

# ArAS News

NEWSLETTER

ARMENIAN ASTRONOMICAL SOCIETY (A r A S)



No. 113 (January 31, 2018)

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Editor: Sona FARMANYAN

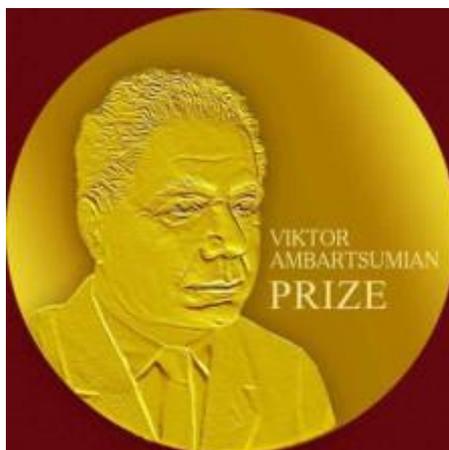
ArAS Newsletter online at: <http://www.aras.am/ArasNews/arasnews.html>

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## VIKTOR AMBARTSUMIAN INTERNATIONAL SCIENCE PRIZE 2018



Viktor Ambartsumian International Science Prize is one of the important awards in astronomy/astrophysics and related sciences. It is being awarded to outstanding scientists having significant contribution in physical-mathematical sciences from any country and nationality. The Prize is being awarded once every two years since 2010. During 2010-2016 it was established by the Armenian Government as USD 500,000. At present it is USD 300,000.

To apply for the Prize, a work may be presented by an author or authors' group (not more than 3 persons). The cash award is being equally shared between the winners, and a diploma, a medal and a certificate are being awarded to each winner. The winner(s) receive USD 200,000 as personal award and USD 100,000 is being used for research projects and foreign fellowships for Armenian scientists, organization of meetings in Armenia, and stipends for Armenian students (all under the supervision of the Prize winners).

### **The right for the nomination of works is reserved to**

- Nobel Prize Winners
- Presidiums of national academies of sciences
- Scientific councils of astronomical observatories or astronomical institutes
- Scientific councils of corresponding departments of universities

Nominations for Viktor Ambartsumian International Science Prize are not allowed in case if the presented work has already won or at the same time has been presented for another international prize.

### **Necessary documents for nomination**

1. Official letter of nomination signed and sealed by the corresponding body,
2. Statement of scientific results or achievements, which are being nominated (2 pages),
3. Curriculum Vitae of the nominee(s),
4. List of refereed publications of the nominee(s),
5. Recommendations from three renowned scientists in the field,

6. Published papers, books, CD/DVDs, or other works that are being nominated,
7. Other documents that might be important for the decision.

### **The documents should be submitted to**

**Viktor Ambartsumian International Science Prize International Steering Committee,**  
Presidium, National Academy of Sciences, Marshal Baghramyan ave. 24, Yerevan 0019, Republic of Armenia.  
Phone: +374-10-525505.

### **Deadline for nominations**

**April 18, 2018.** The decisions will be made before **July 18, 2018** and the Award Ceremony of Viktor Ambartsumian International Science Prize will take place on **September 18, 2018.**

### **Viktor Ambartsumian Prize International Steering Committee**

*Prof. Radik M. MARTIROSYAN* (Armenia, Chair, [president@sci.am](mailto:president@sci.am))

*Prof. Catherine J. CESARSKY* (France, [catherine.cesarsky@cea.fr](mailto:catherine.cesarsky@cea.fr))

*Prof. Anatol CHEREPASHCHUK* (Russia, [director@sai.msu.ru](mailto:director@sai.msu.ru))

*Prof. Norio KAIFU* (Japan, [norio.kaifu@nao.ac.jp](mailto:norio.kaifu@nao.ac.jp))

*Prof. Michel MAYOR* (Switzerland, [michel.mayor@unige.ch](mailto:michel.mayor@unige.ch))

*Prof. Vahé PETROSIAN* (USA, [vahep@stanford.edu](mailto:vahep@stanford.edu))

*Prof. Brian SCHMIDT* (Australia, [brian@mso.anu.edu.au](mailto:brian@mso.anu.edu.au))

*Prof. Joseph SILK* (UK, [silk@astro.ox.ac.uk](mailto:silk@astro.ox.ac.uk))

*Prof. Yervant TERZIAN* (USA, [terzian@astro.cornell.edu](mailto:terzian@astro.cornell.edu))

### **Contact**

*Dr. Areg M. MICKAELIAN* (Scientific Secretary, International Steering Committee, phone: +374-91-195914, E-mail: [aregmick@yahoo.com](mailto:aregmick@yahoo.com)).

