

# ArAS News

NEWSLETTER

ARMENIAN ASTRONOMICAL SOCIETY (A r A S)



No. 98 (October 31, 2016)

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Editor: Sona FARMANYAN

ArAS Newsletter online at: <http://www.aras.am/ArasNews/arasnews.html>

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# EUROPEAN COMMISSION PUBLISHES EUROPEAN SPACE STRATEGY



## European Commission

The European Commission on October 26 presented its new space strategy “Space Strategy for Europe” (COM (2016) 705 final).

Europe is the second largest public space bureau in the world, which connects many European countries with appropriate programs and infrastructures. Aerospace systems such as Copernicus, EGNOS and Galileo are among these. Over the period 2014-2020, the EU alone will invest more than € 12 billion in space activities. In addition, space resources will increasingly be used more strategically to strengthen Europe's competitiveness. Space technologies and information should support policy priorities, for example, in the areas of border protection, the development of digital economy and greenhouse gas emissions.

Against this background and on the basis of Article 189 of the EU Treaty (TFEU), the European Commission therefore proposes a new space strategy for Europe, which focuses on four strategic objectives:

- Use or exploitation of space services and data
- Strengthening a global, competitive and innovative European space sector
- Ensuring the independence of Europe in the access and use of space in a secure and safe environment
- Strengthening the role of Europe as a global player in the promotion of international cooperation

The European Commission is now inviting the European Parliament and the Member States to discuss the present strategy and to support its implementation. From 2017 onwards, the European Commission intends to start implementing the specific measures identified in the strategy and to enter into a continuous dialogue with the relevant stakeholders in order to monitor the effectiveness and progress of this process.

The Commission Communication “Space Strategy for Europe” is available via the following link:  
<http://ec.europa.eu/docsroom/documents/19442>

# IAU SYMPOSIUM #325 ASTROINFORMATICS



**IAU Symposium #325 on Astroinformatics (AstroInfo16)** brought together world-class experts to address the methodological and technological challenges posed by the scientific exploitation of massive data sets produced by the new generation of telescopes and observatories. Astronomy, which already was at the forefront of Big Data science with exponentially growing data volumes and data rates, is now entering the petascale regime at optical, infrared and radio wavelengths. Astronomy is truly becoming data-driven in the ways that are both quantitatively and qualitatively different from the past. The data structures are not simple, and the procedures to gain astrophysical insights are not obvious, but the informational content of the modern data sets is so high that archival research and data mining are not merely profitable, but practically obligatory, since researchers who obtain the data can only extract a small fraction of the science that is enabled by it.

The symposium took place at a crucial stage in the development of this new and exciting field of research, when many efforts have made significant achievements, but the widespread groups have not yet effectively communicated across specialties, gathered to assimilate their achievements, and consulted with cross-disciplinary experts. By bringing together astronomers involved in survey and large simulation projects, computer scientists, data scientists and companies, the symposium will provide a unique environment for the exchange of ideas, methods, software, and technical capabilities, seeking to establish enduring associations between the diverse researchers.

The Symposium covered a broad range of **topics in Astroinformatics**: Database Management Systems, Data Mining, multiprocessor computing for astronomy, machine learning methods for classification and knowledge extraction, algorithms for N-point computations, time series analysis and image processing, advanced visualization for astronomical Big Data, cross-disciplinary perspectives and advanced training. The day following the Symposium presentations were devoted to tutorials on various aspects of informatics.

There were some 120 participants from 34 countries (from Europe, both Americas, Asia, Africa and Australia). Among them there were famous scientists George Djorgovski (USA), Ray Norris (Australia), Edwin Valentijn (Netherlands), Eric Feigelson (USA), Zeljko Ivezic (USA), Joseph Mazzarella (USA), Kazuhiro Sekiguchi (Japan), Giuseppe Longo (Italy), Fionn Murtagh (UK), Reynier Peletier (Netherlands), Yaroslav Yatskiv (Ukraine) and others. From Armenia, **BAO Leading Scientist Areg Mickaelian** participated. He presented a talk “*Multi-wavelength studies of the statistical properties of active galaxies using Big Data*”. He was also the co-author of another contribution (poster with oral presentation) by Martin Topinka (Ireland) on DFBS.

The symposium took place after the **ADASS-XXVI meeting** held in Trieste. On the other hand, COST Action 1403 **BigSkyEarth Conference** was associated to the IAU S325 and took place in Sorrento just after the Symposium. The **Proceedings**, edited under the IAU patronage and published by Cambridge University Press, will serve as a reference for future work. They will include invited talks, contributed papers and posters.

