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ACADEMY OF ATHENS
RESEARCH AND COMPUTING CENTER
ATHENS
1964

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Annual Reports for the Year 1963 of the:

ASTRONOMICAL INSTITUTE
NATIONAL OBSERVATORY OF ATHENS

ANNUAL REPORT 1963

The activities of the Astronomical Institute of the Observatory of Athens and the Astronomical Station at Penteli, may be described as follows:

I.— ATHENS OBSERVATORY

Staff. On July 1st 1963 Professor Plakidis handed over the chairmanship of the Council of Administration to Dr. A. Galanopoulos, professor of Seismology at the University of Athens and Head of the Institute of Seismology of the Observatory.

Meridian and Time Services. Mr. Haimis of the Observatory Staff made meridian observations of 45 equatorial stars, of circumpolar stars, and determinations of Vm; he likewise made collimation measurements, and measurements with the striding level of the axis; corrections were made to the position of the horizontal axis.

Routine checkings of clocks and hour-signals were made by Mr. Haimis, Mr. G. and C. Banos, Dr. Focas, and Mr. D. Elias.

Solar Observations. Photographs of the Sun with the Doridis 400 mm equatorial and large-scale granulation measurements were made on ciné-film, of a total length of about 1,500 m taken by Mr. Prokakis, who is a bursar of the Royal Research Foundation. Furthermore, Dr. C. Macris, Mr. G. Banos and Mr. Prokakis secured in the course of the year, i. e from January 9 untill the end of December, 5,000 photographs of the chromosphere with the Halle monochromatic filter. Mr. Haimis made 60 determinations of sunspots by projection of the image, Mr. G. Banos 80, Mr. C. Banos 71, and Dr. Focas 60. The same observers using the monochromatic filter observed the chromosphere optically. Finally Mr. D. Elias made by projection 327 sketches of photospheric events (sunspots, flares, etc.) and 280 of chromospheric features in Hα. These activities cover 287 days.

Five hundred photographs of the Sun on Hα extending over 100 days were secured by the same observer. Measurements of the solar diameter were made by Prof. Schoenberg's method with his heliometer. These number 16,160 and refer to 101 observations.

Dr. Macris and Mr. D. Elias observed the important centres of activity which occurred in September 1963, through their lifetime; all flares were photographed.

Observations of the Major Planets. Dr. Focas made the following observations:

Mars. 20 polarimetric and 200 determinations.
38 photographic and 760 images.
8 series of diameter measurements.
Jupiter. 20 visual.
25 photographic and 500 images.
Saturn. 15 visual.
12 photographic and 240 images.

Mr. C. Banos, working jointly with Dr. Focas, made 14 photographic observations of Jupiter, and secured 28 plates bearing a total of 560 images. Four plates of Saturn were obtained bearing 80 images.

Various Equatorial Observations. Using the Doridis 400 mm equatorial, Dr. Adamopoulos observed twice comet Ikeya (1953 a), and comet Alckok (1963 b) once. He likewise attempted to identify other comets expected to appear this year but without success, possibly due to their extreme faintness. Dr. Focas also observed comet Alckok (1963 b) assisted by Mr. G. Banos; Mr. Elias observed comet Ikeya 15 times and comet Alckok 4 times. He likewise secured three plates of same, and made 30 visual magnitude estimates. He also made 400 variable star observations, 60 observations of Nova Herculis 1963, and obtained some plates of the surrounding star-field; three micrometer measurements of the position of this nova, 5 observations of double stars and 4 observations of lunar occultations were made. The partial lunar eclipse of July 7, 1963 was observed by Dr. Adamopulos visually, and by Dr. Focas with a polarimeter.

Laboratory Activities. Micrometric measurements on his negatives of Mars of the 1963 series were made by Dr. Focas. He also prepared composite images of Jupiter and studied negatives showing the Red Spot. Mr. G. Banos and Mr. Elias used the Mohl microphotometer on a series of plates of the solar corona taken during the total eclipse of February 15, 1961. Mr. Elias determined the exact value of the step of the Schoenberg micrometer as well as various quantities pertaining to the charachteristics of this instrument.

Research. Dr. Adamopoulos and Mr. Haimis continued working on the program of determining the longitude of the Observatory by means of meridian observations.