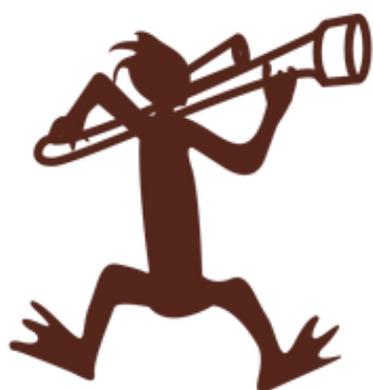
*Sona V. FARMANYAN* (Executive Secretary, International Steering Committee, phones: +374-10-525505, +374-55-911307, E-mail: [sona.farmanyan@mail.ru](mailto:sona.farmanyan@mail.ru), [vaprize@sci.am](mailto:vaprize@sci.am)).

### **Viktor Ambartsumian International Prize official webpage**

<http://vaprize.sci.am>

# JOINT INTERNATIONAL CONFERENCE ON ASTROPHYSICS FOR YOUNG SCIENTISTS

The 41st International School for Young Astronomers. ISYA2018 will take place in Socorro, Santander-Colombia from July 8th to July 28th 2018. The school is organized by the International Astronomical Union (IAU), the Norwegian Academy of Science and Letters (NASL) and by an alliance of Colombian universities: Los Andes, Antioquia, ECCI, Industrial Santander and Nacional.



# ISYA 2018

## 41<sup>th</sup> International School for Young Astronomers Socorro, Santander-Colombia



The ISYA concept is a three-week international postgraduate school for regions where students have less opportunity to be directly exposed to the full extent of up-to-date astrophysics. In this edition it will be entirely computational/theoretical focussed on observational data processing and analysis techniques with archival data. We want to demonstrate how astronomy can be done in the XXI century with a limited direct access to observational facilities, which is often the situation across the countries in our region. The students will heavily use computational facilities of the Supercomputing Center of Universidad Industrial de Santander (SC3-UIS).

Learn more at the webpage of the school: <https://eventos.redclara.net/indico/event/842/>

# ASTRONOMY IN TURKEY

As we have reported on ArASNewsletter #111, Turkey officially joined to the South West and Central Asian ROAD office and expressed its desire to carry out its activities for the development of astronomy by adopting Armenia's coordinating role. In the present article we show the brief history of Astronomy in Turkey.



## 1. Brief history of astronomy in Turkey

Turkey descends from Ottoman Empire (1299-1923). In the medieval ages the theoretical framework of astronomy in Ottoman Empire, as was the case in all Islamic world and Europe, was that set by Ptolemy and Aristoteles. An observatory equivalent to that of Tycho Brahe was founded in İstanbul (1570) by Taqi ad-Din, but could not survive for a sufficiently long time to make a strong impact. As no new observatory was built until 1873, astronomers in the Ottoman era were not able to follow up the scientific revolution in the Western world. Yet, astronomical observations, required for religious and practical purposes were done by local astronomers in each town. The Copernican model was first introduced by translations of catalogs, e.g. that of Noël Duret in (d. 1650), rather than the groundbreaking theoretical works of Copernicus, Galileo or Kepler. This reflects the practical approach of Ottomans to astronomy. The Copernican model was not accepted until the middle of the 19th century.

## 2. Astronomy and astrophysics education in universities and career of academics

Astronomical and astrophysical studies are mainly organized in universities. Both educational and research activities are done simultaneously. In astronomy and space science departments students are required to take basic astronomy and astrophysics courses and some fundamental physics and mathematics courses. There is no need to say that they are all learning how to use computers and run basic computational programs that they need in both educational and research activities during their undergraduate and graduate studies.

### 2.1. Universities

In some universities where there are no formal astronomy departments, there are astronomy and astrophysics courses in which fundamental astronomy and astrophysics topics are covered. Generally such courses are offered within the physics departments. In the formal astronomy departments a heavy practical astronomy course is compulsory for the undergraduate students. When students are graduated from the department they can carry out observational work independently and confidently.

