

# **Bulgaria – The Homeland of International Competitions in Informatics for School Students**

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The roots of Bulgarian experience in conducting Informatics competitions for school students go back to the late 70's of the last century. In those times such competitions were named "Programming Competitions". As a rule, the solution to problems given at the contests required mainly "paper work". The contestants were asked to write on a paper a program which, if executed on a computer, performed a specific task. Then the papers were checked and assessed by the jury. If computer resources were available (for instance "computer time" with a mainframe or a minicomputer), the programs of the students were executed on computer as well. The number of computers in the country in those years was very limited and the access to them for school students was rather restricted. With the advent of microcomputers the situation changed. More and more school students got access to computers and this made it possible to organize competitions which are similar to the ones practiced today - the execution of the code on a computer became an obligatory part of the assessment.

To compete means to compare your abilities and skills with the abilities and skills of others. The broader the base of comparison (larger participation in the competition), the better. This is in the base of the frequently observed trend when school competitions outgrow the frames of the school and become town competitions, the latter grow again to national competitions and, finally, students get involved in international competitions. In Bulgaria regular national competitions in Informatics for school students are conducted since 1981. The nation-wide Olympiad in Informatics (with this name) started in May 1985. An international competition called "Open Competition on Programming" took place in Sofia (May 17-19, 1987). It was organized just before (and in connection with) the Second International Conference and Exhibition "CHILDREN IN THE INFORMATION AGE" (May 19 – 23, 1987) with the intention to make it a traditional event conducted every two years. There were 28 contestants (school students) from 6 countries: Bulgaria (BG), Czechoslovakia (CZ), Federal Republic of Germany (FRG), Hungary (H), Romania (R) and Soviet Union (SU). Bulgaria and Romania participated with two teams. The students were divided in three age groups (less than 14, less than 16 and less than 18 years). The International Jury chaired by Petar S. Kenderov (with Zdravko Vassilev as Deputy) gave two first prizes - to Markus Gutschke (FRG) and to Vulcho Vulchev (BG1). There were three second prizes: Dimitrij Evsjuhin (SU), Andrei Dobos (CZ) and Tomas Mueller (FRG). Vladimir Vesely (CZ), Michael Sperber (FRG) and Svetoslav Nestorov (BG2) got third prize. The competition was a success and sparked great interest and enthusiasm both among participants and organizers. At the 24<sup>th</sup> session of the General Conference of UNESCO held six months later in Paris, Professor Blagovest Sendov, a member of the Bulgarian delegation, suggested to include an International Olympiad in Informatics (IOI) in the Fifth Main Programme of the UNESCO Plan for 1988-89. The proposal was approved and by a contract with the UNESCO Division of Science, Technical and Environmental Education, Bulgaria

took the obligation to organize the first IOI just before the third Conference and Exhibition “CHILDREN IN THE INFORMATION AGE” (Sofia, May 20 – 23, 1989).

Additional experience in conducting international informatics competitions was gained in 1988 when a competition for school students from the so called technical schools was held in Bulgaria (Varna, October 5 – 8). There were 18 students from six countries: Bulgaria (BG), Cuba (C), German Democratic Republic (GDR), Hungary (H), Poland (P) and Soviet Union (SU). The International Jury was guided by Pavel Azalov (Chairman) and Evgeni Genchev (Deputy Chairman). There were two first prizes which went to Georghi Rivov (BG) and Marchin Wojas (P). A second prize was given to Alexiel Matos (C) while the third prize went to Pavlin Kostov (BG).

The first IOI was conducted in Pravetz, Bulgaria, from 16<sup>th</sup> to 19<sup>th</sup> of May, 1989. It was modeled after the International Mathematical Olympiad (IMO) and this was explicitly mentioned in the written Regulations of IOI. For instance, the participating countries were obliged to send in advance to local organizers sample problems from which the International Jury had to select the problems to be given at the competition. Only school students who have not completed certain age (in this case 19 years) by the beginning of the competition were admitted to participate. In the first half hour after the start of the competition the participants had the right to put questions to the International Jury (in written form) concerning the formulation of the problems. The student work was preliminary checked and assessed by the respective team-leader and then finally marked by the “Coordinating Commission”. The final marking was with the International Jury which decided also how many first, second and third prizes are to be given to most successful participants. All expenses related to the stay in Bulgaria of the teams and the team-leaders were covered by the organizers. There was an excursion to Sofia and an entertainment program for the participants in the competition. Professor Iltscho Dimitrov, Minister of Education, gave a reception for IOI participants.

There were however significant deviations from the established routine of IMO. According to the rules of IOI, a team consisted of not more than three students accompanied by a team-leader. With teams of six students which was the case in IMO, it would have been difficult for organizers to ensure support for local expenses of participants and to provide the necessary number of computers (APPLE II compatibles or IBM PC/XT/AT/ compatibles) for all contestants. Another deviation from the practice of IMO was that, while doing the preliminary assessment of the papers, the team-leader had the right to talk to the participant and to ask for explanations of his/her work. This helped significantly the process of marking the papers. At the end of the competition each team leader accompanied by a member of the Coordinating Commission collected the solutions from the members of the respective team. The work of each student (the final version of the solution) was copied on two floppy disks. One remained with the team leader and the other stayed with the Coordinating Commission. The program of each student was run with a set of preliminary prepared (and approved by the Jury) Test Examples.