Dr. Macris carried out a program of photometric measurements on the solar ionised calcium. Mr. G. Banos studied the isophotes of the solar corona on plates taken during the eclipse of February 15, 1961. He also investigated the appearance-frequency of types of spots correlating with solar latitude and rotational velocitty of the Sun at these latitudes; he further studied the secondary maxima in the solar cycle.

Dr. Focas investigated coefficients of activity in the jovian atmosphere on plates taken in 1952-63. Together with Mr. Banos they investigated possible periodicity in the phenomena of the Red Spot during 1957-63 using visual and photometric data; they likewise studied photometric information of the clouds and the polar regions of Mars in the wavelengths 3200-4500 A and on negatives taken at the Pic-du-Midi in 1963; the dark and clear regions of the planet in the spectral region 4500-10,000 A were studied on 65 negatives taken in Athens and at the Pic-du-Midi.

Mr. Elias has worked during the year on the following subjects:

Determination of photometric parameters of comets Ikeya (1963 a) and Alckok (1963 b); the centers of activity of the Sun in Septembrer 1963 (jointly with Dr. Macris); the variations of the solar diameter jointly with Prof. Schoenberg; on visual effects of the chromosphere, on correlations of solar granulation with the values of the solar constant, with the types of spots, as well as their latitude distribution as a function of the 22-year cycle.

Computations. Dr. Adamopoulos made calendar calculations and various other computations for affidavits and certificates. He also computed data on comets Ikeya (1963 a) and Alckok (1963 b) based on observations, as well as eclipse elements for the 100, 200; and 300-km levels, at the request of the Ionospheric Institute. Mr. C. Banos made lunar computations for 1964 and Mr. Elias reduced his observations of comets and earth-satellites and calculated positions of solar flares and spots.

Participation to Meetings and Activities Abroad. Dr. Macris participated to the second meeting of the IQSY committee held in Rome on 18-23 March 1963 and subsequently, in May and June, worked at Arcetri where he secured Moll microphotograms of solar plates taken from 1659-1961. Dr. Focas participated to the cessions of Committee 16 of the IAU, held at Meudon from September 15 untill November lst; on this occasion he did some work on the clouds of Mars. Mr. Elias followed a training program at the Freiberg Fraunhofer Institut under the direction of Prof. Kiepenheuer on the solar observations techniches, their reduction, and the mode of presentation; during this interval he was also busy working on the fine-structure of the photosphere and chromosphere, the monitoring of the centres of activity on the Sun in white light and in Hα, and on possible correlations with the visual and photographic photometry of the flares. From August 8 untill August 16 he worked with. Prof.

Schoenberg at Rimsting Chiemsee on comparative solar measurements with the heliometer which is there in comission. The urgent need of supplying the corresponding instrument installed in Athens with a thermostatic device was felt.

Finally, Mr. Elias visited Larissa to inspect the earth-satellite tracking station, and also Thessaloniki at the request of Prof. Contopoulos, to install a Halle filter and to establish a program for its use.

Publications and Reports. Publications made by members of the staff during 1963 are as follows:

C. Macris and Th. Prokakis.

New Results on the life-time of the Solar Granules. Memoirs of the National Observatory of Athens, Series I, Astronomy, No 10(1).

C. Macris and C. Chassapis.

On the Variations of the Brightness of the Zenith during the Evening Twilight, Memoirs of the National Observatory of Athens, Series I, Astronomy, No 10 (2).

C. Macris.

On the Variations of Brightness of the Chromospheric Flocculi from the Center to the Limb of the Solar Disc, Atti del Convegno Astronomico di Milano, Merate Ottobre 1962, p. 201.

C. Macris.

Sulla Nomeclatura Relative ad Alcuni Fenomeni Solari, jointly with G. Godoli. Memorie della Società Astronomica Italiana, vol. XXXIV, No 3, 1963 p. 336.

C. Banos and J. Focas.

Photometric Study of the Atmospheric Activity on the Planet Jupiter and Peculiar Activity on its Equatorial Area, in the Period 1957-63. Annales d' Astroph., v. 27, 1, p. 36-45.

C. Banos and J. Focas.

Study of the Birefringent Micrometer and Measurenents of the Diameters of Venus, Mars, and Satellites of Jupiter, Memoirs of the National Observatory of Athens, Series I, Astronomy, no 11.

