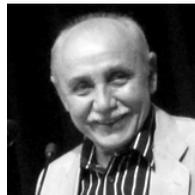# IYNT 2014

Kyustendil · August 22-27, 2014

Information booklet

Greetings from Evgeny Yunosov

IYNT, Founder & Chairman of the General Council
IYPT, Founder & Honorary Vice-President
Foundation for Youth Tournaments, President

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The world is comprehensible.

This is far from being obvious.

Albert Einstein said, "The eternal mystery of the world is its comprehensibility. [...] The fact that it is comprehensible is a miracle". [1] Einstein argued that the greatest achievements of science are based on a firm belief that the world possesses logical unity.

When we speak about a comprehensible world, we mean that existing theories would allow explaining the world all around us. Furthermore, we are confident that the most unbelievable phenomena would be explained in the future, if not now.

What gives us such a confidence?

Throughout its existence, *Homo Sapiens* attempted explaining the surrounding universe. Initially, the humans filled the world with supernatural beings and gave them human qualities to explain daily observations, thereby connecting an inner human world with the real external world. Thus was created the art.

But gradually the astronomical observations, by pagan priests, led to an understanding of the link between various natural phenomena. Humans realized that the phenomena of the external world occur independently of the human mind and that they obey their own laws. A new value appeared in the human society. This value was the knowledge. Thus was created the science.

Although the science was initially driven only by practical goals, the human spirit has always encouraged the society to attempt understanding and explaining the world. Science embeds the desire to understand the nature, the interest to acquire new knowledge, and the ability to create a general picture of the universe.

This has brought each of us here, to our remarkable IYNT.

You are the young IYNT participants who have already experienced the interest and excitement that arise when you look beyond the edge of the knowledge taught to you at school. When working on the IYNT problems, you feel your way along a path of a real scientist who attempts explaining a phenomenon.

The society has always been attracted to "smart games". Solving a simple puzzle brings satisfaction but leads to nowhere. When preparing to the IYNT, you never stop your exploration, making your research problem deeper and wider. When solving the IYNT problems, you acquire a useful habit of thinking. You start to pose questions and search for answers on your own. This makes a part of comprehending the world.

It is believed that a traditional research path includes the following steps: a hypothesis, then an experiment, and then a scientific theory. However, another path is possible. Such a path is called "a game of the mind".

Einstein mentioned that the theory of relativity has grown out of a question he asked when still in teenage years, "What would I see in a mirror if I carried it in my hands and ran at a speed near that of light?" For Einstein, creative activity of a mind had always an indisputable value. In his work, he always went from a theory to an experimental proof.

When it comes to the "game of the mind" at the IYNT, the problem "Invent yourself" offers an enormous room for exploration and discoveries. For a first time at the IYNT, we will hold one Science Fight on this problem only, and then make this "game of the mind" a vector of development for the IYNT.

In its problems, the IYNT opens outstanding research opportunities for the participants, and we will continue formulating the problems in such a manner that they lead to ever more creative and fascinating projects by the young naturalists. Participation at the IYNT has a further pivotal meaning for teachers, the team leaders of the participant teams. The IYNT allows them to foster their professional level when coaching the team during the preparation and then serving on the jury during the tournament.

Saying shortly, the IYNT is a school of the active and creative life.

I wish all IYNT participants to enjoy your experiences, to make vibrant creative discoveries, and to accomplish your true goals.

[1] Albert Einstein. Physics and Reality. *J. Franklin Inst.* 221, 3 (1936), p. 351

Greetings from Ilya Martchenko

IYNT, Member of the General Council
University of Fribourg & Lund University, researcher
IYPT, Treasurer & Executive Committee member

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Dear colleagues,

I wish to extend a warm welcome to participants, team leaders and delegates of the IYNT 2014. I realize how excited you are about the forthcoming Science Fights, and I hope that the IYNT will become an astounding and memorable experience for you.

The IYNT 2014 has attracted the most creative and able entrants from diverse backgrounds. You have already proven to be young leaders and exceptional young minds. Your competition will be tough yet exciting and mutually enriching.