*Areg Mickaelian*

## SUB-REGIONAL EUROPEAN ASTRONOMICAL COMMITTEE (SREAC)

### OPTICON Awareness Conference on “Hot topics in Astrophysics”

#### For South Eastern European Countries

*26- 27 September 2016, Ohrid, Republic of Macedonia (FYROM)*



The workshop intended to present the *Hot topics in Astrophysics*, from Planetary Systems to Cosmology with open questions both for theoreticians, and for observers. It was intended for PhD Students, Post-Docs, or Senior astronomers. Last year's Master students, with a good background in astrophysics or optical engineering, could also participate.

The participants were selected by each participating country. The number of participants was limited to about 30 for practical reasons. All local costs were covered by the school. The school was sponsored by the OPTICON EU-I3 program.

The **Optical Infrared Co-ordination Network (OPTICON)** for astronomy brings together all the national and international agencies and organisations which fund, support, develop and operate Europe's facilities for optical and infrared astronomy night-time astronomy. OPTICON provides a framework allowing joint actions to improve the quality of Europe's infrastructures, to train new astronomers, especially those from Central Europe, in modern new research methods, to develop innovative technologies to enhance research quality, to plan for future developments, and to work towards a strategic plan for Europe's future research infrastructures.

OPTICON runs Research and Technological Development (JRA), Coordination (Networking) and Trans-National Access Activities.

**SREAC** was created within the framework of the project “*Enhancing astronomical research and observation in South-East Europe and Ukraine*” of the UNESCO Regional Bureau for Science and Culture in Europe (UNESCO-BRESCE). The main objective of SREAC is to elaborate and implement a sub-regional strategy for the development of astronomy in South-East Europe and Ukraine and to strengthen astronomical co-operation in the sub-region, and between the region and countries outside. Member countries are Albania, Bulgaria, FYR of Macedonia, Greece, Montenegro, Romania, Serbia, Turkey, and Ukraine. Later on in 2005, **Armenia joined SREAC** as an associated member and Areg Mickaelian became an associated member of the SREAC Board. SREAC meeting in Ohrid was the 7<sup>th</sup> one.

From Armenia, BAO Leading Scientist Areg Mickaelian participated in the Conference with two talks “*Observational possibilities in Byurakan*” and “*Recent activities in Armenian astronomy*”. He also participated in SREAC Board meeting, where a number of discussions were held on various aspects of South Eastern European astronomy. Renada Konstantinova-Antova (Bulgaria) was elected SREAC Chair for the next two years and Gordana Apostolovska (FYR of Macedonia) was elected SREAC Secretary.

*Areg Mickaelian*

## ISM-SPP Olympian School of Astrophysics

The ISM-SPP Olympian School of Astrophysics took place in Paralia Katerini, Mount Olympus, Greece, from 3-7 October, 2016. The school was organized by Olympian Centre for Astrophysics, and was sponsored by ISM-SPP (DFG Priority Program 1573).



The School focuses on the physics and chemistry of the galactic and extragalactic interstellar medium including star formation, and on astrochemistry from photoionized to photodissociation and molecular regions.

The covered topics include:

- Physics and Dynamics of the Interstellar Medium,
- Astrochemistry,
- Hydrodynamics,
- Star formation,
- Hydrodynamical simulations and the comparison with observations.

The lectures were given by well-known scientists from Greece and Germany. The students were also given a time to give a short oral presentations of their posters. The school involved 28 PhD students from different countries (Armenia, Austria, Belgium, Czech Rep., Germany, Greece, Mexico, Poland, Russia, and United Kingdom).

Senior Assistant of Byurakan Astrophysical Observatory (BAO) Hasmik Andreasyan was representative at the school.

*Hasmik Andreasyan*

## XXI INTERNATIONAL ASTRONOMICAL OLYMPIAD

The International Astronomy Olympiad (IAO) is a scientific-educational event for students of the high school junior classes, 14-18 years old, which includes an intellectual competition between these students. The style of the problems is aimed at developing the imagination, creativity and independent thinking. IAO takes place each year in the first two months of the astronomical autumn (i.e. September 22 - November 22) in either an observatory, a scientific research centre (town) or at an institute of the participating countries. IAO is organized by the Authorized National Representative (Astronomical) Organization (ANRAO) of the organizing country. Our ANRAO is the Byurakan Astrophysical Observatory (BAO).

Every participating country may send five students, who are the winners of the respective national Olympiads or easy competitions: three students for the group Alpha (14-15 years old) and two students to the group Beta (16-18 years old). They are to be accompanied by two team leaders as representatives of each country. A considerable part of the knowledge which is necessary for participation in the Olympiad goes beyond the frames of the school curriculum in most of the countries in the world. Preparation for the Olympiad needs extra-curricular activities of various types, whose promoting is one of the Olympiad's aims. The IAO is being held in 3 rounds: theoretical, practical and observational. For theoretical and practical works, 4 hours are given.

