

# ArAS educational activities: history and statistics

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## Abstract

A review of ArAS Educational activities is given. ArAS initiated a number of projects and events related to Astronomical Education, teacher training, as well as public activities. Among the most important are: Byurakan International Summer Schools (BISS, since 2006, 9 such schools have been accomplished), Regional Astronomical Summer Schools (RASS, since 2019, 3 such schools have been accomplished), Byurakan Summer Schools for YSU students (BSS, since 1995, 5 such events have been accomplished), ArAS School Lectures “*From School to the Space*” (since 2012, 11 projects have been organized), Byurakan Science Camps (BSC, since 2014, 10 events have been organized), Armenian Republican Astronomical Olympiads final phase (since 1999), a number of astronomy teacher training programs (since 2010, in total 9 events) and others. The history and statistics of all these events are presented.

## 1. Introduction

Among all ArAS activities, those related to Astronomy Education have been especially productive. Astronomy Education is in general one of the main ArAS goals and tasks. Since its foundation, ArAS has been active in organizing various events and running many projects. Astronomical Olympiads are among the first ones; we started these events in 1995 and then, in 1999, they were officially recognized by the Armenian Ministry of Education and Science and ArAS became the Official representative of the International Astronomical Olympiads (IAO) in Armenia. We have contacts and relations with a number of other international organizations and projects, such as Galileo Teacher Training Program (GTTP), Network for Astronomy School Education (NASE), and, most important, the International Astronomical Union Office of Astronomy for Education (OAE). Here we describe the most important and regular projects, both for students, pupils and teachers. Many other projects are also active. ArAS Astronomy Education webpage gives most of the relevant activities (<https://www.aras.am/Education/education.html>).

## 2. Astronomical Olympiads

Astronomy at school in Armenia was taught for many years (however, in 2009, it was included in the course of the 9<sup>th</sup> year Physics). Two attempts to organize Armenian National Astronomical School Olympiads were made in early 1980s. Then, in 1995, we tried to initiate regular Olympiads in Armenia. At that time, it was organized by ourselves at BAO. And only in 1999, the Armenian Ministry of Education and Science officially included Astronomical Olympiads in its school Olympiads program. During all these years, these annual competitions for revealing gifted pupils in astronomy are organized by the Ministry in collaboration with ArAS, BAO and Yerevan Physical-Mathematical School. The country winners successfully participate and win prestigious prizes in the international astronomical Olympiads as well. Late *Dr. A. V. Oskanian* was the person who raised the Armenian school astronomy to a very high level, so that Armenian pupils won a number of high ranked prizes at International Astronomical Olympiads (IAO). Other people that contributed in the preparation of Armenian pupils and organizations of astronomical Olympiads were and are: *Dr. V. S. Airapetian*, *A. E. Grigoryan*, *Dr. A. M. Mickaelian*, *Dr. M. V. Gyulzadyan*, *Dr. A. A. Hakopian*, *Dr. S. E. Nersisyan*, *Dr. H. A. Harutyunian*, *Dr. T. Nazaryan*, *V. Mambreyan* and others. ArAS is the official representative of the Armenian Olympic team at the International Astronomical Olympiads (IAO), *A. V. Oskanian* and *M. V. Gyulzadyan* have been members of the Council of IAO. There are three kinds of International and Regional Olympiads where Armenian pupils participate:

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- Commonwealth of Independent States (CIS) Astronomical Olympiads
- International Astronomical Olympiads (IAO)
- International Olympiads on Astronomy and Astrophysics (IOAA)

Our pupils are the best among all subject Olympiads in Armenian teams. On the other hand, they are among the best teams among all countries at International Astronomical Olympiads. We have won 10 I rank, 10 II rank, and 20 III rank prizes, totaling to 40 prizes.

### 3. Byurakan Summer Schools (BSS) for YSU students

The first attempt to organize Byurakan Summer School (BSS) for Yerevan State University (YSU) Physics Faculty students (considering some of them as future astronomers) was made on 20-28 August 1995. This event was joint with the Republican School Astronomical Olympiad final stage so that the pupils could interact with the students. Then, since 2005, the event became more or less regular and II-IV schools were organized in 2005, 2009 and 2013. It was supposed to make the event with 4-year periodicity, however, not always it was possible. The last such event, which was this time a winter school, happened in 2022.

