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ASTRONOMICAL INSTITUTE

NATIONAL OBSERVATORY OF ATHENS

ANNUAL REPORT 1976

Staff: Prof. G. Contopoulos was granted a twelve month leave of absence in order to work in Geneva from October 1, 1976.

Prof. M. Moutsoulas is replacing Prof. Contopoulos as director of the Institute during that period.

Mr. D. Dialetis, graduate in Mathematics was appointed assistant of the Institute on October 18th.

Miss K. Stamoula graduate in Mathematics and Mr. J. Douros graduate in Physics were appointed solar observers on the Razdow telescope on May 10th.

Mrs. D. Georgoussis and I. Anagnostopoulos were appointed observers at Kryonesi on May 1st.

Mrs. V. Santarmis and A. Papas were appointed on 1/3/76 and 1/4/76 as guards of the Kryoneri Astronomical Station.

Equipment: The installation of the mirror - aluminising plant at the Astronomical Station of Kryoneri was completed in November.

An order for the construction of a plate - holder with guiding system for the 48'' telescope was placed with Grubb Parsons.

An infrared photometer for the 48'' telescope is under construction at the Royal Observatory of Edinburgh.

An order for the provision of an isodensity tracing system working with the Joyse Loebel microdensitometer was given.

A spectrum scanner has been borrowed for a six month period from the Royal Observatory of Edinburgh.

Workshop: Messrs. E. Sigalas, J. Zacharopoulos, A. Vousas and Ch. Bourdas participated in the installation of the mirror aluminising plant in the Astronomical Station of Kryoneri collaborating with the engineer of Edwards Hight Vacuum Company.

Messrs. E. Sigalas and Ch. Bourdas prepared the instruments for observing the solar eclipse at Santorini and Mr. J. Zacharopoulos adjusted the celostat.

Observations:

1. **Sun:** The Razdow flare-patrol telescope was in continuous operation at the Pentele Station. Hz filtergrams were systematically obtained during the whole year. These observations were carried out by observers of the A.W.S. group until 1st October. After that date the observations were continued by K. Stamoula and J. Douros.

Radiomonitoring of the Sun was pursued on 1415, 2695, 5000 and 8000 MHZ.

Dr. Prokakis, Mr. P. Elias and Mr. D. Dialetis observed the annular solar eclipse from Santorini with the technical assistance of Mr. E. Sigalas and Ch. Bourdas.

Mr. D. Elias continued almost daily observation of Sunspots in Athens and Pentele for the determination of their position, number and type.

2. **Planets:** The observation of Mars and Jupiter within the international Planetary Patrol program in collaboration with the Planetary Data center of the Lowell Observatory was continued by Mr. E. Sarris and Dr. P. Rovithis under the supervision of Dr. C. Banos.

As a result of this international cooperation program of observations during 1975-1976, a map of Mars has been prepared by the Lowell Observatory.

Dr. C. Banos began his research program on Jupiter with the 48'' telescope of Kryoneri Station.

3. **Comets:** Mr. D. Elias performed systematic observations of the position and brightness of various Comets.

4. **Stars:** Dr. Rovithis continued the observations of the eclipsing binary Dr. Vul with the 48'' telescope.

Mr. Kontizas carried out spectrophotometric observations of normal and peculiar early type stars with the 48'' telescope.

Mr. D. Elias continued his observations of variable stars, flare stars and novae.

5. **Study of seeing:** Seeing observations were carried out in the Astronomical Station of Kryoneri by D. Georgousis and A. Anagnostopoulos.

Dr. Th. Prokakis and Mr. D. Dialetis pursued ΔT observations in the Astronomical Station of Pentele.

Time Service: Routine work was carried out by Messrs. D. Elias and J. Zacharopoulos.

Research: Dr. C. Banos continued his work on the atmosphere of Jupiter, specially on the brightness of the Red spot belts and zones.

Dr. Th. Prokakis studied phenomena of the solar activity as well as seeing conditions during solar observations. He also studied the zenith brightness during the annular eclipse of the Sun.

Mr. E. Sarris completed his work on the restricted three-body problem and studied the motion integral in the three dimensional space.

Dr. P. Rovithis studied the velocity field of the nebula M—8 and supernova remnants in collaboration with Dr. Meaburn. He also studied the nova Cygni 1975 and photometric observations of U. Her.

Mr. E. Kontizas studied the intrinsic energy distribution of early type stars and their effective temperatures.

Mr. D. Diabetis studied the distribution of solar flares during the years 1965-1972 as observed from Athens. He also studied the results of zenith brightness photometry during the solar eclipse of 29th April.

International Cooperation: Drs. Th. Prokakis and P. Rovithis attended the XVth General Assembly of the IAU in Grenoble.

Mr. E. Kontizas spent five months at the Royal Observatory of Edinburgh working on his thesis.

Dr. P. Rovithis spent one month at the Haute Provence Observatory and the University of Manchester. He collaborated with Drs. Imbert and Nandy in spectroscopic observations and with Dr. Meanburn in the study of supernova remnants.

Dr. M. J. Smyth spent five days at Kryoneri working with a spectrum scanner, in collaboration with M. Kontizas and E. Kontizas.

Dr. Nandy of the Royal Observatory of Edinburgh spent ten days at Kryoneri using the spectrum scanner.

Dr. Ch. Goudis and Mr. P. Johnson of the Manchester University spent fifteen days at Kryoneri working with the U.B.V. photometer of the Institute.

Publications:

1. Contopoulos, G. and Banos, C.: The new Greek 48'' telescope; Sky and telescope, 1976 Vol. 51, No. 3.

2. Elias, D.: The annular Solar eclipse of April 29, 1976. Memoirs of the National Observatory of Athens, Series I Astronomy, No. 18.

3. Kontizas, E., Kontizas, M., and Smyth, M.J., 1976: Absolute spectrophotometry of Nova Cygni, 1975. M.N. R.A.S., 76, p. 79.