This year the 21<sup>st</sup> International Astronomy Olympiad (IAO XXI) was held Plovdiv, Bulgaria on October 5-13, 2016. As it was mentioned, the IAO provides the opportunity for the students between the ages of 14 and 18 to compete on knowledge and skills in Astronomy as well as to develop friendship with each other. There were 16 teams of the following states participated in the Olympiad: Armenia, Bulgaria, Czech Republic, India, Italy, Kyrgyzstan, Korea, Lithuania, Macedonia, Moscow Land, Romania, Russia, Sweden, Thailand and Ukraine.



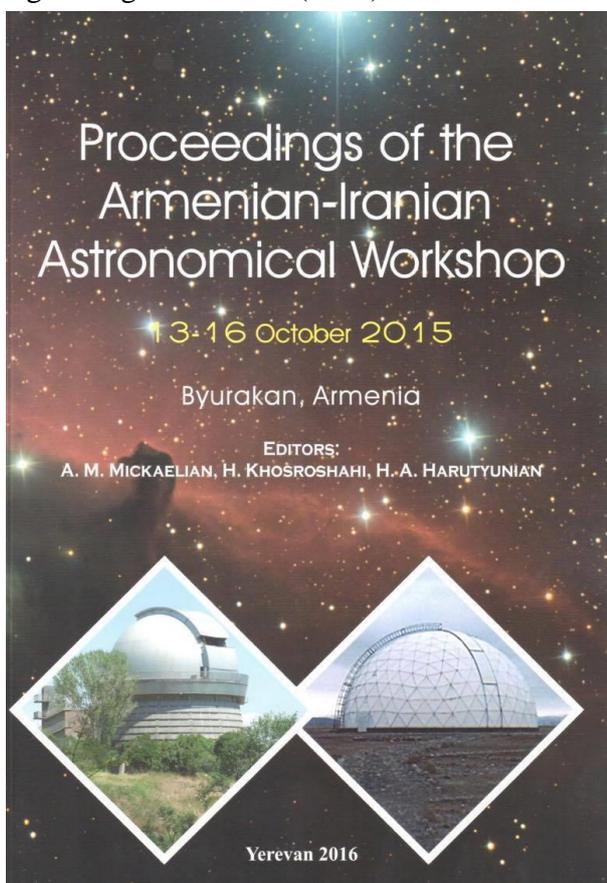
In this year in IAO took part 4 Armenian students: Babajanyan Mushex, Davit Gevorgyan, Areg Grigoryan and Hayk Harutyunyan. Out of all participants only **Areg Grigoryan** took the bronze medal. The team leaders were BAO Researcher **Dr. M.V. Gyulzadyan** and the President of Armenian Youth Aerospace Club **A.E. Grigoryan**.

# PUBLICATION OF ARMENIAN-IRANIAN ASTRONOMICAL WORKSHOP PROCEEDINGS



**Armenian-Iranian Astronomical Workshop (AIAW)** was organized on 13-16 October 2015 in Byurakan, Armenia aimed at strengthening scientific relations between Armenian and Iranian astronomers and establishing new collaborations. A number of such mutual colloquia were held before between the Armenian and Georgian astronomers (in Byurakan, Armenia and Abastumani, Georgia) and the previous experience and format were used for better organization of AIAW.

The organizers and sponsors were: NAS RA V. Ambartsumian Byurakan Astrophysical Observatory (BAO, Armenia), Armenian Astronomical Society (ArAS, the Workshop was also combined with ArAS XIV Annual Meeting), Astronomical Society of Iran (ASI) and Institute for Research in Fundamental Sciences (IPM, Tehran, Iran). There was a representative Scientific Organizing Committee (SOC) of 13 members from Armenia and Iran. There were 30 Armenian and