Following five Turkish state universities have independent Astronomy and Space Science Departments; İstanbul University (1936), Ankara University (1954), Ege University (İzmir, 1962), Erciyes University (Kayseri, 2001), Çanakkale Onsekiz Mart University (Çanakkale, 2001), İnönü University (Malatya, 2011), Atatürk University (Erzurum, 2013)

About 60 undergraduate students enrol to these departments each year, amounting to about 400 students all together. These universities also offer graduate MSc and PhD programmes.

In addition to seven universities above, the universities below offer astronomy and astrophysics within physics departments by means of the offered astronomy and astrophysics courses in their undergraduate curricula as well as the graduate studies: Middle East Technical University (Ankara), Boğaziçi University (İstanbul), Çanakkale 18 March University (Çanakkale), Çukurova University (Adana), Akdeniz University (Antalya), İnönü University (Malatya), Sabancı University (a foundation owned university, İstanbul), Kültür University (a foundation owned university, İstanbul), Atatürk University (Erzurum), Süleyman Demirel University (Isparta), Adıyaman University (Adıyaman), İstanbul Technical University (İstanbul). Total number of

astronomers with PhD degrees, in these universities, is around 100 to 150. Master of Science and PhD students should also be added to this number as being candidates of potential astronomy researchers. Astronomical observations were done in university observatories and in the National Observatory, TUG in Antalya. With the available telescopes in university observatories, both educational and research activities are going on effectively. In addition, they are also open to public on certain occasions during the year, for popular astronomical activities.

Four years of undergraduate education is performed in astronomy and space sciences departments and astronomy and space technologies department in Science Faculties in Turkey. Graduate education and research are also performed in these departments and astrophysics research groups in Physics Departments. Lectures of astronomy and space science departments contain approximately 30% math, 30% physics, and 40% astronomy and also it can be chosen from other fields. Undergraduate students will have *astronomer* title when they finished their courses successfully at the end of four years. Graduate programs of these departments mentioned above are accepting applications twice a year.

### **3. The Observatories in Turkey**

#### **The Royal (Kandilli) Observatory**

A one meter size telescope was bought for educational applications in Army (Harbiye) School, but it was fully destroyed in a big fire during Crimean war (1853-1856). The first observatory, after demolishing İstanbul Observatory in 1579 was built as a meteorological station, 289 years later in 1868 known as “Rasathane-i Amire” (Royal Observatory) at Pera/İstanbul. Rasathane-i Amire meaning magnificent, majestic, glorious observatory, can be considered to be the national observatory of Ottoman Empire. It was supported by the Empire on a report of a French engineer Aristide Coumbary who then became the first director of the Observatory. It was moved to Maçka/İstanbul, mostly as a small meteorological station and largely destroyed during 1909 rebellion. New (Kandilli) Observatory was built initially as a meteorologically station by Fatin Gökmen in 1910 at the present location Kandilli (İcadiye Peak, Kandilli). The first two directors of the observatory before Fatih Gökmen were French Scientist Aristide Coumbary and Turkish mathematician Salih Zeki. Other units (such as solar physics, radio astronomy, time measurement, seismology, geo-magnetism) in the observatory was developed after 1925. After the Turkish Republic was established (1923), Fatin Gökmen proposed to establish astronomy and geophysical observatory. The proposal was accepted and full-fledged astronomical observatory with equatorial refractor of 20 cm diameter and 207 cm focal length has been started to work in 1935. The name of the “Royal Observatory” was abandoned, and “Kandilli Observatory” as a new name was accepted. The Royal (Kandilli) Observatory thus can be considered to be the National Observatory of the Ottoman Empire until 1923. The Kandilli Observatory was specialized more on solar observations, and since 1982 the observatory continues its work and research mostly on the seismology and solar activity as an Institute (the Kandilli Observatory and Earthquake Research Institute) belonging to Boğaziçi University.

#### **İstanbul University Observatory**

Istanbul University Observatory<sup>1</sup> is the first modern observatory (built in 1936) of the Turkish Republic. It was built at Beyazıt - İstanbul by Erwin F. Freundlich as the laboratory of İstanbul University Astronomy Institute which was formed just after 1933 university reform in the Republic. The 30cm Carl-Zeiss astrograph installed in 1936 in the observatory is still used in solar activity observations. Two small reflectors (30cm and 20 cm) in the observatory are used in science & public activities. The observatory site became crowded living area, and thus under heavy light pollution after 1960’s. For the development of research on stellar astrophysics the observatory started in 2011 operating a joint 60cm robotic telescope at Çanakkale 18 March University Observatory site.