Here we give the list of the BSS with the main data.

BSS	Year and Date	Participants	Comments
1BSS	1995.08.20-28	36 students and pupils	Joint with Republican School Astronomical Olympiad final stage
2BSS	2005.08.22-30	14 students, mainly BSc level	Attached to ArAS IV Annual Meeting
3BSS	2009.07.01-08	YSU students of BSc level	Attached to ArAS VIII Annual Meeting
4BSS	2013.08.19-23	15 students from Physics and Radiophysics Faculties and 25 students as IAU S304 LOC supporting team	Combined with IAU Symposium #304 training for LOC supporting team
5BWS	2022.02.26-27	20 students from YSU Physics Faculty 1 <sup>st</sup> course	The 5 <sup>th</sup> Byurakan Winter School for YSU students

### 4. Byurakan International Summer Schools (BISS)

The idea to organize international summer schools at BAO goes back to 1987, when on V. A. Ambartsumian's and Richard West's initiative a single event was organized between BAO and ESO. It was an International School for Young Astronomers with a topic "*Observations with Large Telescopes*", organized jointly by ESO and the Byurakan Astrophysical Observatory on 22-28.09.1987. Unfortunately, the idea to make it regular was not continued due to the disintegration of the Soviet Union. After thorough discussions and preparations, we could start the series of the Byurakan International Summer Schools (BISS) in 2006, with a 2-year periodicity. It was Prof. Daniel Weedman who supported a lot and finally we made it happen. 32 students from Russia, Ukraine, Iran, Georgia, Jordan, Italy, Serbia, Romania and Armenia participated in 1BISS, as well as 14 lecturers from USA, Germany, France, Italy, Russia and Armenia and the school was great success. Only once, in 2014, we missed this event. Otherwise, it is almost 20 years that we conduct these schools. One, in 2010, the 3BISS, was combined with the IAU 32<sup>nd</sup> International School for Young Astronomers (ISYA). Several records were registered for ISYAs; the 32<sup>nd</sup> ISYA had 117 applications, 21 countries were represented and there were 56% female participants (maximum numbers for all ISYAs). As it was announced at the IAU General Assembly in Vienna by the IAU Division C President *Prof. John Hearnshaw*, BISS are among the top-3 world astronomical summer schools (the 2 others are ISYA and VOSS – Vatican Observatory Summer Schools). The analysis was made based on the regularity, duration, number of accomplished events, numbers and level of students and lecturers, the program, represented countries, etc. It is worth to mention that Nobel Prize Winners, IAU President, V. Ambartsumian International Science Prize Winners and other outstanding scientists have been among BISS lecturers, among them Michel Mayor, Jayant Narlikar, Igor Novikov, Robert Williams, Daniel Weedman, Yervant Terzian, Jaan Einasto,

Ajit Kembhavi, Daniel Kunth, Gennady Bisnovaty-Kogan, Michel Dennefeld, et al. In total, 141 lectures and 42 tutorials were given during all events, as well as 94 students' short presentations.

Here we give the list of the BISS with the main data.

BISS	Year and Date	Participants	Comments
1BISS	2006.08.26-09.03	32 students from 9 countries and 14 lecturers from 6 countries	Attached to BAO 60 <sup>th</sup> anniversary meeting
2BISS	2008.09.20-30	31 students and 13 lecturers	Dedicated to V. A. Ambartsumian's 100 <sup>th</sup> anniversary
3BISS	2010.09.12-10.02	48 students from 19 countries, 19 lecturers from 8 countries	Combined with the IAU 32 <sup>nd</sup> ISYA
4BISS	2012.09.15-23	36 students, 15 lecturers	Dedicated to Anania Shirakatsi's 1400 <sup>th</sup> anniversary
5BISS	2016.09.12-23	27 students, 15 lecturers	Attached to BAO 70th anniversary meeting
6BISS	2018.09.10-15	32 students and 11 lecturers	Attached to V. A. Ambartsumian's 110 <sup>th</sup> anniversary
7BISS	2020.09.07-11	50 students and 12 lecturers	Virtual. Attached to the International Symposium "Astronomical Surveys and Big Data 2", also virtual
8BISS	2022.09.12-16	36 students and 12 lecturers	Virtual. Attached to the International Conference "Space Sciences and Technologies"
9BISS	2024.09.09-13	30 students and 10 lecturers (expected)	Attached to the 4 <sup>th</sup> Regional Astronomical Workshop



Figure 1. Group photo of 1BISS students and lecturers and 3BISS participants near BAO 2.6m telescope.