4. Kontizas, E., Nandy, K., 1976: The effective temperature of early type stars, Proc. 3rd European Astronomical meeting Tbilisi 82.

5. Kontizas, E., Papathanasoglou, D., and Deligianis, J., 1976: Spectrographic determination of the chromatic Curve of a refracting telescope. Observatory 96, 158.

The activities of Drs. G. Contopoulos and M. Moutsoulas are described in the report of the Department of Astronomy of the University of Athens.

The Director of the Institute
Professor M. MOUTSOULAS

DEPARTMENT OF ASTRONOMY

UNIVERSITY OF ATHENS

ANNUAL REPORT 1976

Staff: Professor G. Contopoulos is spending one year at the European Southern Observatory (ESO), and with GERN, Geneva, from September 1976; he is on sabbatical leave from the University of Athens. Professor M. Moutsoulas is Acting Director of the Department for the same period.

Dr. P. Laskarides has submitted a thesis on the atmospheric models of δ Cephei stars to the Faculty of Sciences of the University of Athens and received the title of Assistant Professor of Astronomy at the University of Athens (April 1976).

Dr. E. Spithas of the Department of Astronomy of the University of Thessaloniki, joined the Department of Astronomy of the University of Athens in August 1976.

Dr. H. Livaniou continued post-graduate studies at the University of Manchester; she is on leave of absence from the University of Athens. She was awarded a Ph.D. in Philosophy on December 1967.

Mrs. M. Kontizas has spent five months in Britain, at the Royal Observatory of Edinburgh in order to complete her post-graduate studies at the Astronomy Department. She submitted her Ph.D. thesis at the University of Edinburgh in December 1976.

Dr. D. Papathanasoglou received his Doctor's degree in Physics from the Faculty of Science, University of Athens in May 1976.

Mr. D. Vaïopoulos, submitted to the Faculty of Sciences of the University of Athens his thesis on Stellar Evolution with variable G in September 1976.

Mr. P. Niarchos and Miss E. Antonopoulou continued their post-graduate studies at the University of Manchester and the University of Edinburgh respectively; they are both on leave of absence from the University of Athens.

Mr. S. Theodosiou, B.Sc. in Mathematics, was appointed Laboratory Assistant in March 1976.

Miss A. Papadopoulou was appointed Secretary of the Department in December 1976.

IAU: The IAU Secretariat remained in Athens until the General Assembly of the IAU in August 1967. After the General Assembly Dr. G. Contopoulos was replaced as General Secretary by Prof. E. Müller. The permanent staff of the Secretariat, Dr. A. Jappel and Mrs. J. Dankova moved to the University of Lausanne.

G. Contopoulos took part in the organization of the 16th General Assembly in Grenoble (24 August - 2 September). He was also the Editor of the IAU Transactins 16A, (Reports on Astronomy) containing the reports of the 40 IAU Commissions, which appeared in three volumes. One IAU Information Bulletin was published in June 1976.

G. Contopoulos participated at two officers' Meetings, one in Athens and one in Tucson, USA, and at the Meetings of the Executive Committee in Grenoble. He remains a consultant of the new Executive Committee of the IAU.

Other activities :

1) G. Contopoulos was elected member of the Council of the Astronomy and Astrophysics Division of the European Physical Society. He is also a member of the Board of Directors of the European journal «Astronomy and Astrophysics» and member of the Astronomy Committee of the European Science Foundation.

2) M. Moutsoulas was appointed Chairman of the Working Group I (Figure and Rotation of the Moon) of Commission 17 of the IAU. He is also a member of the NASA Lunar Photography and Cartography Resources Committee and of the Working Group 7 (The Moon and Planets) of COSPAR. M. Moutsoulas is also the Associate Managing Editor of the

International Journal «The Moon» and the Assistant Editor of the «Astrophysics and Space Science».

3) Dr. D. Dionysiou visited and had scientific communications with the Professors of the University of London, England, for ten days.

4) Dr. D. Dionysiou was elected member of the IAU and the Royal Astronomical Society (England).

Research: I. Galactic Dynamics and Related Fields:

1) G. Contopoulos and C. Merzanides studied the orbits of stars near the inner Lindblad resonance of a barred galaxy both theoretically and numerically. A paper on this subject is under preparation.

2) G. Contopoulos studied the non-linear self-consistent problem in spiral galaxies including resonances. The resonant form of the distribution function was found and the response density was calculated. Then the self-consistency conditions were expressed explicitly.

3) Th. Papayannopoulos, in collaboration with G. Contopoulos, developed the theory of orbits near the particle resonance of a spiral galaxy. A new integral of motion was used to derive the periodic orbits and trapped orbits near the stable Lagrangian points L_4 and L_5 . Extensive numerical calculations were also made. The agreement with theory was very good.

4) G. Contopoulos with Mrs. E. Athanassoula studied various solutions of Poisson's equation in Spiral galaxies. The simple formula of Kalnajs - Lynden - Bell is not applicable if the wave number (k) increases with distance.

5) Mrs. E. Athanassoula with G. Contopoulos studied the applicability of Lin's linearized theory of spiral waves by including the effects of resonances and calculating the forcing by means of the basic integral equation.

6) C. Terzides with G. Contopoulos calculated the dispersion relations of Lin-Shu and Kalnajs - Lynden-Bell for various galactic models with halos and for various dispersions of velocities.

7) Dr. E. Spithas is investigating spiral structure using Whitham's averaged Lagrangian method. Using Dewar's formulation of the problem and adapting results he obtained in the sace of plasma physics, he calculated the dispersion relation of Lin-Shu (as was done by Dewar), that of

Lynden-Bell and Kalnajs, and others based on several steady-state distribution functions. He has also obtained steady-state distribution functions. He has also obtained equations describing nonlinear interactions of normal spiral modes.

II. Integrals of Motion:

1) G. Contopoulos studied the importance of resonances in limiting the applicability of various integrals in systems of more than 2 degrees of freedom. A paper on this subject was prepared. Further work is done in collaboration with Prof. Galgani and Dr. Giorgilli (Milan).