#### **Ankara University Observatory**

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<sup>1</sup> <http://www.istanbul.edu.tr/fen/astronomy/>

The idea of building Ankara University Observatory<sup>2</sup> was initiated by Edberg A. Kreiken in 1958 at Ahlatlıbel/Ankara and The Observatory was opened formally in 1963 with an international NATO summer school at the Observatory. In 1964, a 15 cm Zeiss Coude refractor, another 15cm photographic refractor a small radio antenna were installed in the Observatory. A 30 cm Maksutov telescope in 1974 started using in photometric research on different classes of variable stars. Three more telescopes (D=12.7cm, 35.6cm and 40cm) were added to the observational instruments of the observatory. Due to large increase in light pollution, the observatory staff submitted a project to the State Planning Department for a modern observatory with a two meter size telescope at light pollution free area, 75km away east of Ankara.

### **Ege University Observatory**

The construction of the Ege University Observatory<sup>3</sup> (EUO) was initiated at the end of 1963 and completed in 1965, just after 10 years of the foundation of Ege University in 1955 with the Faculties of Medicine and Agriculture in IZMIR, the third largest city in Turkey.

In 1962 the Science Faculty started to education. At the beginning of 1963 Abdullah Kızılırmak, from Ankara University, was appointed to the faculty to establish the department of Astronomy and the Observatory. The first instruments of the observatory were 15 cm Unitron telescope, the Foucault pendulum and an Iris photometer. The telescopes used in the Observatory with their sizes and the construction years are as follows: 13 cm spectrograph (1967), 48 cm Cassegrain telescope (1968), 30 cm Meade telescope (1999), 35 cm Meade telescope (2004), 40 cm Meade telescope (2004).

Now, 17 researchers with Ph.D. and 7 research assistants form the staff of both the institute and the observatory. About 30 researchers completed their PhD thesis using the facilities of the observatory. 350 undergraduate students and 20 graduate students are still continuing their education. The number of the papers published in the most-cited journals and the citation counts to these papers reached to 18 and 64 per year, respectively.

Furthermore, the observatory performs an intensive educational program both for schools and public, including short courses and one-week multi-faceted international public outreach program. The observatory is open to the public and schools on Friday evenings. EUO produces special programs for hundreds of elementary and secondary teachers and students. A popular night-time Public Program includes a presentation, observing through a 30 cm telescope with assistance from a telescope operator, and a sack dinner. Visitors can get fine views of the moon, the planets and some of the best-loved features of the sky. One-week Educational programs are designed to inspire and motivate students and are suitable for years 8–18, vacation care, and tertiary and adult education students. Programs are also available for groups who have special needs and access requirements. All educational programs are conducted by highly trained astronomy educators. Participants are divided into groups of 15 students and are accompanied by the astronomy educators at all times. Students are encouraged to ask questions throughout the courses. Observatory provides a unique opportunity for teachers and students to learn about astronomy and space exploration for 12 years old youngsters (?). The courses include: Exploring the heavens, astronomical concepts, stargazing skills - choosing and using a small telescope, variable stars, stellar evolution, universe and cosmology About 800 participants completed these courses.

Light pollution is an increasing problem for observatories everywhere. One of the reasons Kurudag was selected as the site for the observatory was its dark skies that would allow observation of the faintest stars without the interference of city lights. Since 1990s, rapid urbanization of IZMIR has resulted in a significant increase in the amount of sky glow. If such light pollution continues to increase, it will seriously reduce the effectiveness of the Ege University Observatory for many types of research. The observatory already applied to the State Planning Department for a modern observatory with a two meter size telescope at light pollution free area, around Izmir.

### **Çanakkale University Observatory**

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<sup>2</sup> <http://rasathane.ankara.edu.tr/>

<sup>3</sup> <http://astronomy.ege.edu.tr/EUGUAM/TR/>

ÇOMU Observatory<sup>4</sup> started operation in 2002 with a 40 cm reflector. In order to obtain more photometric data on variable stars, three more reflectors (D= 20, 30 and 30 cm) were bought in five years and used mostly for post-graduate studies and research projects. About 30 researchers, half of which holds a PhD degree form the Observatory staff. To extend the research area, the spectroscopic observations were planned and a relatively large telescope (D=122 cm) was bought by a State Planning Department Project and installed in the observatory in August 2009. A site and a dome was provided in the observatory for the joint 60cm robotic telescope of Istanbul University Observatory in 2011. An infrastructure of the science & society activities with a 30cm telescope, a Foucault pendulum and a detailed sundial was also activated in 2011 in the observatory.

