrium, width and shape of spectral lines. Note on line intensities in the absence of the local thermal equilibrium.

The absorption coefficient and relation of emission and absorption. Curve of growth.

References:

1. A.P.Thorne, Spectrophysics, Chapman and Hall, London, 1974
2. B.Cagnac and J.C.Pebay-Peyroula, Modern atomic physics, The Mac Millyn Press, Ltd, 1975

BLACK HOLES

Andrej Čadež, University of Ljubljana

ABSTRACT

Black holes as stationary empty space solutions of Einstein's equations will be discussed. The study of timelike and null geodesics in the region outside the horizon describes the physical properties of the external solutions. Horizons and the analytic continuation of the external solution beyond the horizon will next be touched upon. This will lead to the global space-time diagrams for black holes.

Reversible and irreversible transformations of black holes will be considered in the next section. The three laws of black hole thermodynamics derived in this way will be the starting point for the discussion of quantum effects in the field of black holes.

The quantum mechanical vacuum state in the field of a Schwarzschild/ black hole will be discussed in the final section and the Hawking result on the emission of radiation from a black hole will be derived.

References:

- C.D.DeWitt, B.S.DeWitt ed.: Black Holes, Les Houches Summer School 1972, Gordon and Breach 1973
- C.W.Misner, K.S. Thorne, J.A. Wheeler: Gravitation, Freeman, San Francisco 1973
- S.W.Hawking, G.F.R. Ellis: The large Scale Structure of Space-Time, Cambridge University Press, London, 1973
- J.D.Beckenstein: Phys.Rev. F7, 2333/1973/
- S.W.Hawking: Nature 248, 30 /1974/
- L.Parker: Phys.Rev. D12, 1519 /1975/
- J.D.Beckenstein: Phys.Rev. D12, 3077 /1975/

SOLAR RADIO BURSTS

Vladimir Čadež, Institute of Physics,  
Beograd

Abstract

In the first, the introductory, section the basic characteristics of various waves propagating in solar plasma will be reviewed and discussed. Some attention will be paid to instabilities (like the beam instability etc.) appearing in wave generating mechanism models and their relation to electromagnetic radio emission.

The second part contains observational descriptions of various types of solar radio spectra, their classification and locations of sources for the particular kind of radio emission.

Finally, at the end, the physical mechanisms and models for related radio bursts will be reviewed and discussed.

References:

1. P.S.McIntosh and M.Dryer editors: "Solar Activity Observations and Predictions". The MIT Press, Cambridge Mass., USA (1972).
2. M.R.Kundu: "Solar Radio Astronomy". Interscience Publ., New York (1965).
3. D.B. Merlrose; Sol.Phys. 43, 211-236 (1975).
4. Ø.Elgarøy; Astron.Astroph. 82, 308-313 (1980).
5. P.Kaufmann; Sol.Phys. 60, 367-381 (1978).
6. L.M.Bakunin, A.K.Markeev, V.V.Fumichev and I.M.Chertok; Sov.Astr.23, No.3 (Astron.Zhur. 56, 549-561 (1979) in Russ.).
7. R.T.Stewart; Sol.Phys. 58, 121-126 (1978).
8. K.Papadopoulos, H.P.Freund; Geophys.Res.Lett. 5, 881-884 (1978).

STARK BROADENING AND ITS ASTROPHYSICAL APPLICATIONS

Milan Dimitrijević  
Institute of Applied Physics  
11001 Beograd, P.O.Box 24, Yugoslavia

Spectral analysis of line and continuum radiation from cosmical plasmas is often the main source of information for an astronomer. Typical astrophysical problems for which an investigation of line shapes induced by interaction with particles and fields is important, are: diagnostic of cosmical plasmas, radiative transfer in the stellar plasma, determination of abundances of elements from profiles of absorption lines and investigation of radio recombination lines in ionized hydrogen regions.

In this lecture, various line broadening mechanisms and their astrophysical and practical implications will be discussed. Also, a review of modern theoretical methods for the calculation of Stark broadening parameters will be given, with an emphasis on approximative methods, useful for large scale calculations. Available experimental data obtained from laboratory plasmas, will be critically examined.

References:

Introductory treatment:

1. H.van Regemorter, Spectral Line Broadening (in "Atoms and Molecules in Astrophysics" ed. by T.R.Carson, M.J.Roberts) Academic Press, London and New York, 1972, p. 85
2. A.P. Thorne, Spectrophysics, Chapman and Hall & Science Paperbacks, London, 1974
3. B.E.J.Pagel, Importance of Spectral Line Shapes in Astrophysics, J.Phys.B: Atom.Molec.Phys. 4, 279 (1971)
4. G.Peach, The Width of Spectral Lines, Contemp. Phys. 16, 17 (1975)

Detailed treatment:

5. H.R.Griem, Spectral Line Broadening by Plasmas, Academic Press, New York and London, 1974
6. I.I.Sobelman, L.A. Vainshtein, E.A. Yukov, Excitation of Atoms and Broadening of Spectral Lines, Springer Series in Chemical Physics, Vol. 7, Berlin 1979