Over the last decade, I have been studying the history and educational impact of youth intellectual tournaments, a movement conceived by Evgeny Yunosov in 1979. A regional Young Physicists' Tournament has survived against all the odds and been brought to the international arena in 1988. The IYPT, the global physicists' tournament, is a story of visionary leadership and a breathtaking activity that has brought together thousands enthusiastic friends. Over a span of a quarter-century, the IYPT has grown to become the world's largest and most prestigious event for pre-university students awarded with the 2013 ICPE Medal for "outstanding contributions to international physics education". I am proud of serving as the Treasurer and Archivist of the IYPT, and being part of the tournament family.

Two years ago, during the IYPT 2012, our Founder presented the International Young Naturalists' Tournament, a stunning, all-new event bridging gaps between the natural sciences and focusing on participants of a younger age group. "The IYPT should have a young brother, Young Naturalists' Tournament. The IYNT would bring something into the current IYPT: motivated and more

experienced participants who are fascinated with science", the Founder underlined back in July 2012.

The growing success of the IYNT is a success that is richly deserved. The torch of the IYNT is passed from country to country, from Turkey 2013 to Bulgaria 2014, now to Iran 2015, and then to a thrilling venue of 2016 not yet selected from our hosting bids.

The IYNT is founded on determination and passion. We at the General Council are working to ensure that the IYNT participation is widening and that our competition is accessible in spite of existing financial or organizational barriers. I would like, as this booklet goes to press, to extend our warmest wishes to all teams that could not attend this competition due to the barriers of a financial nature.

I hope you will have an enjoyable stay in the small but beautiful town of Kyustendil. I hope the IYNT 2014 would provide an invaluable opportunity for fruitful contacts, networking, and friendship. I hope the IYNT 2014 would be your experience of a lifetime.

I take this opportunity to thank the Center for Creative Training and the Municipality of Kyustendil for their kind hospitality. I would also like to express my gratitude to all members of the IYNT General Council and Situation Center, in particular, for their wonderful diligence and hard work leading to this event.

I wish you no less than a breathtaking competition.

Greetings from Andrei Kravtsov

IYNT, Member of the General Council
Bauman Moscow State Technical University,
Fundamentals of Physics Chair head

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Dear participants of the IYNT, dear friends!

We are surrounded by a wonderful world. It is the most interesting task for a curious mind to understand the laws of this world. Prominent scientists have been searching for answers to the "children's" questions such as "why is the sky blue", "why is the grass green", "why does the wind blow". They have found the answers to these questions, but the main question is "how does the world work and why" contains so many secrets that everyone interested to study nature would have enough.

Your participation in the IYNT allows you to make not only the first steps of a researcher, but also to learn to discuss, defend your opinions, listen to feedback and find valuable information for further work.

You will learn how to work in a scientific team; you will work together to solve the creative experimental problems in physics, biology, chemistry, geography, mathematics and other natural sciences. You will learn how to present your work and how to oppose and criticize the work of your colleagues from other teams.

You can understand how the natural scientists work. You will feel both the joy and ever incomplete satisfaction with your results. You would be able to tell yourself if your future work would be related to the study of nature.

The IYNT is also a competition. This means that the IYNT is subject to rules. One should also learn complying to rules, because science deals with many rules of procedure developed by scientists over many years. Unlike other events, our Tournament will have winners, but will have no losers, because you will exit the competition with a luggage of knowledge and research experience. It is impossible to lose such a luggage.

Good luck to you! Gain new knowledge, new ideas and new friends!

Greetings from Dina Izadi

IYNT, Member of the General Council
Ariaian Young Innovative Minds Institute, President
IUPAP Working Group 5, member
IYPT, International Organizing Committee Member

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Dear All Participants,

Science and Technology have enormous impact on development on many nations and active learning can help in building capacity of young students.

AYIMI has engaged many students in practical scientific activities from several years ago and now students in Iran participate in IYPT/AYPT/PYPT/IYNT/IJSO and several other tournaments and competitions.