### **Astronomy and Space Science Observatory Application and Research Center (UZAYBİMER)**

This center was founded in Erciyes University in 2009. The primary research area of the center covers both radio astronomy and optical astronomy. The center hosts the first radio observatory of Turkey. The aims of the center are as follows: to support undergraduate and graduate level education on related subjects such as radio astronomy, optical astronomy, theoretical astrophysics, remote sensing and satellite technologies in astronomy and space sciences; to support thesis studies and scientific projects; to acquire observational data in order to build necessary equipment; to organize and perform all necessary maintenance work relating to the observatory; and to make plans for necessary future buildings such as a planetarium, as well as for all educational and technical equipment.

In addition to university observatories, we have a national observatory named TUG that supports Turkish astronomers. One final note is that there are a few projects for large size telescopes: two of them by Ege and Ankara University Observatories, and other one by the Anadolu University, and two projects for 3-4 meters size telescopes; one by TÜBİTAK National Observatory, the other which is an infrared telescope by Atatürk University, to be installed in the Erzurum, in eastern part of Turkey.

### **TÜBİTAK National Observatory**

Early ideas and intentions to own a National Observatory for Turkey can go back as early as 1968. Nüzhet GÖKDOĞAN, the first Turkish astronomer of Istanbul University, Abdullah KIZILIRMAK, the founder of Ege University astronomy and observatory, and Dilhan ERYURT, from the Middle East Technical University, persuaded the idea of a National Observatory among the new generation astronomers through the years 1968-1978. First kick off meeting dedicated especially for the National Observatory held on May 26, 1978 at Ankara University. Conclusion of Ankara Meeting was, then, improved within a wider audience during a National Astronomy meeting in September 11-16, 1978 in Silivri, Istanbul. Nevertheless, an actual step was taken after establishing the “Space Science Research Unit” within TBAG (Basic Science Research Group) at TÜBİTAK (The Scientific and Technological Research Council of Turkey) in 1979. This unit has been renamed and organized as Site Selection for a National Observatory project and this was the point when actual site selection studies started 1983. Seven investigators representing Ankara University, Istanbul University, Ege University, Boğaziçi University and Middle East Technical University cooperated and seventeen candidate locations were pre-examined. Among them with 1612 m altitude Kurdu, Muğla, with 2159 m altitude Ödemiş, İzmir, with 2206 m altitude Nemrud, Adıyaman and with 2547 m altitude Bakırlıtepe Antalya were chosen for simultaneous site testing observations. Many observational astronomers contributed observations at those locations. After four years continuous site testing observations from 1982 to 1986, finally, a concluding report has been published by Aslan et al. (1989). Bakırlıtepe, located on the north west of Antalya on Taurus Mountains were selected for the location of the National Observatory.

Foundation of the National Observatory, as a project, was started by the State planning office in 1991. The project is realized with the leadership of principle investigator Zeki Aslan, who later became the first director of the observatory. Transport and electricity services were completed up to the top of the hill (Bakırlıtepe) where the observatory was materially to be built. On June 17, 1995 running and administrative rules and regulations were put in force. Construction of central building and main observatory buildings were completed

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<sup>4</sup> <http://physics.comu.edu.tr/caam/>

within two years from 1996 to 1997. Finally, the TÜBİTAK National Observatory<sup>5</sup> was officially opened on September 5, 1997.

The first telescope of the Observatory is 40 cm Utrecht made equatorial reflector. The first light was in January 1997. This telescope later replaced by robotic 40 cm aperture Meade LX200GPS model telescope in 2006. At last, this telescope too was replaced by an American made OMI (Optical Mechanics Inc.) robotic telescope with 60 cm aperture which is currently named T60. T60 serving scheduled CCD observations and is dedicated to long period variables since August 2010.

The main telescope of the National observatory is owned by Kazan State University, Kazan, Tatarstan. It has been operated on time sharing basis since its first light was received in September 2001, according to a trilateral protocol among TÜBİTAK, KSU (Kazan state University) and IKI (Russian Academy of Sciences) signed in 1995. The name of the telescope RTT150 implies Russian Turkish telescope with 150 cm aperture. Telescope has three changeable focus capabilities. The two is used commonly by interchanging manually, one: COUDE focus (f/48) used high resolution (R=40000) spectroscopy; two: Cassegrain (f/7.7) focus used for low resolution spectroscopy and imaging.