## 5. ArAS School Lectures "From School to Space"

In 2012, ArAS initiated a major program of visiting Armenian schools by professional scientists from BAO for astronomical lectures. During the first years, Yerevan, Armenian Provinces and Artsakh were included and later on the main emphasis was put on the Armenian Provinces, as well as Artsakh. ArAS and BAO collaborated with the RA Ministry of Education and Science and/or RA Provinces administrations for the selection of the schools and during the recent years, we make announcements and receive applications directly from the schools. The interest from the schools is rather high; in 2023, 132 schools expressed a wish to organize such lectures. Along with the interactive lectures, astronomers distribute books and

promotional material to the schools, very often – small telescopes. Areg Mickaelian, Haik Harutyunian, Hovhannes Pikichian, Ararat Yeghikyan, Ruben Andreasyan, Grigor Brutean, Susanna Hakopian, Marietta Gyulzadyan, Elena Nikoghosyan, Hayk Malkhasyan, Avetik Grigoryan, as well as young scientists Naira Azatyan, Hasmik Andreasyan, Hayk Abrahamyan, Gohar Harutyunyan and Sona Farmanyan have been lecturers of the program. They typically make presentation on the topic “*Our Understanding of the Universe: from Ancient Times to Nowadays*”, as well as several other topics. They also distribute feedback forms to collect info on the pupils who are most interested in astronomy and wish to maintain further contacts with astronomers. The Fund for Armenian Relief (FAR), Prof. Yervant Terzian, Dr. Noretta Andreasyan-Thomas and several other sponsors have been supporting this program during all these years. Areg Mickaelian is the Manager of this program and Sona Farmanyan is the Coordinator.

Here we give the list of all ArAS School Lectures with the main data.

SL #	Year and Dates	Schools	Lecturers	Comments	Sponsors
I	2012.11.07-30	30	8	Yerevan and RA Provinces	Yervant Terzian and Araxy Bablanian (USA), Yeran Tchelikjian (Canada)
II	2013.05.06-07	10	3	Artsakh	Yervant Terzian (USA) and Artsakh Ministry of Education and Science
III	2014.10.28-31	30	7	Yerevan and RA Provinces	Yervant Terzian and Araxy Bablanian (USA), Yeran Tchelikjian (Canada)
IV	2016.11.21-25	27	6	Yerevan and RA Provinces	FAR
V	2018.05.01-24	30	5	RA Provinces and Artsakh	Nora Andreassian-Thomas
VI	2019.04.01-05.15	20	4	RA Provinces	FAR, BAO
VII	2020.12.01-20	23	3	RA Provinces	FAR, BAO
VIII	2021.04.15-05.31	30	5	RA Provinces	FAR, BAO
IX	2022.04.01-29	30	6	RA Provinces and Artsakh	FAR, BAO
X	2023.04.04-27	33	5	RA Provinces	FAR, BAO
XI	2024.04.03-26	30	4	RA Provinces	FAR, BAO