To encourage students in high schools AYIMI educates them how to prepare an international papers to be published in scientific journals. Recently 3 papers from IYPT 2014 were presented in international conference of Physics in Wilfrid Laurier University in Canada and full papers will be published in AIP journal.

To invite all other countries to our new project related to young scientists, Inspiring Science Education Project "Special Prize for Young Scientists" was presented in Wilfrid Laurier University in Canada, Aug. 4-8, 2014.

SPYS Goals:

1- Active Learning by Innovation in Teaching (ALIT), Springer Proceedings in physics 145 DOI, 2014.

2- Resources to attract more students in active learning. Making an appropriate atmosphere for students in high schools or universities to show their novelties.

3- Invite other countries to take part in this project by introducing their national scientific activities.

4- Find the best competitions, tournaments and several scientific activities which students individually or as a team work can show their novelties in solving problems.

5- Invite all the participants to present their works in an appropriate atmosphere in order to select the best innovative and creative works in several basic sciences

6- Promote building capacity among young generation by encouraging them to build something new which helps them to live better in future

7- To attract organizations, societies, communities and to give the special prize every year to the best individual or team working solved problems IYPT is one of the best methods in physics learning and now IYNT for junior students too. So I am very glad that in AYIMI we have several programs according to active learning.

To get our goals we have been the host of IYPT 2011 and IJSO 2012 and now we invite you all to IYNT 2015 in I.R. of Iran.

Greetings from Louis Delarey Heyns

IYNT, team leader and jury chairperson at the IYNT 2013
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Greetings to the IYNT General Council, Local Organising committee, Jurors, Team Leaders and most importantly the bright young minds and scientists of the future.

Congratulations to all on meeting and overcoming all the various obstacles and challenges in order to make IYNT 2014 a reality. Participating in a competition of this nature, particularly the IYNT, is a privilege and an honour. You have worked hard in preparing your solutions to the various research problems but participating will stretch your minds and scientific thinking even further, as you defend your presentations against your Opponents. Reviewers will be challenged to objectively, yet critically analyse how well the Reporters and Opponents fulfil their roles.

My advice to the teams is to remember and focus on the SCIENCE behind the research problem and solution. Explain the Science and do not get distracted with generalities. When presenting mathematical formulae and calculations, explain the principle instead of reading the entire calculation number by number. Most of all ENJOY the learning experience – learn from the other teams and the Jury.

My advice to the Jury is to give meaningful feedback to the teams – mention areas for improvement as well as areas of strength. Feedback should be an encouragement to improve. The teams WANT to hear from you even if you feel more confident expressing yourself in Russian and have someone translate for you.

This will be an unforgettable experience. I wish you the very best and may Science prosper.

General Council of the IYNT

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Main problems for the 2nd IYNT

> Yes, "know"! Men call it so, but then
> Who dares to call the child by its right name?
> *Faust,* Goethe

1. Invent yourself
Formulate an open problem on your own and solve it. Topic: experiments using a microscope. Allowed magnification: from 10X to 40X.

2. Potatoes
A classic board, as understood by carpenters, is a rectangular parallelepiped with significantly varied linear dimensions (length>width>thickness.) They call such a parallelepiped a bar if width and thickness are comparable. If all three dimensions are comparable, they call it a cube. When a homogenous board floats on the water surface, its biggest face is horizontal. A board "knows" perfectly this rule and always "abides" to it. But for a bar the rule becomes ambiguous and its behavior is determined by ratio of its density to water density. For a cube, it is even more "ambiguous" in this regard. Use potatoes for an experimental investigation of floating bodies of different shape. Regulate the density ratio through adding salt to water. Investigate the different ways of how bodies of various shapes can float.

3. Discovery of chemical elements
Name ten most common chemical elements in the Earth crust. For one of them describe and, if possible, reproduce as many as possible of the experiments through which this element has been discovered.

4. Pulse
Investigate how human pulse depends on the speed of running and fitness of the human. Come up with a parameter characterizing the fitness. Estimate how much energy the human spends on running in addition to normal body functions.

5. Last droplet
A beaker is filled to the brim with water that dips into the middle of the beaker from a low height. Can you estimate what droplet will be "the last straw", i.e. the drop that will make the water to spill over the edge of the beaker?