Thirteen countries have sent teams to the first IOI. These were (alphabetically): Bulgaria, Cuba, Czechoslovakia, Federal Republic of Germany, German Democratic Republic, Greece, Hungary, Peoples Republic of China (PRC),

Poland, Soviet Union (, Vietnam (V), Yugoslavia (YU) and Zimbabwe (Z). The teams from Hungary and from Yugoslavia had two students each. Bulgaria participated with two teams and Soviet Union with three teams. Thus, altogether, there were 46 students distributed in 16 teams. The International Jury consisting of Chairman (Petar S. Kenderov), Deputy Chairman (Nelly Maneva) and the team leaders gathered on Wednesday morning (May 17, 1989) to select a problem for the competition. A special Scientific Commission has prepared in advance six problems based on suggestions made by team-leaders before the IOI. The International Jury selected one of those six problem which was originally proposed by China. Then the problem was refined and formulated in the official languages of the Olympiad: English and Russian. The team-leaders translated the problem into the respective languages understandable for their students. The competition itself started in the afternoon of May 17<sup>th</sup>, 1989. The students had four hours to solve the problem. Each student had a microcomputer at his/her disposal. According to personal preferences of participants, most computers were IBM PC compatible. They were provided by the organizers. The team from Federal Republic of Germany and one of the teams from Soviet Union participated in IOI with their own equipment.

Here is the problem given at the first IOI (by default  $N$  stands for an arbitrary positive integer):

*Given  $2N$  boxes in line, side by side; two adjacent boxes are empty, and the other boxes contain  $N - 1$  symbols "A" and  $N - 1$  symbols "B".*

*Example for  $N = 5$ .*

A	B	B	A			A	B	A	B
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*Exchanging rule:*

*The contents of any two adjacent non-empty boxes can be moved into the two empty ones, preserving their order.*

*Aim:*

*Obtain a configuration where all A's are placed to the left of all B's, no matter where the empty boxes are.*

*Problem:*

*Write a problem that:*

- 1. Inputs from the keyboard the initial state as a sequence of A's and B's and zeros (for the empty boxes), and models the exchanging.*
- 2. For a given initial state finds at least one exchanging plan, which reaches the aim or reports that such a plan does not exist. The output should contain the initial state, the intermediate states after each step, and the final state.*
- 3. Finds a plan reaching the aim with a minimal number of steps.*

*Results:*

*Present at least one solution for the example mentioned above.*

The maximal number of points given for a complete solution to this problem was 100. Those students who scored 91 and more points were given the first prize. These were:

Teodor Tonchev (BG2), Markus Kuhn (FRG), Emanuil Todorov (BG1), Andrius Cepaitis (SU1), Igor Maly (CZ) and Daniel Szabo (H). Second prize was given to students who got between 80 and 90 points. These were: A. Altanov (BG1), I. Marinov (BG1), H. Schwetlick (GDR), U. Nielaender (GDR) and L. Novick (SU1). The third prize went to students who got points in the range 60-80. Two encouragement prizes were also awarded. One of them went to Alexei Kolybin (SU3) who was the youngest participant and the second was given to Anita Laloo (Zimbabwe) – the only girl among the participants.

The first eight places in the unofficial country (team) ranking is given by the next table:

No	Country/team	Team Leader	Score
1	Bulgaria (first team)	P. Azalov	275
2	Peoples Republic of China	W. Wu, Q. Ling (Deputy)	221
3	Federal Republic of Germany	P. Heyderhoff	215
4	Czechoslovakia	O. Demacek	209
5	German Democratic Republic	M. Fothe	207
6	Soviet Union	V. Kirjuchin	190
7	Bulgaria (second team)	K. Manev	188
8	Hungary (two students only!)	T. Toeroek L. Zsako (Deputy)	149

Many people contributed to the organization and conduction of the first IOI. The work of the International Jury was supported by the software system created by P. Azalov and V. Dimitrov. In the hands of I. Nenova and V. Dimitrov this system served perfectly all the information needs of IOI – starting with the registration of participants and ending with the ranking with respect to results obtained in the competition. Alexander Pokrovsky from UNESCO (Division of Science, Technical and Environmental Education) closely followed all stages of the organization and conduction of the first IOI. Comprehensive information about the first IOI could be found in [1].

The idea to organize in Bulgaria international competitions in informatics has not evolved “from nowhere”. The original impulse came from the deep traditions Bulgaria had in conducting different types of mathematical competitions. The first National Olympiad in Mathematics was organized in academic year 1949 – 1950. Bulgaria took part in the first International Mathematical Olympiad organized in Romania in 1959 and is among the few countries that participated in all subsequent IMO’s. Bulgaria hosted also the first International Olympiad in Mathematical Linguistics in 2003. A rather complete picture of the contemporary Bulgarian system

of competitions is given in [2]. The general idea behind all activities related to competitions is to give chance to talented Bulgarian youngsters to exhibit and develop their talents in the fields of Informatics, Mathematics and Mathematical Linguistics.

1. P. S. Kenderov and N. M. Maneva, International Olympiad in Informatics, Union of Bulgarian Mathematicians, 1989 (online version at [http://www.math.bas.bg/talents/en/inf/International Olimpiad in Informatics.pdf](http://www.math.bas.bg/talents/en/inf/International_Olimpiad_in_Informatics.pdf) )

2. <http://www.math.bas.bg/talents/ml.htm>

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