The Robotic Optical Transient Search Experiment (ROTSE) operates as a group of four optical telescopes around the world for observing gamma-ray bursts. The four telescopes scattered around the world so that astronomical events could be observable at least by one of the telescopes. ROTSE IIIId telescopes are 45 cm aperture and fully robotic. One of them placed at Bakırlitepe within TÜBİTAK National Observatory site according to cooperation between Michigan University and TÜBİTAK since 2003. One of the recent telescope placed on the Bakırlitepe is T100 telescope with 100 cm aperture equatorial reflector made by Astronomical Consultants and Equipment in USA. T100 is an Richey Cretian type telescope that has a wide field of view, thus equipped with 4k×4k CCD with a an image size 21.5×21.5 arc minute square. T100 has been serving for project based observations since October 2010. It is dedicated primarily to solar system objects, wide angle field studies and any other kind of imaging.

Other telescope placed on the Bakırlitepe is T60 telescope which is a fully robotic telescope made by Optical Mechanic Inc. in USA. T60 is an Richey Cretian type telescope that has a 17×17 arcmin field of view equipped with 2k×2k CCD. T60 has been serving for project based observations since October 2010. It is dedicated primarily to long-term variable stars and Gaia alerts.

### **Eastern Anatolian Observatory Project**

DAG (Eastern Anatolia Observatory) Project is the newest observatory with the optical and near-infrared largest telescope (4 m class) and its robust observing site infrastructure. This national project consists of three phases with DAG (Telescope, Enclosure, Buildings and Infrastructures), FPI (Focal Plane Instruments and Adaptive Optics) and MCP (Mirror Coating Plant) and is supported by the Ministry of Development of Turkey. The tenders of telescope and enclosure have been made and almost all the infrastructure (roads, geological and atmospherical surveys, electricity, fiber optics, cable car, water, generator, etc.) of DAG site (Erzurum/Turkey, 3,170 m altitude) have been completed.

### **Concluding Remarks**

The state of astronomy, in Turkey, has been summarized. From what has been said it is clear that the number of astronomers when the total population is considered is rather low. In spite of this fact, statistics show that Turkish astronomers showed a great performance in publishing their research studies in respectable journals. Besides it is really motivating that Turkish astronomy is getting reasonable support from both Governmental (State Planning Organization and TUBITAK basically) sources and private sources. All these supports are given on project based applications. Meanwhile, authors of this paper would especially like to acknowledge State Planning Organization and TUBITAK for their continuing support to space science projects in Turkey.

It is a common belief in Turkey that Turkish astronomy will make a good leap forward in coming years, both in education and in research.

Read the full article at: <http://iau-swa-road.aras.am/eng/index.php>

## Release of Astrocurier January Issue



Read in this issue of Astrocurier

N.I.Shakura and R.A.Syunyaev - laureates of the State Prize of Russia

Anniversary of Galina Alexandrovna Ponomareva

The 80th anniversary of Yury Nikolaevich Efremov

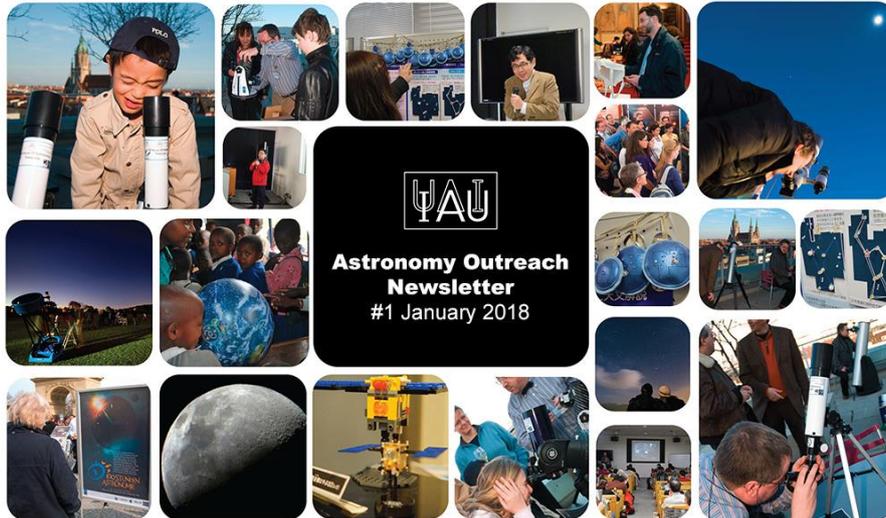
The 70th anniversary of Leonid Nikolaevich Berdnikov