6. Water on the Earth

The modern astrophysics states that the World Ocean emerged on the Earth due to a lengthy and intensive comet bombarding at a certain stage of the Solar System formation. Find out as many parameters of this grandiose phenomenon as you can.

7. Tourist route

You are a manager at a travel agency developing sport and sightseeing trips. In a summer, a family with children wishes to make a week-long trip from Paris to Düsseldorf. They wish to cover part of the route on a bicycle (no more than 50 km per day) and part of the route on regional trains (no more than 2 hours per day.) Since the children have to sleep during the night, the travel should not start before 10 a.m. and finish after 8 p.m. on any day. The overnight stays should be possible at camping sites where pitching a tent is allowed. The trip should pass through interesting places.

Suggest a journey plan to the family and specify the following for each day: mileage on the bicycle, duration of train connections, highlights of the sightseeing. List the online resources required for a detailed planning of the travel. Take into account the usability of the services given the fact that the tourists speak only English.

8. Droplet

Place a droplet of salt water on a glass plate and study the process of drying. How does the deposit of dried droplets depend on the salinity of water? Perform the same with a droplet of black tea.

9. Traffic lights in a test tube

Volodya the fifth grader decided to collect as many liquids of various colors as possible in one tube. He succeeded to produce the "chemical traffic lights" as shown. Try to beat Volodya's record.
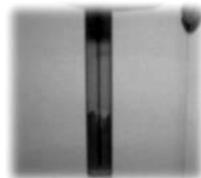
10. Straw

What is the maximum length for a vertical straw such that you still can drink non-carbonated water through it? Still can drink cola through it?

11. Colorful bouquet

It is known that the color of a carnation flower can be changed if the flower is watered with an ink solution. Can the color of the flowers be changed by other methods? Explain the principle of your method. To what flowers is it applicable?

12. Foxes and penguins

There are certain regularities in the distribution of closely related species of warm-blooded animals. For example:

1. North Africa is home for the smallest and long-eared Fennec Fox, and tundra is home for the bigger Arctic Fox, which has shorter ears and legs. The regular fox is something intermediate between them.

2. The biggest of the penguins, the Emperor Penguin (height over 120 cm), lives on the Antarctic coast; while the smallest, the Galapagos Penguin (height about 50 cm), lives in the tropical belt near the coast of South America.

Identify and explain the regularities in the distribution of warm-blooded animals across the Earth. Show your own examples evidencing these regularities.

13. Format of photos

You have a photograph in the BMP file format (a natural scenery or a portrait.) Convert it to the JPG file format. The differences are nearly invisible though they exist. Propose a visual method to demonstrate these differences.

14. Weight loss

Weigh yourself on a "good" balance immediately before the going to the bed in the night and then immediately after waking up. Did you detect a difference? Explain the results. Besides, what balance would you consider a "good" balance?

15. Four points

Do the following experiment: put points at arbitrary positions on several sheets of paper, four points per each sheet. Suggest other participants of the experiment (e.g., members of your team) to do the same. Now connect sequentially these points with straight line segments so that they form a quadrilateral (cases in which a triangle or just a straight line are formed,

should be discarded.) Now count the total number of the quadrilaterals (N) and the number of convex quadrilaterals (n), and calculate the ratio $k=n/N$. Likely to be that $k>0.5$.

Question: What is k for a very large N and why, if :

a) the experiment is performed by a computer and visualized on the display?

b) the experiment is performed by a computer, but is not visualized, and is carried out in a mathematical program?

c) the experiment is performed a large number of people?

d) a real experiment is not performed, but you find the ratio theoretically if N tends to infinity?

16. Potatoes again

If a freshly dug potato tuber, or a tuber stored in a dark room, is left in the sunlight, its surface becomes green. Why does this happen? And what would happen to the color of the tuber if it is put again into a dark room for a long time?