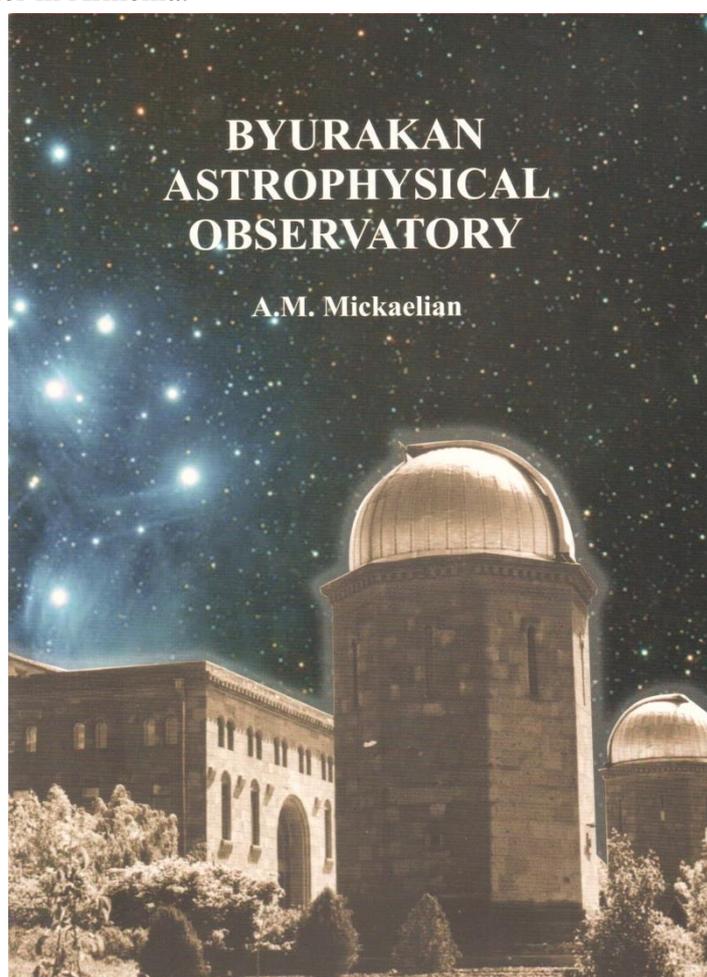
16 Iranian participants, as well as the Director of Abastumani Astrophysical Observatory (AAO) was also invited as the representative of Georgia. The scientific program consisted of 18 invited and 22 contributed talks and 4 posters. Invited talks by senior scientists were given on each topic followed by a number of contributed ones, as well as posters were presented and discussed. The Volume consists of 4 sections: 1) *Astronomy in South West Asia* (Armenia, Iran and Georgia); 2) *Sun, Stars and Nebulae*; 3) *Galaxies and Cosmology* and 4) *Archaeoastronomy and Astronomy in Culture*. A number of excellent review talks were given on various related topics and many new outstanding results were presented during the Workshop, and many papers are useful for a number of astrophysical fields. A Preface, Organizers and Sponsors, the List of Participants, and Author Index are also given.

Editors of the proceedings are: A. M. Mickaelian, H. Khosroshahi and H. A. Harutyunian.

All abstracts of the Proceeding are available in ADS system.

## PUBLICATION OF "BYURAKAN ASTROPHYSICAL OBSERVATORY" BOOKLET

Popular booklet “**Byurakan Astrophysical Observatory**” was recently republished by the “EditPrint” Publishing House dedicated to the 70<sup>th</sup> anniversary of Byurakan Astrophysical Observatory after V.Ambartsumian of the National Academy of Sciences (BAO). **Dr. A.M. Mickaelian** is the author of the booklet. The booklet is prepared for astronomers, students, BAO visitors and for the ones who is interested in BAO and Armenian Astronomy. The booklet consists of 64 pages; it is made as a visiting card and presents concise and full information about BAO. A brief history of BAO, the biography of our great scientist Viktor Ambartsumian, brief biographies of 11 other deserved scientists formerly working at BAO (B.E. Markarian, G.A. Gurzadyan, L.V. Mirzoyan, M.A. Arakelian, et al.), information on the BAO telescopes (2.6m, 1m Schmidt, etc.) and other scientific instruments, scientific library and photographic plate archive, Byurakan surveys (including the famous Markarian survey included in the UNESCO “Memory of the World” International Register), all scientific meetings held in Byurakan, international scientific collaboration, data on full research staff of the observatory, as well as former BAO researchers, who have moved to foreign institutions are given in the booklet. At the end, the list of the most important books published by Armenian astronomers and about them is given. Being an important scientific, educational, and cultural cradle, BAO is also presented as one of the most visited scientific tourism center in Armenia.



## MOST PRODUCTIVE SCIENTISTS IN ARMENIA



The Armenian State Committee for Science (SCS) announced the results of the contest “Most Productive Scientists 2016”. 97 scientists are awarded additional funding for a year. The awardees are selected based on their scientific publications and citations on them, conference presentations, supervision of theses, patents, supervision of research groups, grants and prizes, and scientific-organizational work have been taken into account.

Out of 97 scientists, there are 60 representatives from Natural Sciences, 15 from Engineering and Technology, 15 from Armenology and Human sciences and 7 from Social Sciences. Most representatives are from:

- 26 – Yerevan State University (YSU)
- 17 – A. Alikhanian Yerevan Physics Institute (YerPhI)
- 9 – Armenian State Engineering University
- 7 – Institute of Archaeology and Ethnography
- 5 – Institute of Mechanics
- 4 – Institute for Physical Research
- 3 – Byurakan Astrophysical Observatory (BAO)
- 3- Armenian-Russian (Slavonic) University

Among the 97 awarded scientists, 5 are from the field of Astronomy and Astrophysics; 3 from BAO and 2 from other institutions (physicists working on astronomical problems):

- Vahagn Gurzadyan (YerPhI; cosmology)
- Tigran Magakian (BAO; physics and evolution of stars)
- Areg Mickaelian (BAO; extragalactic astronomy)
- Tigran Movsessian (BAO; physics and evolution of stars)
- Aram Saharian (YSU Department of Theoretical Physics; cosmology)

The list of the most productive scientists will be revised annually.

