

Autumn astronomy school at SAO RAS

The Russian olympiad on astronomy and space physics was initiated in 1994 and has regularly been held ever since. As one of the rewards its winners get an invitation to the Special Astrophysical Observatory to take part in the Autumn Astronomy School. It is as long as four years that in late October and in early November students and their teachers from different regions of Russia and neighbouring countries assemble in the Observatory settlement, Nizhnij Arkhyz of the Karachai–Circassian Republic.

The first School held in November 1994 was organized jointly by SAO RAS and Coordination Council of the Astronomy Olympiad under financial support from the Soros Foundation. The later Schools (1995, 1996, 1997) were no longer funded by the Soros Foundation and the Observatory and the institutions sending the participants had to take upon themselves all the expenses.

The school organizers do their best to help the guests of the Observatory acquire not only new knowledge but also new impressions. This is favoured both by personal contacts with professional astronomers and hobby-mates and the complex programme that involves apart from science and education, the cultural, local lore and sports components. In particular the visitors have an opportunity without dropping the curriculum to see the difference between the flat areas, where the radiotelescope RATAN-600 is situated, the gorge hiding the Observatory's township, and the spur of the Main range where the optical telescope BTA is perched at an elevation of 2100 m above the sea level. At the same time the school participants can go sightseeing in the Arkhyz landscape region, one of the most picturesque places in the Northern Caucasus. The studies generally begin with a hike about the ruins of a medieval alanian

town, the focal point of the northern branch of the "Silky Way", the center of Alanian eparchy. The Xth century local churches are the most ancient in Russia.

It is planned to include in the school programme the trips to the Caucasus Spa region to see the places associated with Lermontov's life and activity, the architecture of modernism and constructivism and other cultural sights, (so far this has been impossible due to shortage of time).

The scientific aspect of the programme offers lectures, practical training and observations. Since the school is hosted in Russia's largest observatory, the observations receive primary attention. The students and teachers are permitted to be present during the observations with the feeds of the radio telescope RATAN-600 and in the control rooms of the 6 m and 1 m optical telescopes, have an opportunity of visual observing and taking pictures of celestial objects with small instruments on their own. When overcast, the optical observations are replaced by getting familiar with the design of BTA, which is the first large telescope on an altazimuth mounting, with various mountings and optical systems of other telescopes of SAO and Kazan University station, with the very latest spectrographs, photometers and other light detecting devices created at SAO, with the techniques of data acquisition and reduction. Laboratory exercises are run in astronomical photography and in use of CCD, which have replaced photographic plates in astronomy. Many are fond of wandering about the sky with the aid of the Palomar Prints and their computer analogs.

When selecting the lectures, laboratory work and teachers, we seek to reflect the fundamental sections of present-day astrophysics and, alternatively, to adhere to the principle "here and right now". The lectures are delivered by the leading specialists of SAO: academician Yu.N. Parijskij, Corresponding member of RAS Yu.Yu. Balega, Drs. I.D. Karachentsev, V.E. Panchuk and others. Lectures from other institutions are also involved, including adult participants of the School. In a lecture hall or at the telescopes the guests meet the astronomers carrying out current observational programmes, know about the problems posed, progress and failures in their solutions. And, of course, the subject matter of all the classes are tailored to the observations of the latest weeks and months.

The lectures are attended not only by the guests but also by the post-graduates and young astronomers of SAO.

Lectures delivered in 1997.