J. Focas.

Observations of Comets, I.A.U. Circular No 1837.

D. Elias.

Observations of Comets, I.A.U. Circular No 1837.

D. Elias.

Preliminary Photometric Parameters and Predicted Magnitude of Comet Ikeya (1963 a). I.A.U. Circular No 1837.

D. Elias.

(Jointly with J. Xanthakis, C. Macris, and G. Banos). The total solar eclipse of February 15, 1961. Praktika of the Academy of Athens. v. 37, 1962, pp 204-209.

D. Elias.

(Jointly with A. Coutsogiorgos). Earth-satellite Observations, Bull. of the Geographical Service of the Army, 1963 A. Semester.

D. Elias.

Nova Herculis 1963 (in press).

D. Elias.

Photometric Parameters of Comet Alckok (1963 b) (in press).

D. Elias.

(Jointly with M. Anastassiades, C. Macris, D. Elias and C. Caroumbalos), Optical and Ionospheric Observations of the Activity of the Solar Center of September 1963 (in press).

Dr. E. Schoenberg und D. Elias.

Die Umrisse der Sonnenphotosphäre und die Variation ihres Durchmessers (in press).

The following reports were been prepared and mailed by D. Elias.

a) On Sunspots, to Solar Division, A.A.V.S.O. Bureau of Standards, U.S.A. and to Sternwarte Zurich.

b) Copies of routine solar observations and negatives of pictures in Hα to Fraunhofer Institut, Freiburg.

c) Earth-satellite observations to the Smithsonian Astrophysical Observatory, Washington D.C., the Department of Scientific and Industrial Research, Radio Research Station, England, and to the Academy of Sciences, U.S.S.R.

Visits and Popularising Activities. In the course of the year this Institute was visited by Prof. Blaauw of Gröningen, Dr. O. Redman of Cambridge, England, Dr. Blackwell of Oxford, Dr. Schoenberg, Prof. Lacroute of Strasbourg, Dr. Naef of Urania, Zurich, Ccl. Downie and Capt. Herzer of the European office of Aerospace Research and Dr. Kiepenheuer of Freiburg.

In the course of the year there have been the usual routine visits of the Observatory by the schools of Athens, by private groups, and by individual visitors. Popularising lectures were given by members of the staff in Athens and over the country.

Repairs, Constructions and Purchases of Equipment. The meridian circle suffered some necessary repairs. Twenty five thousand dollars were made available by NATO for modernising this instrument, but after expert inspection by Prof. Lacroute of Strasbourg the consensus was that this sum was inadequate for the purpose. After approval by NATO this grant was made available for the purchase of instrumentation of solar research.

The Doridis 400 mm. equatorial was serviced by the technical staff. The parallactic pillar of the equatorial table which was under construction at the Salamis Arsenal was delivered by the Navy and technical assistance was made available for its completion.

The Halle filter was expedited to its constructor for repairs as one of the crystals of the monochromatic filters was found cracked. A. A filar micrometer with four eye-pieces and a camera be with three 9×12 plate-holders, ordered with Secretan, Paris, have been delivered,

A new monochromatic filter destined to be used for the large-scale photography of the chromosphere thus allowing the study of

the fine-structure, was ordered with Halle; the expense is covered by a NATO grant.

The European Office of Aerospace Research, U.S.Air-Force, has granted funds for the purchase of a K monochromatic filter, and the construction of an appropriate mounting; this equipment will be used for monitoring the photosphere and the chromosphere.

Repairs were made by members of the staff to the Newall drive and the photoelectric photometer donated by Dr. Hall.

II.—PENTELI ASTRONOMICAL STATION

Meteorological Observations. Daily routine observations at 8 a.m. were continued by Mr. Chassapis. Pluviometric data were reduced and forwarded to the Ministry of Public Works.

Astronomical Observations. Mr. Chassapis checked chronometers and made the necessary computations. He furthermore made 265 observations of long-period and irregular variables. Of these 235 were made with the Newall for minima, and the rest with the Zeiss instrument. The number of observed stars was 214. All observations mere communicated to the A.A.V.S.O. Mr. Chassapis observed comet Alckok using the micrometer of the Newall. He likewise used the Newall's birefringent micrometer to observe double stars. He also carried out observations on the zenith brilliance during twilight using the Fecker photoelectric photometer on a Polarex altazimuth telescope. Two series of measurements were made of 150 sightings each, mainly in the blue green and red, and jointly with Dr. Macris.