2) G. Contopoulos began a study of the asymptotic surfaces in systems of 3 degrees of freedom near unstable periodic orbits in collaboration with Prof. Martinet (Geneva).

3) P. Michaelidis, in collaboration with G. Contopoulos, applied the theory of Lie transforms in studying the 3:2 resonance in systems of 2 degrees of freedom.

4) Ch. Varvoglis, in collaboration with G. Contopoulos, studied a new integral of motion in various devices of plasma confinement.

III. Relativity:

1) G. Contopoulos and N. Spyrou found the center of mass of a system of N -extended bodies. A paper on this subject was published in the *Astrophysical Journal*.

2) G. Contopoulos and A. Zenios studied the integrals of motion in the vicinity of a perturbed Kerr black hole.

3) Dr. D. Dionysiou applied the 2-post-Newtonian Lagrangian of a N -body system to the problem of the secular shift of the perihelion of the orbit of two gravitating bodies of comparable mass up to 2-post-Newtonian approximation.

4) Dr. D. Dionysiou extended the theories of Einstein-Infeld-Hoffman (1938), Einstein-Infeld (1940) and Robertson (1938) into second order equations of motion, i.e. into the 2-post-Newtonian approximation.

IV. Lunar Research :

1) M. Moutsoulas worked on the selection of reference points linking

selenodetic systems based on Earth-based photography, orbital photography, radar mapping and visual observations by astronauts.

2) M. Moutsoulas worked at the Lunar Science Institute of NASA in Houston, Texas, on the establishment of an identification list for the 66 first-order selenodetic control points.

3) M. Moutsoulas worked at the DMA Aerospace Center in St. Louis, Missouri, on the location definition of selenographic control points based on photogrammetric measures of lunar craters.

V. Celestial Mechanics :

1) Dr. M. Zikides worked on some aspects of the restricted and Elliptic three-body Problem. He worked also with Mr. A. Pinotsis and Mr. E. Sarris on Problems of Celestial Mechanics.

VI. Stellar Evolution:

1) Mr. D. Vafiopoulos finished his study of stellar evolution from the Main Sequence with variable G under the supervision of Dr. P. Laskarides.

2) Dr. P. Laskarides and Mr. A. Pinotsis continued the study of the problems of stellar evolution with variable G .

VII. Variable and Early Type Stars :

1) Dr. P. Laskarides finished his work and published the results on the atmospheric model of beta Cephei stars.

2) Mrs. M. Kontizas worked on photographic photometry of star clusters in the Small Magellanic Cloud. She also carried out spectrophotometric observations with the 48" telescope of the Kryoneri Observatory for the determination of the continuum of early type stars in collaboration with Mr. E. Kontizas of the National Observatory of Athens. Mr. S. Theodosiou participated in the observations as part of his observational training.

3) Mrs. B. Kontizas worked in the interpretation of the spectral scanings of Nova Cygni 1975, which were taken at the Pentelisi Astronomical Station in August 1975.

4) Dr. P. Laskarides received a two year grant from the National Research Foundation to initiate spectrographic work with the Richardson spectrograph attached to the 26" refractor of the Pentele Astronomical Station. The Spectrograph case has been constructed and orders have been given for the purchasing of the electronic gear of the spectrograph. The program includes the spectrographic study of variable and early type stars.

5) Dr. H. Livaniou and Mr. P. Niarchos continued their work on the Fourier analysis of the light curves of eclipsing binaries.

VIII. Annular Solar eclipse of April 29th, 1976 :

1) M. Moutsoulas with Professor G. Veiss of the Technical University of Athens lead the expeditions for the Annular Solar Eclipse from Santorini. Establishment of coordinates of the observing sites were performed and all the necessary facilities were prepared for the foreign as well as the Greek expeditions.

Photographic and photoelectric observations of the phenomenon have been made as follows :

2) Dr. B. Papathanasoglou observed the eclipse from the island of Kos. Sky and Telescope (July 1976) has published some of his photographs of the eclipse.

3) Mr. J. Deliyannis and Mrs. M. Stathopoulou - Tsoga observed the eclipse from the island of Santorini.

4) Dr. M. Zikides observed the eclipse, as partial, from the University campus.

A study of the data of the above observers is now in progress.

IX. Infrared Astronomy :

Miss E. Antonopoulou continued her work in Infrared Photometry at the University of Edinburgh. As part of this program she observed in the infrared from the U.K. 1.5 m. flux collector on Tenerife (Izana Observing Station of the Institute of Astrophysics of the Canaries).

Publications :

1) G. Contopoulos (editor) : Transactions of the IAU. vol. 16A (Reports on Astronomy, parts 1, 2, 3, Reidel, Dordrecht, 1976.

2) G. Contopoulos : Strongly Perturbed Dynamical Systems, in V. Szebehely and B. D. Tapley (eds.) Long-Time Predictions in Dynamics, Reidel, Dordrecht, 1976, p. 43.

3) G. Contopoulos and P. Grosbol : The Past Positions of the Spiral Arms of our Galaxy, in E.K. Kharadze (ed), Proc. Third European Astron. Meeting, Tbilisi, 1976.

4. G. Contopoulos and N. Spyrou, *Astrophys. J.* 204, 592, 1976.

5) M. Moutsoulas : «Reference Points for Selenodetic Control», in Space Research XV, Proceedings of the 17th Plenary Meeting of COSPAR, pp. 65 - 70.

6) M. Moutsoulas and D. C. Kinsler : Selenodetic Control Network, The Moon, vol. 15, pp. 223 - 240.

7) M. Moutsoulas : Location Definition of Selenographic Control Points based on Lunar Craters, The Moon, vol. 16, pp. 193 - 198.

8) Z. Kopal, M. Moutsoulas and F. B. Waranius (eds) «Bibliography», The Moon, vol. 15, pp. 183 - 201.