17. Measurement of color sensitivity

Some people (called color blind persons) have difficulties comparing the colors of two objects. But most people perceive the color difference at the first glimpse. The difficulties arise when the colors are hardly distinguishable, e.g. if colors of two leaves from the same tree need to be compared. How is it generally possible to quantitatively estimate the ability of a person to distinguish the color shades? Is a single numerical parameter sufficient, or a more complicated evaluation system is required?

Regulations of the International Young Naturalists' Tournament

Contents:

Chapter 1. General information

I. Young Naturalists' Tournament

The International Young Naturalists' Tournament (hereinafter the *IYNT*) is a team competition for students of secondary schools in their ability to solve research problems of the natural sciences, convincingly present their solutions, and defend them in scientific discussions called Science Fights (*SF.*)

II. General Council

1. The IYNT is solely governed by the General Council (*GC*) established by the founding countries of the IYNT. The GC presides over the manner in which the Tournaments are held, ensures implementation of the Tournament Regulations, and entrusts the Local Organizing Committee (*LOC*) of the host country with hosting and conducting the respective IYNT event. The LOC determines the

venue of the IYNT and the schedule and ensures all necessary conditions for hosting the Tournament.

2. The GC has approved the present version of the Regulations and it can be edited or amended only by the General Council.

III. Participants of the IYNT

1. The participants are aged 12 to 16. The students who turn the age of 16 years before May 15, 2014 cannot be participants.

2. Teams.
The participating teams represent schools and institutions of secondary education.
Teams of institutions of secondary education comprise students from one institution.
Combined teams comprise students from cities, republics, countries.

3. The membership of the teams
        A team is composed of six students of secondary educational institutions. The LOC may allow participation of teams of five or four students. The composition of the team cannot be changed during the IYNT.
        The team is headed by a Captain who is the official representative of the team during the IYNT.
        The team is accompanied by two adults. One of them, aged no less than 18, is the team leader and the official representative of the team at the IYNT team. He or she interacts with the organizing bodies of the IYNT and arranges the participation of the team, including the preparations of a package of documents. Another one is the scientific supervisor of the team and works in the Jury for the Science Fights (*JSF*).

4. Registration of teams in the Tournament
The teams participate at the Tournament via application and registration. The team must fulfill the requirements for the registration, established by the General Council.

5. Rejection of participation in the Tournament
It is possible that the team registration is declined in the following cases:
        The team represents a specific institution which has already registered a team.
        The team have not fulfilled the requirements of the registration.
        The total number of teams wishing to take part in the Tournament exceeds the number the LOC can host. In this case, the LOC must report to the GC the

total number of teams they can host no later than 6 months before the registration deadline. In this case, the GC will decline the registration of the teams with a low preliminary ranking (R0) in cooperation with the LOC.

6. Preliminary ranking of teams (R0)
The preliminary ranking is determined for the teams participating in the preliminary competition.

Participation in the preliminary competition is voluntary.

Participants of the competition send solutions of several problems from the main set of problems to the Jury of the Tournament before a deadline.

IV. Problems of the IYNT

Main problems
1. The main problems are theoretical and experimental problems in natural sciences.
2. The main problems of the IYNT may be used in any competition that could lead to preparation and selection of a national team for the IYNT.

Additional problems
3. The additional problems of the IYNT are not published in advance and are offered to the teams directly in the course of the Science Fights.

V. Jury

1. The Jury evaluates the solutions of the IYNT problems made by the teams and the team performances in Science Fights.

2. The Jury of the IYNT is formed by the GC in cooperation with the LOC. The Jury consists of independent experts and the scientific advisors of the participating teams (one scientific advisor per each team.)

3. Groups of Jury for Science Fights (*JSF*) are formed from the individual jurors. Each Group consists of several independent experts and three advisors of the teams (team leaders) such that their teams do not take part in the respective Science Fight. One of the independent experts is the Chairperson who conducts the Science Fight and ensures that the Regulations are respected.

VI. Team registration

1. In order to participate at the IYNT, each team must register on the webpage of the IYNT. Each team is then assigned with their identification number (*ID*.) The ID of the team will be used in all official IYNT forms and protocols.

2. If all the registration requirements are fulfilled, the team is recognized official participant of the IYNT and is officially invited.