## RADIK MARTIROSYAN – FOREIGN MEMBER OF RUSSIAN ACADEMY OF SCIENCES

At the recent elections of the Russian Academy of Sciences (RAS) the President of Armenian National Academy of Sciences **Prof. Radik Martirosyan** was elected a foreign member of RAS. So far, *Prof. Sergei Hambarzumyan* (Department of Energy, Engineering, Mechanics and Control Processes, since 2003), *Prof. Levon Mkrtychyan* (Department of Medical Sciences, since 2014) and *Prof. Radik Martirosyan* (Department of Physical Sciences, Section of General Physics and Astronomy, since 2016) are RAS foreign members from Armenia. We congratulate *Prof. Martirosyan* and wish him further achievements.



Radik Martirosyan was born on 01.05.1936 in v. Mataghis, Martakert province, Artsakh. He has graduated from the YSU Radiophysics Department in 1958. His first interest in science was astrophysics, particularly radioastronomy. However, he took post-graduate fellowship at the USSR Academy of Sciences P.N. Lebedev Institute of Physics under the supervision of the Nobel Prize Winner acad. A.S. Prokhorov and in 1964 defending his thesis was awarded Ph.D. degree in Phys.-Math. Sciences. Since 1964 he continued his research activities at the newly created NAS RA Institute of Radiophysics and Electronics (IRPhE), and since 1965, he simultaneously taught at the YSU; as an Associate Professor since 1966, and as a

Professor since 1982. He was Head of Laboratory (1970-1980), Deputy Director (1971-1981) and Director (1980-2006) of IRPhE, Head of Chair of Ultrahigh Frequencies of YSU Radiophysics Department (1983-1993) and YSU Rector (1993-2006). During his rectorship, new departments and new specialties were created at the YSU and the number of students was twice increased. In 1980, he was awarded Doctoral degree in Phys.-Math. Sciences. Martirosyan was elected NAS RA Corresponding member (1986) and Full member (1990) in Radiophysics and Electronics, NAS RA Presidium member (since 1993) and President of NAS RA (since 2006). He is the Chair of the International Steering Committee of Viktor Ambartsumian Prize since 2009. During the last 5 years, Martirosyan's role was significant for the accomplishment of NAS RA legislative program, rejuvenation of institutes' directors, elections of new Academy members, improvement of publishing and library, international collaboration and other scientific-organizational matters.

Martirosyan's research relates to quantum and ultrahigh frequencies radiophysics, application problems of superconductivity, space research, radioastronomy, studies of Earth's natural resources by radiophysical methods. He has obtained important results in the field of investigation and creation of new, high efficiency quantum amplifiers working in cm and mm radiowavelength ranges. He has discovered and studied new materials serving as active medium quantum amplifiers. Based on these works, quantum devices of new type have been created that later have been applied in radioastronomical research. Martirosyan has participated in the space program "Intercosmos", particularly in accomplishment of "Vega" project. He is the author of more than 200 scientific papers, two books published in Sweden and the USA. He is a laureate of Ukrainian and ArmSSR (1988) state prizes. He was awarded the Armenian Order of St. Mesrop Mashtots (1999), "Sign of Honour" and "Peoples' Friendship" orders, French National Order of the Legion of Honour and Italian order "For Services in the fields of Science and Culture", Gagarin gold medal and other medals. For his significant contribution in the development of astrophysics and his great support to BAO and ArAS, as well as on the occasion of his 80<sup>th</sup> anniversary ArAS awarded *Prof. Radik Martirosyan* a certificate of ArAS Honorary Member.

## AGOP TERZAN VISITS BAO



One of the most important persons of Armenian Diaspora and French astronomy Agop Terzan visited to Byurakan Astrophysical Observatory (BAO). Prof. Terzan had a meeting with BAO staff and shared his memories and experience related to Armenian astronomers and Byurakan.