9) Z. Kopal, M. Moutsoulas and F. B. Waranius (eds) «Bibliography» The Moon, vol. 15, pp. 485 - 514.

10) P. Laskarides : On the Pulsation of β Cephei stars (in Greek). Dissertation, Athens 1976.

11) H. Livaniou : «Fourier analysis of the light changes of distorted eclipsing systems. Photometric perturbations for total transit and partial eclipses, Ph.D. Thesis, Victoria University of Manchester, 1976.

12) D. Papathanasoglou : On the study of the quality of the Solar Image, Doctor's thesis, University of Athens, 1976.

13) D. Papathanasoglou, J. Deliyannis and Kontizas: Spectrographic Determination of the Chromatic Curve of a Retracting Telescope, The Observatory, 96, 158, 1976.

14) E. Kontizas, M. Kontizas and M. J. Smyth : Absolute spectrophotometry of Nova Cygni 1975. M.N.R.A.S. 187, 79, 1976.

Lectures :

G. Contopoulos gave seminars at the Kitt Peak Observatory, the Geneva Observatory and the European Southern Observatory.

Dr. D. Dionysiou gave two invited lectures in the International Post Graduate Summer School, Suceava, Romania on the subjects of Riemannian space and Relativity theory and Gravitational waves.

Dr. D. Dionysiou presented two papers in the Conference of Applied Mathematics, held in Thessaloniki, Greece, on «Gravitational Radiation from an isolated system of N—bodies in higher multipole moments» and «Gravitational Radiation from an isolated perfect fluid in higher multipole moments».

Meetings :

Drs. M. Moutsoulas, M. Zikides, D. Dionysiou and D. Papathanasoglou as well as Mr. J. Deliyiannis attended the IAU XVIth General Assembly in Grenoble, France (24.8.76 - 2.9.76).

Dr. H. Livaniou attended the Royal Astronomical Society Meeting held in Manchester, England (6-10.4.1976).

The Head of the Department
Professor M. MOUTSOULAS

ASTRONOMY DEPARTMENT UNIVERSITY OF THESSALONIKI

ANNUAL REPORT 1976

Staff : Dr. S. Persides continued as temporary Head of the Department.

Dr. N. Spyrou returned in October from the Institute of Astronomy of the University of Cambridge. Dr. C. Mertzanides was appointed Chief Assistant in August. Miss B. Kessidou resigned at the end of the year. Thus the staff of the Department consisted of the following :

1) Dr. S. Persides, assistant professor, 2) Drs N. Spyrou and C. Mertzanides, chief assistants, 3) Miss B. Kessidou, Mr. D. Papadopoulos, Mr. N. Caranicolas, Mr. P. Fylactopoulos, Mr. S. Avgoloupiis, and Mr. H. Varvoglis, assistants, 4) Mrs. F. Papageorgiou, Miss D. Mori and Mrs. C. Mertzanides, secretaries and Mr. K. Papadopoulos, technician.

Dr. G. Contopoulos, professor at the University of Athens, continued his collaboration with the Department in some research programs. Miss M. Petrou worked also in collaboration with the Department.

Research Programs :

I. Galactic Dynamics and Related Fields :

1) Dr. Contopoulos and Dr. Mertzanides completed a theoretical and numerical study of the periodic orbits near the Inner Lindblad Resonance of «weak bar» galaxies. A paper on this study is ready for publication.

2) Dr. Contopoulos and Dr. Mertzanides began a study of the families of the main resonant orbits in galaxies. This research is in progress.

3) Dr. Mertzanides continued the study of the non-linear effects near the Inner Lindblad Resonance of galaxies. A part of this study was published in Astronomy and Astrophysics.

4) Dr. Mertzaniades began a study of the velocity field in spiral and «weak bar» galaxies. A computer program producing the equivelocity contours of flat galaxies was developed.

5) Dr. Contopoulos and Mr. Varvoglis continued their work on the structure of the magnetic fields and the orbits of charged particles.

II. General Relativity :

1) Dr. Persides continued his study of wave phenomena in black-hole space-times. Three papers were published.

2) Dr. Persides and Mr. Papadopoulos continued the study of waves going through the horizon of a Schwarzschild black hole.

3) Dr. Persides and Miss Petrou completed a brief study of the configuration of a static field in Schwarzschild's space-time.

4) Dr. Spyrou worked on the post-Newtonian general relativistic tensor-virial equations for a system of extended bodies with internal motion and structure. Two papers were accepted by the Journal of General Relativity and Gravitation.

5) Dr. Spyrou continued the study of variational approaches to the energy in general relativity which he started with professor Lynden-Bell at the University of Cambridge.

6) Dr. Spyrou continued to work on the post-Galilean invariance of the post-Newtonian Eulerian equations of hydrodynamics. A paper is near completion.

III. Solar Physics :

Mr. Fylactopoulos and Mr. Avgoloupis continued their observations of various solar phenomena.

Publications :

1) S. Persides: Global Properties of Radial Wave Functions in Schwarzschild's Space-Time. I. The Regular Singular Points, Communications in Mathematical Physics 48, 165, 1976 = Contr. Astron. Dept. Univ. Thessaloniki, No. 83.

2) S. Persides: Global Properties of Radial Wave Functions in Schwarzschild's Space-Time. II. The Irregular Singular Point, Communications in

Mathematical Physics 50, 229, 1976 = Contr. Astron. Dept. Univ. Thessaloniki, No. 86.

3) S. Persides: A Master Differential Equation for Perturbations of a Schwarzschild Black Hole, Lettere al Nuovo Cimento 17, 444, 1976 = Contr. Astron. Dept. Univ. Thessaloniki, No. 87.

4) C. Mertzaniades: Plane Galactic Orbits near the Inner Lindblad Resonance, Astron. Astrophys. 50, 395, 1976 = Contr. Astron. Dept. Univ. Thessaloniki, No. 85.