Building and Repairs. Various requirements were met during this year, the most notable being the constructions on the building which is to house the equatorial table. Building no 4 which is housing the Beals cameras and building no 5 have been whitewashed and equiped with electric and plumbing facilities. Pumps were installed and provisions have been made for adequate fire-extinguishing equipment. Heating facilities were provided and a contract was signed with a contractor for extensive repairs on the Newall dome.

The Coordination Ministry has made available a credit of $ 50,000 for the construction of a new building to house the offices and to provide living quarters for the scientific and technical personnel.

The Director ot the Insnitute

Prof. S. Plakidis

RESEARCH AND COMPUTING CENTER
ACADEMY OF ATHENS

ANNUAL REPORT 1963

Staff. Mr. G. C. Ananiadis left on September 30, 1963 after a one year term as research assistant paid from funds made available through the Greek Royal Research Foundation. He was replaced on December 1, 1963 by Mr. J. Zampakas.

Equipment. One epidiascope Leitz Wetzlar IIIL2, one projector Prado 500, one projector Agfa Sonector 8 with Sonector-Phon, one tape recorder Grundig TK 40 and one addressograph Adrema 6/35 were acquired.

Research Programs. The following research programs were carried out during 1963:

1) Statistical Study of Solar Activity (Prof. Dr. J. Xanthakis). The analytical study of the variation of the different indices of solar activity reported last year was extended to cover one additional index of solar activity i.e. the sunspot magnetic field strengths. Simple analytical relations representing with satisfactory approximation the variation of the annual values of this index both within each sunspot cycle and from cycle to cycle have been given.

2) Photoelectric Photometry of Galactic Cepheids (Dr. L. N. Mavridis in collaboration with Dr. K. Bahner). The discussion of the photoelectric two-color (B, V) observations of 18 galactic cepheids reported last year was continued. A new method for the study of the light variation of cepheids with more than one period has been developed. This method is now being applied to the study of the light variation of the cepheid TU Cas.

3) Distribution of the M—, S— and C—Type Stars in Selected Areas of the Milky Way (Dr. L. N. Mavridis partly in collaboration with Prof. Dr. J. J. Nassau and Prof. Dr. V. Blanco). The photographic photometry of the M—, S— and C—Type Stars discovered in the areas reported last year was continued.

4) Rotational Velocities of the Members of Selected Open Clusters (Dr. L. N. Mavridis in collaboration with Prof. Dr. R. Kraft). The study of the spectrograms for the 50 stars in the area of the open cluster NGC 6633 and the 28 comparison stars with known rotational velocities refered to in last year's report was continued.

5) Study of the Low-Latitude Aurorae (Dr. W. Abbott). The observational material used in this study consists of photographs taken with an ASCA system installed on Mt. Aderes (Argolis, Greece) using two interference filters centered at 5577 A and 6300 A as well as without filter.

Publications. The following publications appeared in 1963:
Contributions from the Research and Computing Center, Academy of Athens, Series I (Astronomy):

No 12: Two Interplanetary Phenomena of 468 B.C. by Sp. Marinatos. Comments by John Xanthakis. Pragmatiai of the Academy of Athens Vol. 24, No. 4, pp. 24-45, 50-53, 1963.

Visitors. The following scientists visited the Center during 1963: 1) Prof. Dr. Adrian Blaauw, Director of the Sterrenkundig Laboratorium Kapteyn, Groningen, 2) Prof. Dr. John Heard, Director of the David Dunlap Observatory, Richmond Hill, Ontario, 3) Prof. Dr. Pierre Lacroute, Director of the Observatoire de Strasbourg, 4) Prof. Dr. Walter Fricke, Director of the Astronomisches Rechen-Institut, Heidelberg, 5) Prof. Dr. Fred Whipple, Director of the Smithsonian Astrophysical Observatory, Cambridge, Mass. and 6) Prof. Dr. K. O. Kiepenheuer, Director of the Fraunhofer Institut, Freiburg i. Br. Professors Blaauw, Heard and Lacroute delivered also colloquium lectures.