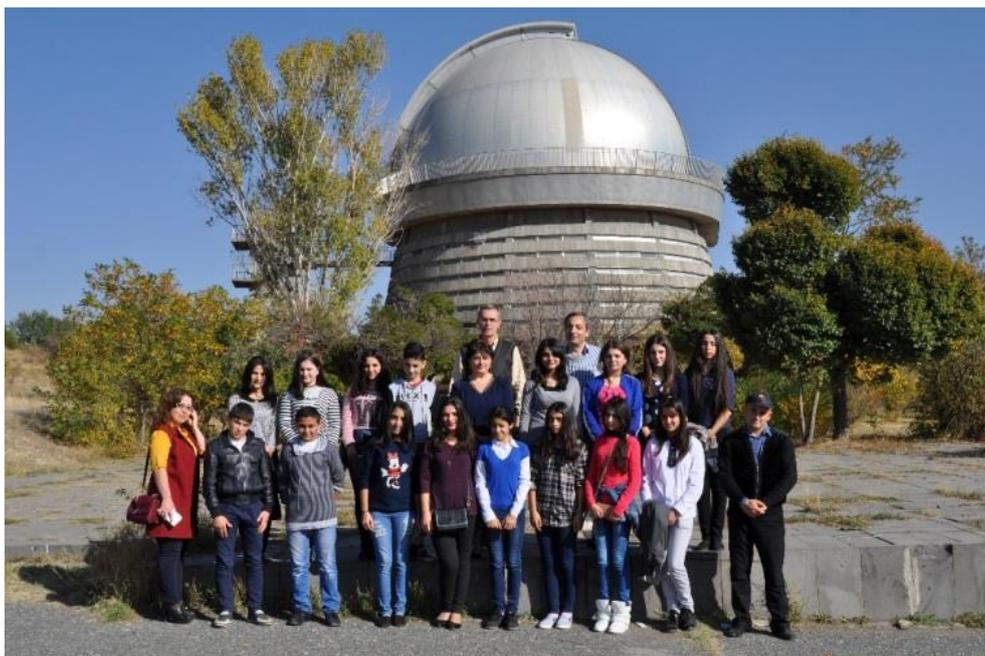


Agop Terzan was born on October 31, 1927 in Constantinople (Istanbul). He graduated from the Constantinople University (he got his Bachelor degree on Mathematics in 1945 and Masters on Astronomy in 1949) and worked as a teacher of mathematics at Central Lyceum of Istanbul. In 1956 he moved to France. In 1957-1959 Terzan worked as a teacher of mathematics at technical lyceum and in 1959-1965 as an assistant astronomer, later as a scientist. In 1967-1998 he worked at the Lyon Observatory, in 1982-1983 he was the Deputy Director of that observatory. In 1965 he was awarded a doctorate of mathematical sciences by Lyon University; in 1980 he was awarded a professorship. Terzan's works mainly refer to variable stars, stellar clusters and problems of physics of stars. Since 1963 he made observations by a number of most significant telescopes of the world. He discovered 710 variable stars in the immediate vicinity of 14 globular clusters, 11 new globular clusters (named Terzan 1, etc. till Terzan 11), 158 diffuse nebulae, 124 galaxies (from which 25% appeared to be active galaxies of Sy2 type), 4430 red variable stars in direction to the Galactic center (including 458 ones which were later identified with the IRAS infrared sources), 1428 high proper motion stars ( $\mu > 0".1$  per year). 26 planetary nebulae, 122 diffuse galaxies in direction to the center of Our Galaxy. Later it was found out that those galaxies discovered by Terzan formed the cluster of galaxies of Ophiucus constellation, as well as the super-cluster of Sagittarius-Ophiucus, which was essentially discovered due to Terzan. On the basis of the observations recently made by European astronomers it was found out that Terzan 5 cluster was one of the main formations of the center of Our Galaxy; on its basis the Galaxy was formed. In essence it is the protogalaxy, which formed its central part (bulge) joining the Milky Way. It is noteworthy to mention that the stellar clusters revealed by Terzan and named after him are known to all astronomers. With his perennial activity and essential results he has a serious contribution in observational astrophysics. As a result of the above mentioned works Terzan published more than 100 scientific papers in the most important astronomical journals. Terzan also has a serious contribution in the working out of astronomical devices (devices and photometers for comparing eclipses). He also has a considerable contribution in editorial and administrative works. In 1968-1978 he was the Head of Lyon Astronomical Society. He was awarded a Henry Rey prize of the French Astronomical Society (1977), prizes of French Ministry of Education (1979) and a number of medals. He was a Corona Prize winner of the French Academy of Sciences (1988).

## “MY UNIVERSE” CONTEST WINNERS IN BAO

10-11.10.2016, Byurakan, Armenia

The Armenian Astronomical Society (ArAS) and the Fund for Armenian Relief (FAR) jointly organized “*My Universe*” essay contest for pupils aged 10-15 from Tavush Province Shamshadin region of the Republic of Armenia. The contest kicked on the September 3 and closed at September 14. The results were announced on September 20 by the impartial jury consisting of philologist teachers and the astronomer Areg Mickaelian (Chair) that had evaluated and selected the best essays.