## 6. Byurakan Science Camps (BSC)

The series of the Byurakan Science Camps (BSC) was initiated by Sona Farmanyan in the frames of ArAS educational activities in 2014. It is intended for extracurricular education and attracting interest to young generation, typically pupils of 10-15 age (slightly different from year to year). During the schools, a very extended program is offered to the participants: meetings with famous people (writers, poets, composers, artists, scientists), lectures (on Astronomy, related and other sciences), tutorials, night observations, acquaintance to the night sky (constellations and bright stars), cognitive excursions in BAO, visits to other research institutions, visits to Armenian sightseeing around Byurakan (Amberd Fortress, Tegher Monastery, Aghdzk Armenian Kings Cemetery, Monument to Armenian Alphabet, Saghmosavank and Ohanavank Monasteries) and in Byurakan village, films, intellectual games, competitions, sports and leisure. Several times robotics courses were held and small rocket launch was performed for the participants. The topics of the lectures are related to the importance of science for the society, our understanding of the Universe, different astrophysical topics, archaeoastronomy and cultural astronomy, etc. During the Closing Ceremony, all participants get prizes and gifts: small astronomical telescopes, books on astronomy and other topics, sports items, games, etc. Areg Mickaelian is the Manager of this program and Sona Farmanyan is the Coordinator.

Here we give the list of all BSC with the main data.

BSC	Year and Dates	Participants	Sponsors
1BSC	2014.10.19-25	28 pupils, 10 lecturers	ArAS

2BSC	2015.10.25-31	18 pupils, 9 lecturers	ArAS
3BSC	2016.08.22-27	27 pupils, 10 lecturers	FAR, ArAS
4BSC	2017.08.21-26	23 pupils, 12 lecturers	FAR, BAO
5BSC	2018.07.03-09	51 pupils, 6 lecturers	Nora Andreassian-Thomas
6BSC	2019.07.07-12	30 pupils, 6 lecturers	Stepan Gishian Fund
7BSC	2021.10.24-30	30 pupils, 6 lecturers	FAR, BAO
8BSC	2022.07.25-31	40 pupils, 7 lecturers	FAR, BAO
9BSC	2023.07.16-22	26 pupils, 6 lecturers	FAR, BAO
10BSC	2024.06.02-09	30 pupils (expected), 10 lecturers	FAR, BAO



Figure 2. Group photo of 4BSC (left) and observations of the Sun with a Solar filter at 5BSC (right).

## 7. Teacher Training Programs (TTP)

A number of Teacher Training Programs have been accomplished in Byurakan. These were in collaboration with the Galileo Teacher Training Program (GTTP), due to a joint Polish-USA project by Ewelina Gradzka and in frame of the Network for Astronomy School Education (NASE). At present we also work with the IAU Office for Astronomy Education (OAE). GTTP was initiated during the International Year of Astronomy (IYA-2009), when Armenia joined the international project. Rosa Doran is the international Coordinator. We have organized one event for the teachers in 2010 and the second one is planned for 2024. On the other hand, GTTP awards Galileo Teachers Certificates to most active teachers and those teaching with novel methods. NASE events were organized in 2019, 2023 (virtual) and 2024. These are training courses for astronomy teachers with extracurricular activities and methods. Rosa Maria Ros (Spain) is the chair of this program. The OAE was established in 2019 in Heidelberg, Germany. Armenia participates in its activities with its National Astronomy Education Coordinators (NAECs). The Teacher Training Event in 2024 will be a joint one between OAE, GTTP and NASE.

Here we give the list of all Teacher Training Programs with the main data.

Program	Year and Dates	Coordinator	Description
GTTP Course	2010.08.19	Rosa Doran, Areg Mickaelian	Physics/Astronomy Teachers Training, 24 teachers from 16 schools
GTTP Certificates	2011-2023	Rosa Doran, Areg Mickaelian	Annual Certificate Award to most active teachers and those teaching with novel methods

Under Armenian Sky	2018.07.29-08.02	Ewelina Gradzka, Sona Farmanyan	Teacher Training Program for Astronomy teachers
Young Explorers Club	2018.10.06-07	Ewelina Gradzka, Sona Farmanyan	Teacher Training Program for Primary School teachers
Young Explorers Club	2019.04.13-14	Ewelina Gradzka, Sona Farmanyan	Teacher Training Program for Primary School teachers
Under Armenian Sky	2019.04.19-21	Ewelina Gradzka, Sona Farmanyan	Teacher Training Program for Astronomy teachers
NASE	2019.05.05-08	Rosa Maria Ros, Areg Mickaelian	Training Program for Yerevan State Pedagogical University students
NASE	2023.06.05-30	Rosa Maria Ros, Arus Harutyunyan	Teacher Training Program for Astronomy teachers (Virtual)
OAE/GTTP/NASE	2024.07.23-26	Sona Farmanyan, Lilit Darbinyan, Areg Mickaelian	Teacher Training Program for Astronomy teachers

## 8. GTTP Certificates

ArAS agreed with the International Project “*Galileo Teachers Training Program*” (GTTP) to award Certificates to those Armenian teachers who are actively involved in educational activities and/or have introduced novel methods in Astronomy Education. *Prof.* Rosa Doran (Portugal) is GTTP International Coordinator and Areg Mickaelian is the Armenian one.