Reviews of experimental data:

7. N.Konjević, W.L.Wiese, J.Phys.Chem.Ref.Data, 5, 259 (1976)
8. N.Konjević, I.R.Roberts, J.Phys.Chem.Ref.Data, 5 209 (1976)

THE PHOTOSPHERIC VELOCITY FIELDS AND RELEVANT EFFECTS

M. K a r a b i n

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**Abstract.** One review of our present knowledge of the photospheric motions of different scale will be given. We will concentrate on surface motions of the quiet Sun, which are subject to direct observations, namely: Oscillations, Granulation, Supergranulation, Large and Global scale motions. Methods of direct observations are mentioned, calling attention to difficulties associated with interpretation of Doppler shift measurements. Modern technique has made it possible to detect the velocity field of the solar surface to a sensitivity of few m/s.

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QUASISTATIC LINE-WING BROADENING AND COLLISIONAL  
REDISTRIBUTION OF RADIATION BY NEUTRAL PARTICLES

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Abstract

Quasistatic line-wing broadening will be discussed with emphasize to astrophysical applications. Far and very far wings of the strong (usually self-reversed) resonance lines will be described using the interaction potential curves and simple quasistatic approximation. Self and foreign-gas broadening as the principal source of broadening in relatively cool stellar atmospheres and interstellar gas will be discussed. The appearance of the extrema in the difference of the potential curves of the interacting atoms.

Recent experimental and theoretical work in the field of neutral atom broadening will be discussed, especially in connection with the collisional redistribution of radiation.

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SOLAR GRANULATION METROLOGY VIA COHERENT OPTICAL  
FOURIER ANALYSIS

V. Ruždjak

Dimensional and statistical metrology of the solar disc photosphere granular structure is performed fast and easy by optical Fourier analysis. Granule average diameter and its statistical distribution are obtained from the two-dimensional Fourier spectrum of the granulation pictures. Basic principle of the procedure and development of a hybrid opto-digital set up is described.

Literature :

J.W. Goodman " Introduction to Fourier Optics "  
McGraw-Hill 1968.

J.D. Gaskill " Linear Systems, Fourier Transforms, and Optics "  
John Wiley and sons, 1978.

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CONCLUDING REMARKS

The School proceeded smoothly, according to the Program / see enclosure /. Most of the young astronomers gave a short seminar / see enclosure /. An important feature of our School was a continuous contact of the young astronomers with all the lecturers. The contact showed to be fruitful, in the sense, that the young astronomers discussed their scientific problems and their work with the lecturers and asked for the orientation in their future work at home institutes. Some invitations have been extended to young astronomers during the School and different types of collaboration have arisen.

We would like to stress the friendship and comradeship among all the participants, which contributed much to the mutual understanding of all the participating astronomers from different countries. Besides raising the standard of knowledge, it was an important result of the School contributing to the future international collaboration of the Balcan and Mediterranean countries in the field of astronomy.

Hvar, October 8, 1980.

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Prof. J. Kleczek

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*V. Ruždjak*  
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Dr. V. Ruždjak

Deputy Director



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Zoran Knežević : "Astronomy in Yugoslavia"  
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Levent Altas : "Kandilli Observatory"  
Mary Kontizas : "UBV Photometry"  
E. Theodossiou : "Effective Temperatures of Early-Type  
Stars"  
Mary Kontizas : "Star Clusters in Small Magellanic  
Cloud"  
Vangelis Kontizas: "Temperatures of Early-Type Stars"  
Zsuzsanna Vizi : "Distance Correction in Galaxy"  
Bojan Dintanjana : "Photometry"  
H. Dara-Papamargariti: "Surges"  
Bojan Vršnak : "Internal Motions in Solar Prominences"  
László Kondás : "Sunspot Motions and Solar Flares "  
M. Muminová : "Voyager Mission (Jupiter and Moons)"

XI IAU-UNESCO SCHOOL FOR YOUNG ASTRONOMERS, HVAR 1980

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Direct Payments to Hvar School

IAU 1st and 2nd payment	Din. 162 870
Local sources	<u>248 800</u>
Total	<u>410 870</u>

Expenses paid directly by the Faculty of Geodesy

Accommodation of all participants and lecturers	260 760
Travel: B. Cester, M. Hack, V. Vujnović, G. Pichler, D. Vukičević, M. Dimitrijević	13 420
Lecture fees Cester, Hack, Sanchez-Magro, Vujnović, Pichler, Vukičević, Dimitrijević	11 000
2 Excursions	50 000
Rent of lecture room	20 000
Printing of programs, diplomas, announcements, postage	22 163
Copying of exercises and implements for practical training	5 125
Pocket money	11 800
Coffee twice a day	12 000
Travel grants	8 800
Sightseeing	1 500
Transport of instruments and custom formality fees	3 877
Opening dinner	5 000
Closing dinner	7 000
Total	<u>432 445</u> (\$16,235)
<u>Final payment claimed from IAU</u>	<u>21 575</u> (\$810)