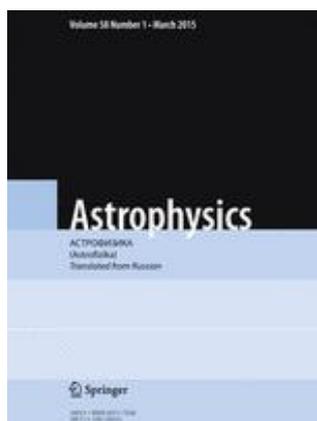


The contest award ceremony was held at Byurakan Astrophysical Observatory (BAO) on October 10. The winners 15 pupils, 2 teachers and FAR representative had a 2-day stay at BAO guest house, got acquainted to BAO research and other activities, met professional astronomers, visited BAO 2.6m telescope and Viktor Ambartsumian’s museum, had night observations and visited Amberd Medieval Fortress.



The winners were awarded with certificates and prizes. The principle prize was Avetik Grigoryan’s popular science book “*From the Deep of Ages to the Universe*”. The book presents a fascinating popular science story about the cognizing race of mankind in aeronautics, aviation, astronomy and astronautics starting from ancient ages to our time, as well as about the man-kind’s space future. Under the attraction of 14 extraordinary phenomena and mysteries of the outer space this book leads the reader from simplest and ordinary notions to deep and encyclopedic knowledge in natural science and technology, awakes inquisitiveness, develops ability and tendency to creative research and investigation, as well as gives a comprehensive conception of Universe and the history of its study.

## RELEASE OF ASTROPHYSICS SEPTEMBER ISSUE



### **Distribution of Peculiar Radial Velocities in Galactic Clusters in a Model with Dissipative Redshift**

V. V. Orlov, A. A. Raikov

### **Eclipsing SU UMa-Type Dwarf Nova 1RXS J003828.7+250920 During the “Period Gap”. I. Multiperiodicity and Color Features in 2011-2012**

E. P. Pavlenko, A. A. Sosnovskij, N. A. Katysheva, T. Kato, K. Littlefield

### **Magnetic Stars After the Hayashi Phase. II.**

Yu. V. Glagolevskij

### **Search for Compact Stellar Groups in the Vicinity of Iras Sources**

N. M. Azatyan, E. H. Nikoghosyan, K. G. Khachatryan

### **Detailed Study of Emission Structures in the Vicinity of LkH $\alpha$ 198**

M. H. Gevorgyan, T. A. Movsessian, H. R. Andreasyan, T. Yu. Magakian

### **The Object CLN 138 – a Double Star-Formation Region**

A. L. Gyulbudaghian

### **Hysteresis Effect in the Activity Indices of the Atmospheres of the Sun and Solar-Type Stars During the Rising and Falling Phases of Cycles**

E. A. Bruevich, G. V. Yakunina

### **Relationship of Solar Radio Emission at $\lambda=1.43\text{m}$ and Optical Processes in the Sun**

Sh. Makandarashvili, N. Oghrapishvili, D. Japaridze, D. Maghradze

### **Study of Variations in Solar Differential Rotation Based on Compact Magnetic Features and Hydrogen H $\alpha$ Filaments**

D. R. Japaridze, B. B. Chargeishvili

### **Approximate Solution to the Fractional Second-Type Lane-Emden Equation**

E. A-B. Abdel-Salam, M. I. Nouh

### **Lithium in Stellar Atmospheres: Observations and Theory**

L. S. Lyubimkov

## RELEASE OF NRAO NEWSLETTER OCTOBER ISSUE



### Upcoming Events

NRAO Assistant Director of Science Support and Research

Eric Murphy Appointed ngVLA Project Scientist

ngVLA Science Advisory Council

CASA 4.7.0 Release

Possible Disk Truncation in Ophiuchus Brown Dwarfs

ALMA Call for Development Project Proposals

ALMA Band 1 Science Workshop - First Announcement

ALMA Cycle 4 Observing Underway

Half a Decade of ALMA Science Conference

Recent Media Releases

Career Opportunities

From the Archives

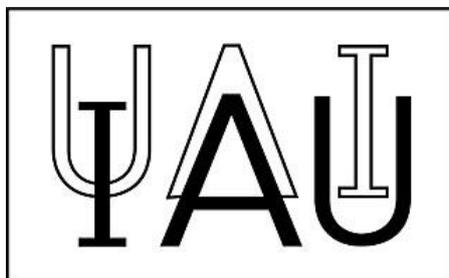


**National Radio Astronomy Observatory**



A facility of the National Science Foundation

## RELEASE OF IAU ASTRONOMY OUTREACH NEWSLETTER 2016 #20, October #2



In this newsletter:

From the Editors

Start planning for IAU General Assembly (GA) 2018 in Vienna, Austria

Letters of Intent for IAU Scientific Meetings in 2018

National Outreach Contact (NOC) Corner: News from Japan

Latest training courses from the Network for Astronomy School Education (NASE)