Miscellaneous. Prof. Dr. J. Xanthakis was the head of the Greek delegation to the IInd Comité International de Geophysique, International Years of the Quiet Sun Assembly held in Rome between March 18-22, 1963. He also attended the Symposium No. 22 of the International Astronomical Union on «Stellar and Solar Magnetic Fields» held in Rottach-Egern am Tegernsee between September 3-10, 1963.

Dr. L. N. Mavridis visited during the summer 1963 the Observatoire de Paris with the help of a grant from the Scientific Affairs Division, North Atlantic Treaty Organization. During the same summer he also visited the Landessternwarte auf dem Königstuhl, Heidelberg and the Astronomisches Rechen-Institut, Heidelberg.

The Director of the Center
Dr. L. N. Mavridis

DEPARTMENT OF ASTRONOMY
UNIVERSITY OF ATHENS

ANNUAL REPORT 1963

Staff. Mr. Catsis, Chief-Assistant, obtained a bursary from the French Goverment. For six months he attended seminars on Celestial Mechanics with Prof. Kovalevsky at the Bureau des Longitudes, in Paris and was trained, at the Observatory of Paris, to use the Danjon astrolabe. At Meudon he worked in tracking earth-satellites.

Assistant Mr. Antonacopoulos visited Manchester and participated to research on the three-body problem with the aid of the Atlas electronic computer of the University of Manchester. Extra-assistant P. Rovithis was called to serve in the army and was replaced by Mr. Frangakis, who obtained a grant from the Ministry of Coordination allowing him to work at the Observatory of Athens on visual tracking of earth-satellites, computation of the orbit elements and investigations on the high atmophere densities as suggested by satellite drags.

Teaching. Prof. S. Plakidis, full professor and Head of this department delivered a course on General Astronomy. Assistant Professor, D. Cotsakis gave a course on the Sun and the major planets. Assistant Professor W. Abbott gave a course on the atmospheres of the planets.

Exercises. Students were trained to the use of astronomical methods and instruments; exercises were held in this Department, in the Observatory of Athens, and at the Penteli station, and were supervised by D. Catsis, G. Antonacopoulos, and Ch. Frangakis; 202 students attended, 130 from the Mathematical group, and 72 from the Physics.

Research. Assistant Professor W. Abbott carried out a program of monitoring the airglow on 5577 A at the Darditsa airglow station. This program was sponsored and supported by NATO and was carried out with the collaboration of the Ionospheric Institute of the Observatory of Athens. Interesting tentative results were published.

Purchase of books, periodicals and equipment. The normal credit of $ 1,050 was used up to meet routine requirements, purchase of books, and payment of the subscriptions to periodicals. An extra credit was used to acquire equipment and more books. A Nardin sidereal chronometer, ordered in 1952, was delivered to this Department.

Publications. S. Plakidis: The Conquest of Space, 1963, D. Cotsakis: a) Life on the Stars., b) Radioastronomy, c) The Planetarium and its contribution to teaching, d) Matter and antimatter.

Lectures. Lectures were held for the public by the members of the staff in various lecture-halls of Athens. Mr. Catsis lectured on the study of earth-satellite orbits by the method of von Zeipel.

The Head of the Department
Prof. S. Plakidis

ASTRONOMICAL DEPARTMENT
UNIVERSITY OF THESSALONIKI

ANNUAL REPORT 1963

Instruments. A Becker iris-photometer has been delivered.

Staff. The Director of the Department, G. Contopoulos, remained in the U.S.A. until August 1963. From January 1 until May 30 he was at the Yerkes Observatory of the University of Chicago as a research associate. He spent June 1963 at the Institute for Advanced Study, Princeton N. J., as a research associate. During July and August 1963 he was at the NASA Institute for Space Studies, N. York, as a senior research associate. Then he visited Ankara, Turkey, to lecture at the NATO Summer Courses on the Structure of Stellar Systems. He returned to Greece on September 14. During his absence he was replaced by the professor of Analysis Dr. J. Anastassiades.

Dr. B. Barbanis, chief-assistant of the Astronomical Department attended the Summer Courses on the Structure of Stellar Systems in Ankara from August 26 to September 18.