5) G. Contopoulos and N. Spyrou: The Center of Mass in the Post-Newtonian Approximation of General Relativity, Astrophys. J. 205, 243, 1976 = Contr. Astron. Dept. Univ. Thessaloniki, No. 84.

6) N. Spyrou: Post-Galilean Invariance of the Post-Newtonian Eulerian Equations of Hydrodynamics, Astrophys. J. 209, 243, 1976 = Contr. Astron. Dept. Univ. Thessaloniki, No. 88.

Meetings:

Drs. Persides, Spyrou and Messrs Caranicolas and Varvoglis participated in the XVIth General Assembly held in Grenoble, France, from August 24 to September 2.

Dr. Persides participated in the Congress of Applied Mathematics held in Thessaloniki from August 16 to August 21.

Dr. Spyrou participated in a) the Conference on the Recent Developments in the General Theory of Relativity, held in Cambridge, England, from June 28 to June 30, b) the IAU Symposium No. 74 on Radio Astronomy and Cosmology, held in Cambridge, England, from August 16 to August 20 and c) the IAU Colloquium No. 41 on the Dynamics of Planets and Satellites and Theories of their Motions, held in Cambridge, England, from August 17 to August 19.

Lectures :

Drs. Persides and Mertzaniades gave a lecture in the Research Center for Astronomy and Applied Mathematics of the Academy of Athens.

Miscellaneous :

Drs. Spyrou and Mertzaniades were admitted as members of the IAU in August.

The Head of the Department
Asst. Professor S. PERSIDES

DEPARTMENT OF ASTRONOMY
TECHNICAL UNIVERSITY OF ATHENS
ANNUAL REPORT 1976

Staff : There have been no changes in the staff which consists of Chief Assistant Dr. M. Kyriakopoulos, B.Sc., and Assistants Mrs. K. Loukidelis, B. Math., Mrs. K. Babilis, B. Math., Mr. B. Kyriakou, civil engineer and rural and survey engineer of this University, and of Miss E. Cheretis rural and survey engineer of this University.

Teaching and Training : During the academic year 1975 - 76 Prof. J. Argyrakos, Head of this Department, assisted by his Chief Assistant Dr. M. Kyriakopoulos and Assistants K. Loukidelis, V. Kyriakou, K. Babilis and E. Cheretis delivered a course on General, Spherical and Practical Astronomy. A seminar was likewise held for the benefit of the last-year graduates, on special subjects. The courses were attended by 138 + 42 students of the third and fourth year respectively belonging to the School of Rural and Survey Engineers of this University. A course on Electronic computers was also held by Professor J. Argyrakos and Assistant N. Karamolengos.

Scientific Activities. Efforts are being continued for creating a program library for the computer. This would result in the automatization of the computing work. Several programs have been drawn. Assistant E. Cheretis has published a paper on «Calculations of the method of equal heights with the electronic computer» and Assistant C. Loukidelis is working on «Systems and Determinations of selenographic coordinates».

The Director
Professor J. ARGYRAKOS

RESEARCH CENTER FOR ASTRONOMY
AND APPLIED MATHEMATICS
ACADEMY OF ATHENS
ANNUAL REPORT 1976

Staff : On February 13, 1976, Dr. B. Tritakis was appointed Chief Assistant at the Center after resigning from his position as Assistant at the same Center. At the end of 1976 Dr. B. Petropoulos was appointed Assistant at the Center. The present staff consists of: 1) Ass. Prof. Dr. C. J. Macris, Director, 2) Dr. C. P. Poulakos, Chief Assistant, 3) Dr. B. P. Tritakis, Chief Assistant, 4) Mrs. H. C. Papamargariti - Dara, Assistant, 5) Mr. Th. G. Zachariadis, Assistant, 6) Dr. B. Chr. Petropoulos, Assistant, 7) Mr. M. C. Chondros, Secretary, 8) Mr. E. St. Tsioros, Technician, and 9) Miss E. D. Panoussi, Assistant of the Secretariat.

Research Programs :

During the year 1976 the following research programs were carried out:

- 1) Solar Activity and Terrestrial Phenomena, by Professor John Xanthakis and C. Poulakos and B. Tritakis.
- 2) Photometric Study on $Ca_{2,3,2}$ Spectroheliograms, by C. Macris and H. Papamargariti - Dara.
- 3) Photographic Study of Solar Corona with the help of photographs taken during total Solar Eclipses, by C. Macris and Th. Zachariadis.
- 4) Research on the Atmosphere of the Planet Mars and Venus, by C. Macris and B. Petropoulos.
- 5) Research on Galactic Structure and H II regions, by C. Poulakos.

Publications :

The following publications appeared in 1976 as contributions from the

Research Center for Astronomy and Applied Mathematics, Academy of Athens, Series I (Astronomy):

1) Atmospheric Pressure Variation in the Martian Atmosphere by C. J. Macris and B. C. Petropoulos. Praktika of the Academy of Athens, Vol. 51, pp 224-244, 1976 (Contribution No. 45).

2) Space Distribution of Early Type Stars in a Southern Milky Way Region, by C. Poulakos, Astron. Astrophys. Vol. 50. 11-14, 1976 (Contribution No. 46).

3) Analytical Expression of the Mean Annual Variations of the Precipitation within Various Latitude Zones of the Earth, by J. Xanthakis and B. Tritakis. Praktika of the Academy of Athens, Vol. 51, pp. 600-635, 1976 (Contribution No. 47).

4) Variations saisonnières de la pression dans l'atmosphère de Mars, by C. J. Macris et B. Petropoulos (C. R. de l'Académie des Sciences, Tom. 294 pp. 5-8 (S.B.), 1977 (Contribution No. 48).

5) Several H II Regions in the Near Infrared by C. Poulakos, Astron. Astrophys. Vol. 50, pp. 41, 1976.

Library :

220 new volumes and 1500 reprints, mostly from foreign institutions were secured by the library on an exchange basis.

Equipment :

In the course of 1976 the following equipment were acquired:

1) An extension of the Memory of the electronic calculator Hewlett - Packard 9820.