History of SAO

Present-day cosmology and radio astronomy

Fractals and cosmology

Evolution of chemical elements in the Universe

Relativistic astrophysics

Star-formation bursts in dwarf galaxies

Cosmic disks and jets

Evolution of medium-mass stars

Solar activity

News of space studies of the Solar system

Problem of search for extraterrestrial intelligence

Radio telescopes and techniques of radio astronomy observations

Speckle interferometry

High temporal resolution photometry

Detection of a gravitation lens with the 6 m telescope

Investigation of edge-on galaxies

Optical identification of gamma bursts with the 6 m telescope

Spectroscopic enigma: DIBs (diffuse interstellar bands)

Evolution of scientific theories and knowledge of the world

Language and culture

Modernism and astrophysics

The programme for adults is as congested. The adults are school teachers, Lyceum teachers, planetary lectures, who are generally experts in astronomical education. Their meetings, exchange of opinion and experience with one another, with the SAO researchers and Organizing Committee members are extremely beneficial. Besides, the problem of teaching astronomy in secondary school and the system of additional education are subjects of discussion at conferences and "pedagogical councils". At one of them (in 1991) an Association of astronomy teachers was initiated.

Among the teachers there are adherents of both the professional and the wider humanitarian approaches to primary and secondary education. However, the opinion prevails that the background of astronomy should be introduced in the 5-9 grades while its involved sections that require a knowledge in physics and mathematics should be left for the senior grades.

In 1996 and 1997 International olympiads of the Astronomical Society were conducted within the frames of the School. Apart from the Russian students they were attended by guests from Sweden, Finland, India and Armenia. The team of Russia had been formed on the basis of the results of the Russian olympiad, the other countries had determined the membership of the teams on their own. The language problem was settled in the way it was tackled at most of the international olympiads: the Organizing Committee prepared tasks in two working languages (Russian and English), but prior to the rounds the team leaders could translate the tasks into the mother

tongues of the participants.

Our olympiad includes 3 rounds: theoretical, practical and observational. In the theoretical round the participants are divided into two age subgroups: grades 9–10 and 11(12). They are offered 6–7 problems for a time of 4 hours. For the practical round 2–2.5 hours are allotted. The tasks for this round may also allow for the age, but so far they have been the same for everyone.

The tasks and the time of the observational round are dependent on the weather conditions. In 1996, for instance, the sky was clear from day to day and from night to night which led to overstrain of even enthusiastic observers. Venus was then in the western elongation and could be seen with the naked eye at least until the midday. This allowed the observational round (day–time Venus observation, measurements of its angular separation from the Sun) to be successfully coordinated with the practical round (construction of the orbit from the results of similar observations over the last few years). In contrast, in 1997 only one out of 7 scheduled nights was clear. This was utilized for testing the knowledge of the star chart of the sky, using the methods of ancient warriors: constellations and stars were suggested to be recognized through the clearances between the crowns of the trees.

The committee of jury is formed from the research workers of SAO, team leaders and Russian Olympiad Coordination Council members. The papers, having been preliminary encoded are checked twice at least by different jury members. The papers are distributed between the jury members not on the country basis (as it is adopted with most international olympiads)

but in accordance with the tasks (as done at the Russian olympiads). This allows a higher uniformity of the testing criteria to be attained.

On finishing the School, each participant (both young and adult) is presented with a special certificate. Besides, the participants and winners of the olympiad are awarded with appropriate diplomas. But what is the most important that they get from the stay at SAO, which is recognized by the participants themselves, is a knowledge of what a professional astronomer works on.

It should be noted that an olympiad is in essence somewhat different from a school. The former is more important than the latter for the students inclined rather to competition than to studies, and when the olympiad is over, their interest in studies is markedly reduced. In some regions, however, the educational authorities refuse to support financially a trip to a far–away observatory. So we will have to work at harmonic combination of the olympiad and the school.

We believe that the Autumn Schools of SAO RAS will be run to advantage, and ask all the readers interested in them to send their questions, remarks, advices and the tasks for olympiads at the addresses indicated.

The next fifth School is scheduled for October 1988. Information (in Russian and English) of the School and the olympiad is in Internet at [www](http://www.issp.ac.ru/univer/) of the Moscow University Branch (142432, Chernogolovka of Moscow Region, 15, University av.: <http://www.issp.ac.ru/univer/>; e-mail: gavrilov@issp.ac.ru).

M.G. Gavrilov, E.L. Chentsov