Mr. M. Moutsoulas, graduate of Mathematics, has been appointed research assistant by the Royal Foundation since October 1st.

Scientific Work during 1963. a) During his stay at the Yerkes Observatory Dr. Contopoulos worked with Dr. Chandrasekhar on General Relativity, especially the n-body problem in the post-Newtonian approximation. A paper dealing with the Virial theorem in the post-Newtonian approximation has been published already. In this parer a generalisation of the classical and tensor virial theorems is given.

Further work included the canonical equations of motion in the n-body problem and the restricted 3-body problem, namely the Jacobi integral, Hill's curves and Langrangian points in the post-Newtonian approximation; the calculation of the differences between the classical theory and the post-Newtonian approximation may give the opportunity for new tests of General Relativity in Celestial Mechanics.

Finally a systematic study was on the transformation of coordinates and momenta that lead from an original reference system to another, with origin at the center of mass (defined in post-Newtonian approximation). If the classical integrals are conserved in both systems, the form of the transfornation can be found within an arbitrary rotation of the space-axes. Further papers on this subject are in preparation.

b) During his stay at Yerkes Dr. Contopoulos continued his work on the «third integral». A paper on a classification of the

integrals of motion has been prepared. It is proved that arbitrarily «near» any given potential in the form of a series there is another isolating one. The non-isolating integrals are divided into quasi-isolating and ergodic. It seems that in most cases the integrals are quasi-isolating.

c) Dr. Contopoulos and Dr. Woltjer worked on «the third integral in non-smooth potentials». The potentials used were either a sine wave parallel to the axis y, or the product of two sine waves, parallel to the axes, superimposed over a smooth potential. A third integral of motion was found in the form of a series. Many calculations to check the isolating character of the third integral were made at the Electronic Computer of the Institute for Computer Research of the University of Chicago, and of the NASA Institute for Space Studies, in N. York. The calculations show that as the perturbations increase the integral which is initially isolating becomes quasi-isolating and then ergodic. This work was finished in Greece and a paper will be sent for publication.

d) During his stay at Princeton Dr. Contopoulos worked with Dr. Strömgren on the problem of the places of origin of the A stars near the sun. A new formula for the potential on the plane of symmetry of our Galaxy that incorporates all the modern data was adopted. Extensive «Tables of Plane Galactic Orbits» have been constructed for this model and will be published by the Institute for Space Studies.

It was proved that a slight change of the galactic model in the outer parts may make most of the high velocity stars escaping or non-escaping. Therefore any conclusion about these stars is still quite uncertain.

e) Dr. Contopoulos continued at the Institute for Space Studies his work on the «Resonance Cases and Small Divisors in a Third Integral of Motion» begun at the Yale University Observatory. The formula for the third integral contains an infinite number of divisors of the form $m^2P - n^2Q$ where m, n, are integers (n=even). If $P^1/_2/Q^1/_2$ is rational then one such divisor is zero; in such resonance cases the form of the third integral changes. It is proved that for $m+n>4$ the change is not important if the perturbations are small. However for $m+n=4$ and $m+n<4$ the changes are very important. The first part of this work has been published already. The work is continuing now with the help of Mr. M. Moutsoulas. Many numerical calculations have been made at the Institute for Space Studies. The agreement between numerical results and theory is very satisfactory.

f) Dr. Contopoulos and Mr. Bozis made a number of orbit calculations at the Yale University Observatory and the Institute for Space Studies, for comparison with their theoretical study of the orbits of stars during the collision of two galaxies. A paper under the title «Escape of Stars during the Collision of two Galaxies» has been submitted for publication in the Astrophysical Journal.

g) Dr. Contopoulos made some calculations for further study of periodic orbits in some two-dimensional potential fields.

h) Dr. Contopoulos and Dr. Danby calculated some orbits of artificial satellites in order to compare Brouwer's theory and the theory of the third integral in first approximation. This work is being continued.

i) Dr. Barbanis used the third integral in order to explain the characteristic forms of the boundaries on the velocity plane RZ and on the planes zR and zZ for different potentials. He found that all peculiar characteristics can be explained by the third integral, even if only the first order terms are used. A paper on this subject is under preparation.

j) The Hα-birefringent filter has been adjusted to the 20cm refractor and a series of observations have been carried out by assistant Mr. C. Papageorgiou.