During 2011-2023, there were in total 13 awards, including 7 times awarded to 2 persons; in total 20 recipients. Among them there are BAO Astronomers and PR Department Members, teachers and educators. Here are all Galileo Teachers:

BAO: Hayk Abrahamyan (2015), Levon Aramyan (2016), Naira Azatyan (2022), Marietta Gyulzadyan (2011), Ashot Hakobyan (2014), Arus Harutyunyan (2019), Gor Mikayelyan (2019), Varduhi Mkrtchyan (2023), Tigran Nazaryan (2011), Sergey Nersisyan (2014), Gayane Baleyan (2022), Ani Davtyan (2021), Sona Farmanyan (2016).

Others: Educators, Teachers, et al.: Avetik Grigoryan (Yerevan, Ayas, 2012), Robert Sargsyan (Yerevan, 2013), Vardges Mambreyan (Yerevan Phys.-Math. School, 2018), Armine Patatanyan (Yerevan, Teacher, 2017), Kristine Mkrtumyan (Syunik, Teacher, 2018), Lilit Hovhannisyan (Gyumri, Teacher, 2023), Ewelina Gradzka (Poland, 2020).

The distribution by countries is such: Armenia – 19 (BAO – 13), Poland – 1, and the gender distribution is Male – 9 and Female – 11.

## 9. Summary and Conclusion

Among other educational programs not described in this paper there are:

- Regional Astronomical Summer Schools (RASS), since 2019, every 2 years, in total 3 schools have been organized, Program Coordinator – Areg Mickaelian
- Byurakan Summer School for Artsakh students (BSSA), once in 2022
- Byurakan Science Camp for Artsakh pupils (BSCA), once in 2022
- Byurakan Summer School for Engineers (BSSE), once in 2021
- Mathematical Camp for Artsakh pupils, since 2021, 3 events organized, Coordinator – Gaiane Panina (Steklov Mathematical Institute, Moscow, Russia)
- International Astronomical Olympiads Armenian team training, since 1999, Coordinator – Marietta Gyulzadyan

- YSU Physical Faculty 3<sup>rd</sup> year students practice in BAO, organized jointly by YSU and BAO, Coordinator – Emilia Karapetian
- “*My Universe*” essays contest for Shamshadin region pupils, since 2016, 4 events organized so far, Coordinator – Sona Farmanyany, Supported by FAR
- “*World of Knowledge*” essays contest, 2021, 1 event organized, Coordinator – Sona Farmanyany, Supported by FAR
- E-ROAD & SWCA ROAD Erasmus+ *Project Writing and Management*, 2023-2024, Coordinator – Sona Farmanyany
- Royal Astronomical Society (RAS) Educational Project “*Our Unstable Universe*”, 2021-2022, Coordinator – Armine Patatanyan

## Acknowledgements

The authors are thankful to the Armenian Astronomical Society (ArAS), Byurakan Astrophysical Observatory (BAO), RA National Academy of Sciences (NAS RA) and the IAU South West and Central Asian Regional Office of Astronomy for Development (IAU SWCA ROAD).

## References

- Harutyunian, H. A.; Mickaelian, A. M. 2007, Modern facilities in Astronomy Education, IAU GA XXVI Special Session #5, pp. 263-264
- Mickaelian, A. M.; Mikayelyan, G. A. 2021, The role of Big Data in Astronomy Education, IAU Symposium #367, pp. 214-217

## Links

IAU: <https://www.iau.org/>

IAU OAE: <https://astro4edu.org/>

GTTP: <https://galileoteachers.org/>

NASE: <https://www.naseprogram.org/>