2) 5 Pocket electronic calculators H-P.

3) A complete equipment for a photographic laboratory. The Value of the instrumentation amounted to 780.000 Drs. was covered from the public Investments.

Scientific Committees:

Secretarial assistance has been offered by the Research Center for Astro-

nomy and Applied Mathematics to the following scientific committees, which are presided by Prof. J. Xanthakis.

- 1) Greek National Committee for Astronomy.
- 2) » » » on Space Research.
- 3) » » » for Mathematics.

Mr. M. Chondros in the course of 1976 continued offering his services as Secretary of these Committees.

Object of these committees is the coordination of research in Greece and the maintaining of contacts with similar bodies abroad.

Meeting :

Prof. John Xanthakis in collaboration with Prof. F. Vassiliou presided the meeting of the Balkan Mathematical Union, held on August 1976 in Thessaloniki; he presented a paper with the title: «L'Activité solaires et la Variation de la moyenne annuelle de la Précipitation Zonale».

Prof. John Xanthakis participated in the IAU General Assembly, held at Grenoble, France, as the National representative of Greece. This meeting was attended also by C. Macris and B. Petropoulos who presented a paper under the title: «Seasonal Variations of the Pressure in the Martian Atmosphere».

Prof. John Xanthakis and the staff of the Center participated in the first symposium of Solar Studies held at the Astronomical station of Penteli between 15-18 November 1976 and delivered lectures on special topics.

Assis, Prof. C. Macris attended the Second Symposium on «Natural Atmospheric Optical Emissions» held on May 1976 at Stara Zagora, Bulgaria, following an invitation by the Bulgarian Academy of Sciences.

Dr. B. Tritakis attended the 7th Interdisciplinary Cycle Research Symposium, held between June 25 and July 5, 1976 at Tomburg, Frankfurt, Germany, and presented the paper: «J. Xanthakis and B. Tritakis: Analytical Expression of the Mean Annual Variation of the Precipitation within Various Latitude Zones of the Earth».

Scientific Missions :

During the Solar Eclipse of April 1976, the Center organized an Expe-

dition to the island Santorini to study the variation of the Zenith brightness during the eclipse.

Dr. B. Tritakis spent two months at the Sacramento Peak Observatory and at National Oceanic and Atmospheric Administration (NOAA) in Boulder, Co., U.S.A., studying the evolution of the coronal holes, their influence on the terrestrial phenomena.

Mrs. H. Papamargariti - Dara, spent one month at the Ondrejov Observatory (Czechoslovakia) studying the evolution of the Solar prominences.

Cooperation with foreign Institutes :

In the course of 1976 the Center continued its cooperation with the foreign Institutes.

Visits :

This Center was visited by Dr. M. J. Smyth of the Royal Observatory of Edinburgh who gave a lecture with the title «Modern Infrared Astronomy».

Miscellaneous :

The Greek National Committee for Astronomy organized seminars on special topics which were held at the R.C.A.A.M. for the benefit of the Greek astronomers.

The Director of the Center
Ass. Prof. Dr. C. J. MACRIS

DEPARTMENT OF GEODETIC ASTRONOMY

UNIVERSITY OF THESSALONIKI

ANNUAL REPORT 1976

Staff: The staff of the Department consisted on December 31, 1976 of the following: 1) Professor L. N. Mavridis, Chairman, 2) Dr. A. C. Tsioumis, Chief Assistant, 3) Dr. G. Asteriadis, Chief Assistant, 4) Mr. M. E. Contadakis, Assistant, 5) Mr. G. Kareklidis, Assistant, 6) Mr. D. Stavridis, Assistant, 7) Mrs. H. Zervaki-Zoirou, Assistant, 8) Miss J. Karrinti, Assistant, 9) Mr. D. Arabelos, Assistant, 10) Mr. Ch. Kaltsikis, Assistant, 11) Miss P. Kyriakidou, Secretary, 12) Mrs. M. Spyropoulou - Topatsi, Secretary, 13) Miss M. Stamatelou, Secretary, 14) Mrs. E. Pilidou - Rossiou, Secretary, 15) Mr. P. Kanakis, Secretary, 16) Mr. Ch. Papantoniou, Technician, 17) Mr. C. Rizos, Technician and 18) Mr. P. Domvros, Driver.

Research Programs: The following research programs were carried out during 1976:

1) Photoelectric Photometry of Galactic Cepheids. The discussion of the photoelectric two-color (B, V) observations of the twelve galactic Cepheids RT, RX, SY Aur; RW Cam; SU Cas; VZ Cyg; V, Y, BG Lac; RS Ori; SV, AW Per observed by K. Bahner and L. N. Mavridis in 1956-59 with the 72-cm reflector of the Landessternwarte auf dem Königstuhl, Heidelberg, was concluded. The results were included in a paper by L. N. Mavridis (in collaboration with Dr. K. Bahner) presented by Professor J. Xanthakis in the Academy of Athens. The discussion of the three-color (U, B, V) observations of the five Cepheids GD Cyg; X, Z, RR Lac; and U Vul carried out by L. N. Mavridis, A.C. Tsioumis and G. Asteriadis in 1967-70 with the 38-cm reflector of the Hamburger Sternwarte installed at the Stephanion Observatory, was also concluded. The results were included in a paper by G. Asteriadis,

L. N. Mavridis and A. C. Tsioumis presented by Professor J. Xanthakis in the Academy of Athens.

2) Period Changes of Galactic Cepheids (Professor L. N. Mavridis in collaboration with Dr. K. Bahner). The investigation of period changes in selected galactic cepheids reported last year, was continued.

3) Rotational Velocities of the Members of Selected Open Cluster (Professor L. N. Mavridis in collaboration with Professor R. Kraft). The study of the rotational velocities of 50 stars in the area of the open cluster NGC 6633 reported last year, was continued.