Publications. Under the series: Contributions from the Astronomical Department of the University of Thessaloniki have appeared:

1) Nr. 10: G. Contopoulos: On the Existence of a Third Integral of Motion, Astronomical Journal **68**, 1, 1963.

2) Nr. 11: C. Goudas and B. Barbanis: A New Property of the Third Integral, Zeitschrift für Astrophysik **57**, 183, 1963.

3) Nr. 12: G. Contopoulos: A Classification of the Integrals of Motion, Astrophysical Journal **138**, , 1963.

4) Nr. 13: G. Contopoulos: Resonance Cases and Small Divisors in a Third Integral of Motion, Part I, Astronomical Journal **68**, 1963.

Other Publications:

1) S. Chandrasekhar and G. Contopoulos: The Virial Theorem in General Relativity in the Post-Newtonian Approximation. Proc. of the National Acad. of Sciences **49**, 608, 1963.

2) G. Contopoulos: Some Applications of the Third Integral of Motion, Astronomical Journal **68**, 70, 1993.

3) B. Barbanis: The Development of Radio Astronomy and its Contributions to the Study of the Universe, Bulletin of the Geographical Service of the Army **82**, 175, 1962 (in Greek).

4) B. Barbanis: Exercises of Astronomy (A) Spherical Astronomy, Thessaloniki, 1963, (in Greek).

Conferences. Dr. Contopoulos participated to the Conference of Celestial Mechanics of NASA in Washington D.C., January 10-11, 1963 where he was the chairman of the Meeting on Relativity and Gravitation.

Seminars - Lectures. Dr. Contopoulos gave a number of seminars or colloquia on special topics of Stellar Dynamics during his stay in the United States at the following Universities or Institutes: Yale University, University of Rochester, University of Chicago, Yerkes Observatory, University of Illinois (Urbana), Purdue University (Lafayette), Warner and Swasey Observatory (Cleveland) and at the Summer Institute for Space Mathematics in Cornell University (Ithaca, N.Y.). He gave a series of lectures on Stellar Dynamics at the NATO Summer Courses on the Structure of Stellar Systems.

After his return to Greece he began his regular courses in Astronomy to the 3rd and 4th year students of Mathematics and Physics. A special advanced seminar on astronomical subjects and computing methods was held twice a week.

Dr. Barbanis gave a course in Spherical Astronomy and Celestial Mechanics. He supervised also the exercises of the the students in these subjects and in Astrophysics.

Mr. Papageorgiou undertook the training of the 3rd and 4th year students in practical Astronomy.

Foreign Visitors. Dr. K. O. Kiepenheuer visited in December 1963 the Observatory of the University of Thessaloniki.

DEPARTMENT OF ASTRONOMY
TECHNICAL UNIVERSITY OF ATHENS

ANNUAL REPORT 1963

Mr. G. Catsiaris, graduate in Mathematics of the University of Athens, continued his voluntary contributions to the work of this Department untill July, 1963, and was subsequently appointed chief assistant. Mr. Vlachos, graduate in Mathematics continued working as assistant O.C.D.E. to this chair. He has been proposed for appointment as salaried assistant.

Instruments. The following purchases of equipment were made during 1963:

a) A box of drafting instruments Kern.

b) A Hermannwetzer chronograph with three inscriptions and two speeds.

c) A Kern DKM_3A astronomical theodolite with accessories, a fixed level, and a Horrehow level.

d) A Nardin sidereal chronometer.

e) A Wild T_3 theodolite with accessories.

f) Stop-watch, Huber.

g) Two Dominetwerk projectors.

Exercises and Teaching. The Head of this Department, Dr. Argyrakos, held a course in General, Spherical, and Survey Astronomy. He likewise tought Practical Astronomy. Chief assistant G. Catsiaris assisted in the exercises of Theoretical Astronomy and assistant D. Vlachos trained the students in Practical Astronomy. Seminars were held occasionally on particular subjects. All activities were supervised by the Head of the Department. The courses and exercises were attended by 92 students of the third and fourth years of the Schools of Agronomy and Survey Engineering.

The Head of the Department

Prof. J. Argyrakos