Inspiring Every Child with Our Wonderful Cosmos - UNAWE's new video

Global Hands On Universe (GHO�) recommended software

Discover HubbleSite

Subscribe to the NASA Space Place Gazette

Meetings & global events

a) Recently Added

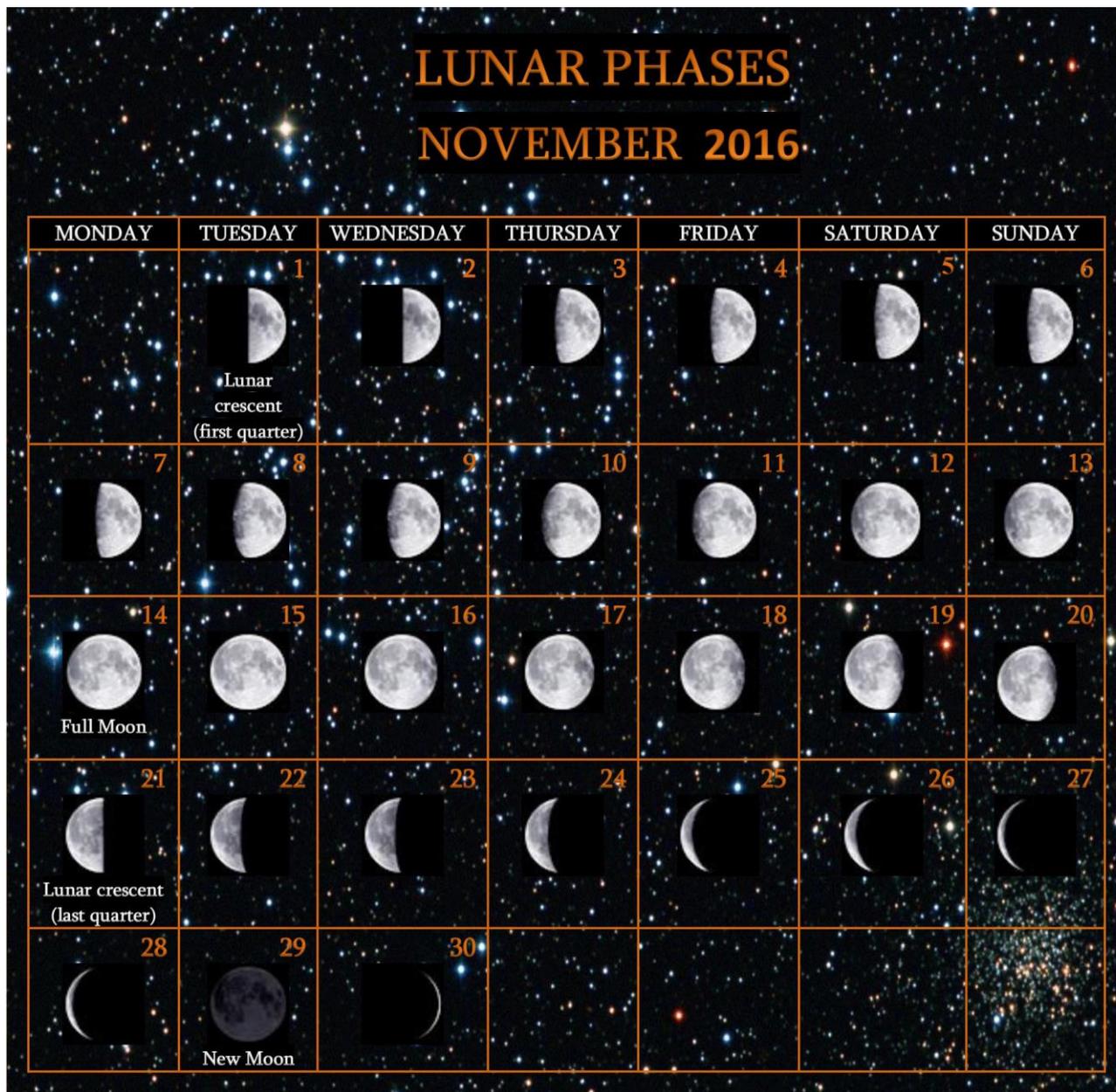
b) Upcoming

IAU Astronomy Outreach Newsletter in other languages

Contributions to IAU Outreach Newsletter for 2016



# LUNAR PHASES OF NOVEMBER



# NOVEMBER CALENDAR OF ASTRONOMICAL EVENTS

Monthly Calendar of Astronomical Events  
NOVEMBER 2016

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
	1	2	3	4	5	6
7 Lunar crescent (last quarter)	8 Leonids meteor shower	9 Lunar occultation of Neptune	10	11	12	13
14 Full Moon Super Moon	15	16	17	18	19	20
21 Sofik Iskandarian's 80 <sup>th</sup> anniversary  Lunar crescent (last quarter)	22	23	24 Conjunction of Mercury vs. Saturn	25 Geminids meteor shower	26	27
28 IAU Symposium #329	29 New Moon	30 ArAS Newsletter #99 Release				