4) Investigation of Problems of Star Formation (Professor L. N. Mavridis in collaboration with Professors B. Strömberg and J. Xanthakis). The survey of the stars with ultraviolet excess contained in an area of 2.000 square degrees in high galactic latitudes reported last year, was continued.

5) Distribution of the M-, S- and C- Type Stars in Selected Areas of the Milky Way (Professor L. N. Mavridis). The photographic photometry and the study of the space distribution of the M-, S- and C- type stars found in the four areas centered on the open clusters NGC 188, NGC 752, NGC 7790 and M25 reported last year, was continued.

6) Photoelectric Observations of Flare Stars (Professor L. N. Mavridis in collaboration with Dr. G. Asteriadis and Messrs. M. E. Contadakis, G. Kareklidis, Farouk Mahmoud, D. Stavridis and P. Varvoglis). Photoelectric observations of the flare stars: 1) YZ CMi, 2) UV Cet, 3) EV Lac, 4) AD Leo, 5) BD + 1602708 were carried out with the 30-inch reflector of the Department of Geodetic Astronomy installed at the Stephanion Observatory. The results are being prepared for publication.

7) Photoelectric Observations of Suspected Flare Stars (Dr. G. Asteriadis and Mr. M. E. Contadakis). Photoelectric observations of the flare star candidates 1) Gliese 752 A, 2) Gliese 809, 3) Gliese 831, 4) Gliese 835, 5) Gliese 526 were carried out with the 30-inch reflector of the Department of Geodetic Astronomy installed at the Stephanion Observatory. The results are being prepared for publication.

8) Kinematics of Stellar Systems. A study of the Kinematics of the Gould Belt with the help of the Lesh O,B Stars was completed by Dr. A. Tsioumis (in collaboration with Professor W. Fricke). The results are being prepared for publication. Another study of the space distribution and the kinematical behaviour of the M- giant stars of the solar neighborhood was completed

by Dr. A. Tsioumis. The results were included in a paper presented by Professor J. Xanthakis in the Academy of Athens.

9) Kinematics of Stellar Systems (Dr. G. Asteriadis). A study of the Kinematics of the AGK3 stars was completed. The results are being prepared for publication.

10) Gravity and Magnetic Investigations in Greece (Professor L. N. Mavridis in collaboration with Mr. D. Arabellos and Miss J. Karrinti). The discussion of the gravity and magnetic measurements carried out by the Department of Geodetic Astronomy in different areas of Greece during the last six years was continued.

11) Propagation of Optical Radiation and Microwaves through the Earth's Atmosphere. A study of lateral refraction in the area of Thrace was initiated by Professor L. N. Mavridis (in collaboration with Messrs. A. Gounaris and C. Destefanos). Another study of the seasonal variation of the refractivity N of the air for microwaves in the area of Thessaloniki based on radiosonde observations carried out in this area was initiated by Professor L. N. Mavridis in collaboration with Dr. A. Bandellas, Dr. A. Tsioumis and Mr. P. Savaidis.

12) Study of the Deviation of the Vertical in Different Areas of Greece (Professor L. N. Mavridis in collaboration with Dr. A. Tsioumis and Messrs. D. Stavridis and Ch. Kaltsikis). A study of the deviation of the vertical in different areas of Northern Greece was initiated. The first results are being prepared for publication.

The research programs Nos. 4 and 5 were carried out in co-operation with the Research Center for Astronomy and Applied Mathematics, Academy of Athens.

Publications: The following publications appeared in 1976:

Contributions from the Department of Geodetic Astronomy, University of Thessaloniki:

No. 13: M.E. Contadakis, G. Kareklidis, F. Mahmoud, L. N. Mavridis, D. Stavridis, E. Zervaki-Zoerou. Photoelectric Observations of the Flare Star BY Dra in 1973, 1974. Commission 27 of the IAU, Information Bulletin on Variable Stars No. 1181, 1976.

Publications of the Department of Geodetic Astronomy, University of Thessaloniki.

No. 3: W. Torge, L. N. Mavridis, H. Drewes and D. Arabelos. Anlage eines Schwerenetzes hoher Präzision im Bereich der Ägäischen Platte, Zeitschrift für Vermessungswesen, Vol. 101, 213, 1976.

Teaching: Professor L. N. Mavridis delivered during the academic year 1975 - 76 courses in Geodetic Astronomy to the third-year undergraduates and in Higher Geodesy to the fourth-year undergraduates of the Division of Rural and Surveying Engineering, Faculty of Technology, of the University. Chief Assistant Dr. A. Tsioumis delivered during the same academic year courses in Higher Geodesy to the third-year undergraduates of the same Division.

Visitors: Mr. Farouk Mahmoud, Helwan Observatory, worked at the Department during 1976.

Miscellaneous: Professor L. N. Mavridis continued acting as President of the Administrative Council, Democritus University of Thrace. He was also appointed, effective April 13, 1976 President of the Administrative Council of the State Scholarship Foundation. Professor L. N. Mavridis, Dr. A. Tsioumis, Dr. G. Asteriadis and Mr. D. Stavridis attended the XVIIth General Assembly of the IAU held in Grenoble, France, August 24 to September 2, 1976. During this Assembly Professor L. N. Mavridis was appointed Chairman of the IAU Commission No. 27 (Variable Stars), Working Group on Flare Stars as well as Member of the Organizing Committee of the IAU Commission No. 46 (Teaching of Astronomy).

Dr. A. Tsioumis visited in July and August 1976 the Astronomisches Rechen-Institut, Heidelberg, West Germany, and discussed scientific problems of common interest with Professor W. Fricke.

Dr. G. Asteriadis visited in September 1976 the Astronomisches Rechen-Institut, Heidelberg, West Germany, and discussed scientific problems of common interest with Professor W. Fricke.

Mr. M. E. Contadakis received, effective October 1, 1976 a one-year leave of absence from the Department and is working at the Max-Planck Institut für Astrophysik, Heidelberg.