3. The teams that have registered on the webpage of the IYNT but not included into the list of official participants, can attend the YNT out of the competition. Such teams do not take part at the Semi-Final and Final Science Fights. The LOC decides to allow such teams to attend the event and about the conditions of such a participation.

VII. The agenda of the IYNT

The agenda of the IYNT includes:
Opening Ceremony;
Introduction of teams in a short performance (officially graded round);
Drawing lots;
Two Selective Science Fights with main IYNT problems (officially graded rounds);
Two Selective Science Fight with additional IYNT problems (officially graded rounds);
One Selective Science Fight with the problem 'Invent Yourself' (officially graded round);
One Semi-Final Science Fight (officially graded round);
One Final Science Fight (officially graded round);
Cultural program provided by the host country;
Extra contests in various nominations (graded but not used in the official ranking of teams);
Closing and Awards Ceremony.

VIII. Winners

1. The members of the team winning in the Finals are awarded 1st place diplomas and Gold medals of the IYNT.

2. Other teams participating in the Finals are awarded 2nd place diplomas and Silver medals of the IYNT.

3. All other teams participating in the Semi-Final SFs are awarded 3rd place diplomas and Bronze medals of the IYNT.

4 All other participants of the IYNT receive certificates of participation.

5. Team leaders receive certificates indicating the ranking of their team.

IX. Official language

The official language of the IYNT is English.

Chapter 2. Rounds of the Competition and the Grading

The rounds of the IYNT lead to the official ranking of the IYNT. In such rounds the performance of the teams undergoes a comparative evaluation by the Jury. The grading reflects whether the team is successful in their performance.

I. Calculation of the grading parameters in the actual stages of the Tournament

1. Grading (G)
Each member of the Jury grades the team performances by giving integer grades (G): In the contest of team Introductions   from 1 to 10.
     For a Report in a Science Fight   from 1 to 30.
     For an Opposition   from 1 to 20.
     For a Review   from 1 to 10.

2. Average points (P)
The average points for the short Introduction performances at the Opening Ceremony are equal to the arithmetic mean of all grades given by the Jurors.
The average points for the performances of the teams in SFs are calculated in the following manner:
    The two remaining extreme grades, one maximum and one minimum, are replaced with one grade equal to their arithmetic mean.
    In the next step, the arithmetic mean of this and all remaining grades is calculated. The resulting value if the Average points (P) of the team for their performance.
All Average points are rounded to 0.01 point.

3. Sum of Points (SP)
The Sum of Points for the team Introduction at the Opening Ceremony is equal to the Average Points earned.
The Sum of Points in the Scientific Fight is equal to the arithmetic sum of all the Average Points for the team in all performances in the given SF.
The resulting Sums of Points are rounded to 0.01 point.

4. Total Sum of Points (TSP)
The value of TSP is equal to the sum of all SPs for the team during all completed stages and performances. The resulting value is calculated after each SF and rounded to 0.1 point.

5. Winner of the graded rounds

In the contest of team Introductions, the winner is not determined but the Sum of Points (SP) is included in the total Sum of Points of the Team.

The winner (-s) of the Science Fight are the team with highest Sum of Points (SP) in that Science Fight and the teams with the SP that differs from the maximum SP by no more than one point.

6. Criterion of Victory (V)

The criterion V equals 1 for the teams winning at a Science Fight.

The criterion V equals 0.5 for the teams which are not winners of the Science Fight but have the value of SP that differs from the maximum SP by no more than 10 points.

The criterion V equals 0 for the teams which have the value of SP that differs from the maximum SP by more than 10 points.

7. Sum of Victories (SV)

The parameter SV of a team equals the sum of criteria V in all Science Fights.

8. Ranking (R)

The team ranking has values from 1 to N, where N is total number of teams. It indicates the position of the team in the list of all teams sorted descending.