70th anniversary of Nikolai Gennadievich Bochkareva

Anniversary of Lilia Nikolaevna Filippova

Follow the link to find the Newsletter: [http://www.sai.msu.ru/EAAS/rus/astrocourier/acur\\_int\\_1.htm](http://www.sai.msu.ru/EAAS/rus/astrocourier/acur_int_1.htm)

## Release of IAU Astronomy Outreach Newsletter 2018, January



Read in this issue:

0) From the Editors

1) Hands in the Stars: The First International Comparative List of Astronomical Words in Sign Languages

2) IAU Approves 86 New Star Names From Around the World

3) IAU General Assembly, Meetings and Symposia for 2018

4) IAU OAD Astronomy Outreach for Development: Planetarium Content Development

5) Season 10 of 365 Days of Astronomy: The Year of the Everyday Astronomers

6) GalileoMobile Goes Back to Chile

7) ALMA Animated Series

8) Scale Solar Systems around the World

9) Meetings & Global Events

10) IAU Astronomy Outreach Newsletter in other languages

11) Contributions to IAU Outreach Newsletter

## Valery Hambaryan -60



On January 7, 2018, the Armenian astrophysicist Dr. Valery Hambaryan celebrated his 60th anniversary.

He was born in 1958 in the village Satkha (Georgia). In 1971-1974 he studied at the Physical-Mathematical Special School in Yerevan. In 1979 he graduated from the Yerevan State University (YSU) Department of Physics with a specialization of Astrophysics and in the same year he started working at the Byurakan Astrophysical Observatory (BAO). In 1984-1988 he was a post-graduate student at BAO and in 1992 he defended his PhD thesis on Optical study of red dwarf stars under the supervision of Prof. L. V. Mirzoyan. In 1998, he left BAO as a senior research associate, moved to Germany and worked in Munich (Max-Planck Institut für Extraterrestrische Physik, 1998-1999 and 2006), Potsdam (Astrophysikalisches Institut Potsdam, 1999-2005, 2006-2007), and Jena (Astrophysikalisches Institut und Universitäts-Sternwarte,

since 2007). Since 2017, he also is a scientific adviser at the Department of Astronomical Surveys in BAO.

Hambaryan's research interests include physics and evolution of stars, Galactic structure, regions of star formation, T Tau type stars, flare stars, multiple stars, neutron stars, spectroscopy, photometry, timing analysis, and image processing. His recent research is related to X-ray studies of variable objects based on ROSAT, XMM-Newton, and Chandra space observatories data. He has published 145 scientific papers, including those in the world most prestigious astronomical journals. Since 1994 he is a member of the International Astronomical Union (IAU). He is married and has two daughters.

Valeri Hambaryan's personal webpage is at <http://www.astro.uni-jena.de/Users/vvh/>

# FEBRUARY CALENDAR OF ASTRONOMICAL EVENTS

**Monthly Calendar of Astronomical Events**  
**FEBRUARY 2018**

| Monday                           | Tuesday  | Wednesday                                    | Thursday                          | Friday  | Saturday | Sunday |
|----------------------------------|--|--|-----------------------------------|---|----------|--------|
|                                  |  |  | 1                                 | 2   | 3        | 4      |
| 5                                | 6<br>Lidia Erastova's<br>80 <sup>th</sup><br>Anniversary | 7<br>Lunar<br>crescent<br>(last<br>quarter)  | 8                                 | 9   | 10       | 11     |
| 12<br>ArAS<br>School<br>Lectures | 13   | 14   | 15<br>Partial<br>Solar<br>Eclipse | 16<br>New Moon  | 17       | 18     |
| 19<br>IAUS 340<br>Jaipur, India  | 20   | 21<br>Conjunction<br>of Venus vs.<br>Neptune | 22                                | 23<br>Lunar<br>crescent (first<br>quarter)<br><hr/> Richard<br>Belian - 80 <sup>th</sup><br>Anniversary | 24       | 25     |
| 26                               | 27   | 28   |                                   |   |          |        |

# LUNAR CALENDAR OF FEBRUARY