The Head of the Department
Professor L. N. MAVRIDIS

DEPARTMENT OF ASTRONOMY UNIVERSITY OF IOANNINA

ANNUAL REPORT 1976

Staff: Mr. D. Rizos, graduate in Mathematics, was appointed Assistant, effective Mars 2, 1976. Thus, the staff of the Department on December 31, 1976 consisted of the following persons:

1) Professor G. Banos, 2) Mr. Ph. Krommydas, Assistant, 3) Mr. D. Rizos, Assistant, 4) Mrs. H. Drossou, Secretary, 5) Mr. Ch. Nakas, Technician.

Mr. Ph. Krommydas was awarded a scholarship by the Ministry of Coordination. Since September he is at the University of Sussex for post-graduate studies.

Teaching: Prof. G. Banos held courses in Astronomy to the third-year undergraduate students of Physics and Mathematics.

Mr. Ph. Krommydas and Mr. D. Rizos held tutorial courses and exercises in Astronomy to the same students.

Research: Mr. Ph. Krommydas continued his work on Ap Stars. Mrs. H. Dara and Mr. Th. Zachariades started working on the solar prominences and the fine structure of the solar chromosphere, respectively under the supervision of Prof. G. Banos.

Equipment: For the training of the students the following equipment have been ordered: a) A 8'' Cassegrain telescope (F/12), through Star-Liner Co. b) A Hz solar filter (0,75 A HBW, 1/3 A tun.) through Carson Astr. Inst. Co.

Miscellaneous: Mr. Ph. Krommydas and Mr. D. Rizos spent 10 days, in July and August at the Stephanion Observatory of the Department of Geodetic Astronomy, University of Thessaloniki, where they followed the technique of photoelectric observations.

Mr. J. Zacharopoulos and Mr. Ch. Bourdas of the National Observatory of Athens spent 3 days at the Dourouti station, where they carried out technical work.

Publications:

Astronomy and Astrophysics, Part 1 and 2, University of Ioannina, Ioannina 1976.

The Head of the Department
Professor G. BANOS

DEPARTMENT OF ASTRONOMY

UNIVERSITY OF PATRAS

ANNUAL REPORT 1976

Staff: Professor B. Barbanis was elected full Professor of Astronomy at the University of Thessaloniki in December 1976. He is the Dean of the Faculty of Sciences of the University of Patras since September 1, 1976.

The members of the Department are: 1) Professor B. Barbanis, 2) Associate Professor G. Antonacopoulos, 3) Dr. E. Evangelidis, 4) Mr. P. Antonopoulos, 5) Mrs. C. Flogaiti - Giannoulatou, 6) Mr. B. Zafiroopoulos, 7) Mrs. D. Galanakis and 8) Mr. G. Sotiropoulos.

Teaching: Prof. Barbanis held courses in General Astronomy to the third year undergraduate students, courses in Dynamical Astronomy and Cosmology to the fourth year students, and courses in Differential Equations to the second year students. Associate Prof. Antonacopoulos held courses in General Astronomy and Analytical Geometry. Dr. E. Evangelidis gave lectures in Dynamical Astronomy and Cosmology and held example classes in those subjects. Mr. Antonopoulos held example classes in Differential Equations and was partly involved in Laboratory classes in Astronomy. Mrs. Flogaiti - Giannoulatou held example classes in General Astronomy and Astrophysics as well as Laboratory classes in Astrophysics. Mr. Zafiroopoulos held example classes in Celestial Mechanics, General Astronomy and Astrophysics as well as Laboratory classes in Astrophysics.

Research Program : Prof. Barbanis has been working on trapped orbits in spiral galaxies. Prof. Antonacopoulos has been working on the secular variations in the restricted 3-body Problem. Dr. Evangelidis has been working on, 1) the instability of gravitating rotational systems and 2) waves in strong magnetic fields (Pulsars) (three papers have been accepted for publi-

cation). Mr. Antonopoulos has been working on the trapping of particles in time dependent Hamiltonian.

Publications: 1) B. Barbanis: Density Maxima Formed by Trapped Orbits, *Astron. and Astrophys.* 46, 269 - 274, 1976. 2) B. Barbanis: Trapping of Particles in a Time-Dependent Hamiltonian, *Celestial Mechanics* 14, 201 - 208, 1976.

Meetings: Prof. Barbanis, Dr. Evangelidis and Mr. Antonopoulos participated in the XVIth General Assembly of the International Astronomical Union held in Grenoble between 24 August — 2 September 1976. Prof. Antonopoulos participated in the No. 41 Colloquium of IAU on «Dynamics of Planets and Satellites and Theories of their Motion» held in Cambridge, England, between 17th - 19th August, 1976. Dr. Evangelidis spent Summer - Autumn in Max - Planck - Institut, on a NATO Research Fellowship.

The Head of the Department
Prof. B. BARBANIS

CHAIR OF ASTROPHYSICS
UNIVERSITY OF ATHENS

ANNUAL REPORT 1976

Teaching: Prof. S. Svolopoulos held courses on Astrophysics to the fourth-year students and on Space-Physics to the third-year students of Physics.

Also 17 students worked on their thesis on Astrophysics for obtaining B.Sc. in Physics.

Research: Prof. Svolopoulos continued his studies on B stars from spectra taken at the Observatory of Haute Provence.

Meetings: Prof. Svolopoulos participated to the IAU General Assembly in Grenoble.

Publications:

1) S. N. Svolopoulos: A spectrophotometric Study of the Be star HD 164447. *Astron. Nachr.* Bd 297, 87, (1976).

2) W. Becker, S. Svolopoulos: Three Colour Photometry of a Field in the Galactic Anticentre section near M 37. *Astron. Astrophys. Suppl.* 23, 97, (1976).

3) W. Becker, S. N. Svolopoulos, Ch. Fang: Kataloge photographische und photoelektrischer Helligkeiten von 25 Galaktischen Sternhaufen in RGU- und UcbV-system. *Astronomisches Institut der Universität Basel*, Basel, 1976.

The Head of the Chair
Professor S. SVOLOPOULOS