

PARTICIPATION OF SERBIA AT THE
INTERNATIONAL OLYMPIADS IN ASTRONOMY
AND ASTROPHYSICS IN 2012 AND 2013

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Abstract. The topic is the participation of contestants from Serbia in international contests in astronomy: 6th IOAA in Brazil 2012, 7th IOAA in Greece 2013 and the Saint-Petersburg Olympiad in 2013. Also, organisation and preparations of contestants, volunteer work of trainers and financial problems. Contribution of Mathematical Gymnasium in Belgrade. A presentation of contests within Serbia, which serve for the purpose of selecting contestants for international contests. Organisation and events during international contests, as well as the success of Serbian contestants.

1. INTRODUCTION

Serbian teams have been participating in international astronomical competitions since 2002 (under the name of Yugoslavia) with exception of year 2003 (due to insufficient funds). First participation was at the 7th International Astronomy Olympiad (IAO), in Nizhnij Arkhyz, in Russia. From 2009 through 2011 Serbia participated both in IAO and IOAA (International Olympiad in Astronomy and Astrophysics). In the following years Serbia attended IOAA only, because of their multiple advantages:

democratic and transparent test preparation with discussions concerning problems formulations, problems solutions, also transparent grading of students work, well defined syllabus etc. In 2013 Serbia entered St. Petersburg Astronomy Olympiad, a correspondence competition, as the only guest country invited by the organizers which did not belong to the USSR. For further reference, see Eskin *et al.* 2012. Previous participations of Serbia in IAO and IOAA have been presented in Atanackovic-Vukmanovic (2006), Atanackovic (2012), Miler (2009, 2011), Ninkovic and Milic (2011, 2014).

2. NATIONAL COMPETITIONS

Astronomical competitions in Serbia are organized by NAOC annually on two levels: regional and national. Regional competition consists of one theoretical test with 3 theoretical questions and 4 problems. National Astronomy Olympiad consists of 3 parts: Theoretical part (5 problems, 240 minutes), Observational part - either outdoor (telescope and naked eye observations) or indoor (test with sky charts) and Data Analysis (120 minutes). Regional competition in astronomy in 2012 was on May 13th. There were 8 participants: 7 from Mathematical Grammar School in Belgrade (MG), and 1 from Gymnasium Jovan Jovanovic Zmaj. Luka Bojovic and Ivan Tanasijevic won 1st prize, Djordje Zikelic and Vanja Sarkovic 2nd prize, Vladimir Sladojevic and Predrag Obradovic 3rd prize, and Ivana Beslic honourable mention. National Astronomy Olympiad in 2012 was on June 16th (theoretical part) and 17th (indoor observational and Data Analysis round). Competition rounds were weighed in the following manner: Theory 55%, Data Analysis 30% and Observations 15%. Results: Luka Bojovic, I prize; Ivan Tanasijevic, I; Aleksandar Miladinovic I; Djordje Zikelic, II; Dusan Sobot II; Predrag Obradovic, III; Uros Ristivojevic, honourable mention; Vladimir Sladojevic, honourable mention.

Regional competition in astronomy in 2013 was on May 11th (the venue and test format unchanged). Out of 12 participants in Belgrade (all from MG) 9 qualified for the next stage. Jury members: Slobodan Ninkovic, Sonja Vidojevic and Stefan Andjelkovic. NAOC awarded 1st prize to Ivan Tanasijevic, 2nd prize to Djordje Zikelic and Predrag Obradovic, 3rd prize to Uros Ristivojevic and honourable mention to Mladen Dobrasinovic and Caslav Lukic.

National Astronomy Olympiad in 2013 (venues unchanged) was held on June 1st (theoretical and outdoor observations) and 2nd (data analysis). The criterion changed to: Theory 60%, Data Analysis 25% and Observations 15%. Results: Ivan Tanasijevic, I prize; Luka Bojovic, I; Aleksandar Miladinovic, II; Predrag Obradovic, II; Uros Ristivojevic, III; Djordje Zikelic, III; Marko Puric, honourable mention.

Prize "Jelena Milogradov-Turin" has been awarded both to Luka Bojovic and Ivan Tanasijevic in 2012 and Ivan Tanasijevic in 2013. Special award for scoring 100% on the Observational and Data Analysis rounds in 2013 was awarded to Uros Ristivojevic.

3. 6th IOAA IN BRASIL AND 7th IOAA IN GREECE

The teams were lead by dr Slobodan Ninkovic and dr Sonja Vidojevic on both occasions. The 6th IOAA was held August 4th 14th 2012, in Rio de Janeiro, Brazil. Due to financial issues Serbia was represented by only 3 students. Results: Luka Bojovic, silver medal; Aleksandar Miladinovic, bronze medal; Predrag Obradovic, honourable mention.

Approximately 200 participants from 35 countries attended the 7th IOAA - held from July 27th to August 5th, 2013 in Volos, Greece. Serbian team had 5 contestants. Serbia ranked 3rd best country in the overall placement. Results: Ivan Tanasijevic, gold medal; Luka Bojovic, gold medal; Aleksandar Miladinovic, silver medal; Uros Ristivojevic, honourable mention; Predrag Obradovic, honourable mention.



Figure 1: Serbian national team at 7th IOAA – the 3rd best team in the world, from left to right: Predrag Obradovic – honourable mention, Ivan Tanasijevic – gold medal, Luka Bojovic – gold medal, Sabrina Lousini (volunteer assigned by Local Organizing Committee), Uros Ristivojevic – honourable mention, Aleksandar Miladinovic – silver medal, dr. Sonja Vidojevic (team leader) and dr. Slobodan Ninkovic (team leader).

4. ST. PETERSBURG ASTRONOMY OLYMPIAD 2013

Serbia participated in St. Petersburg Astronomy Olympiad with 2 participants (both from MG): Predrag Filipovic (1st grade) and Marko Puric (2nd grade). This competition consists of 2 parts: Theoretical Part and Data Analysis Part. There are 3 different categories; our contestants were in separate categories. Marko Puric ranked 2nd (1st prize) with 52 points in total, after the absolute winner who had obtained 54 points.

5. ASTRONOMY PREPARATORY CLASSES

NAOC has been introducing prior contestants from IAO and/or IOAA as regular astronomy instructors for high school students since 2012. Students are divided into 2 groups: experienced contestants and beginners. The introductory course starts from the basics, but covers the entire syllabus. The advanced lectures are focused on deepening the understanding of astrophysical phenomena and applications of mathematics and physics. During the school year lectures were held in MGs classrooms during the weekend. In the school year 2012/2013 instructors for theoretical part

of the courses were Stefan Andjelkovic and Filip Zivanovic (former IAO/IOAA contestants), while observational course (naked eye observations, telescope observations and lectures in planetarium) was held by Branko Simonovic. For the preparations of IOAA in 2013 Stefan Badza (former IAO/IOAA contestant) joined instructors team. After the IOAA in 2013, Vanja Sarkovic (former IAO contestant) joined as well. In the following year, more people are expected to join and help building a new system for astronomy competitions preparations and organizations, which would sustain the traditional success of Serbian national team in IOAA. This process is crucial due to the fact that we expect to host the 2021 IOAA in Belgrade, Serbia. One of the useful resources for preparing national team was a one week stay on mountain Avala in 2013 afore the IOAA, provided by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

6. PROSPECTS AND CONCLUSION

Serbian national team results in IOAA in last 2 years continue the 12 years long tradition of success in IAO and IOAA. A lot of effort has been put to maintain those results both in gathering human resources and financial support. In the recently held 8th IOAA in Suceava, Romania, Serbian national team won 1 gold medal (Ivan Tanasijevic), 1 silver medal (Luka Bojovic), 2 bronze medals (Predrag Obradovic and Djordje Zikelic), and 1 honourable mention (Marko Puric). NAOC is determined to include schools all over Serbia in the programme of astronomy preparatory classes. This represents a colossal challenge for our team of instructors, and NAOC as well. The main goal remains to teach and prepare the students for the following competitions, and select the best ones for Serbian national team. In 2013, at the 7th IOAA, Serbia was nominated as the host for 15th IOAA in 2021. Representatives of NAOC are currently in talks with the Ministry of Education, Science and Technological Development of the Republic of Serbia with the goal of finding the way to organize this prestigious international event.

References

- Atanacković-Vukmanović, O.: 2006, *Publ. Astron. Obs. Belgrade*, **80**, 275-283.
Atanacković, O.: 2012, *Publ. Astron. Obs. Belgrade*, **91**, 273-284.
Eskin, B., Tarakanov, P., Kostina, M.: 2012, *Publ. Astron. Obs. Belgrade*, **91**, 287-292.
Miler, Ratomirka: 2009, *Zbornik radova konferencije Razvoj astronomije kod Srba V*, ed. Milan S. Dimitrijević, *Publikacije Astronomskog društva "Rudjer Boskovic"*, **8**, 859-868.
Miler, Ratomirka: 2011, *Zbornik radova konferencije Razvoj astronomije kod Srba V*, ed. Milan S. Dimitrijević, *Publikacije Astronomskog društva "Rudjer Boskovic"*, **10**, 1315-1326.
Ninković, S. i Milić, I.: 2011, *Zbornik radova konferencije Razvoj astronomije kod Srba V*, ed. Milan S. Dimitrijević, *Publikacije Astronomskog društva "Rudjer Boskovic"*, **10**, 1327-1330.
Ninković, S. i Milić I.: 2014, *Zbornik radova konferencije Razvoj astronomije kod Srba V*, ed. Milan S. Dimitrijević, *Publikacije Astronomskog društva "Rudjer Boskovic"*, **13**, 1407-1411.