The value of R for all N teams is calculated only after the completion of the third Selective Science Fight. The highest ranking (R=1) is assigned to the team that has the highest Sum of Victories (SV) in all preceding rounds. In case of equal SV for two or several teams, their ranking is determined via comparison of other grading parameters in the following order:

Total Sum of Points (TSP) in all preceding rounds;

the sum of Average grades for all Reports in all preceding SFs;

the sum of Average grades for all Oppositions in all preceding SFs;

the Average grade for one single best Report in the preceding SFs;

the Average grade for one single best Opposition in the preceding SFs.

If the listed criteria are not sufficient to unambiguously resolve the ranking of the teams, the Organizing Committee introduces additional criteria allowing determination of a univocal ranking.

9. Preliminary Ranking (R0)

The Preliminary Ranking of the teams reflects whether the team was successful in fulfilling the requirements of the registration. It is made public before the drawing of lots and is considered only for the drawing of lots.

II. Penalties

1. Violations in the number of rejects – NR (number of rejects)
If the number of rejections for a specific type of problems (main or additional) within one SF exceeds the limit, the SP in the said SF is reduced. If the total number of rejections at all (the current and all preceding) Science Fights exceeds the limit by one, the SP in the said SF is reduced by 10%; if it exceeds the limit by two the SP is reduced by 20%; if it exceeds the limit by three the SP is reduced by 30%, etc.

If there is no rejection in a particular Science Fight, the SP is not penalized even if the total number of rejections in preceding SFs exceeded the allowed limit.

Repeated rejection (if a challenge on the same problem has been rejected by the team before) incurs no penalty.

2. Violations in the number of performances in one Science Fight – NP (number of performances)
Exceeding the allowed number of times to take the floor within one Science Fight. Each individual team member is allowed to take the floor only once. If the team member takes the floor in two roles, it is recognized as one violation; if the team member takes the floor in three roles, it is recognized as two violations.

3. Violations in the performances in Selective and Semi-Final Science Fights – NT (number total)
Exceeding the allowed number of times to take the floor within all Science Fights, except for the Finals and the Science Fights with the problem 'Invent Yourself'. Throughout all Science Fights, counted together, an individual team member is allowed being Reporter only once; plus being Opponent only once; plus being Reviewer only once. Any violations are registered as summed up after each Science Fight.

The SP in the Science Fight with two violations by a team is decreased by 10%; if there are two violations, the SP is reduced by 20%, if there are three violations, the SP is reduced by 30%, etc.

4. Forbidden usage of Internet and phones – DT (data transfer)
The number of such violations is summed after each Science Fight.

SP of a team in a Science Fight in which this type of violation was detected is decreased: by 10% if the violation is the first one, by 20% if the violation is the second one, by 30% if the violation is the third one, and so on.

5. Violations in the duration of one performance – DP (duration performance)
The team exceeding the duration of their Introduction at the Opening Ceremony by no more than two minutes will have their SP for the Introduction

reduced by 10%. If the duration is exceeded by more than two minutes, their SP for the Introduction is reduced by 40%.

There are no penalties for exceeding the time allowed for presentations at the Science Fights. This is under control of the Chairperson who will stop the presenter when the time is up.

6. Summing of the penalties

The penalties for the violations described in p. 1 – p. 4 are applied independently and sum up, if the violations happened *within one Science Fight.*

III. Grading parameters

The current values of Grading parameters for the teams (with penalties applied) are published as a table after each Science Fight.

SP, Sum of Points for the most recent completed round.

TSP, Total Sum of Points.

SV, Sum of Victories.

R, Ranking (starting from the third Science Fight.)

Chapter 3. Introduction of teams at the Opening Ceremony

Each team introduces themselves in a short performance at the Opening Ceremony of the IYNT.

The performance can be of any genre and of any kind. Team leaders may also take part in the performance.

The duration of the Introduction performance is limited to 3 minutes.

Exceeding the time allowed for the Introduction incurs a penalty.

Taking the penalties into account, the grading parameters for each teams are determined:

SP, Sum of Points for the Team Introduction.

Chapter 4. Science Fights

A Science Fight is a meeting of three teams in which the teams discuss and present their solutions of the IYNT problems.

I. Types of Science Fights

There are five types of Science Fights (SF) in the IYNT which differ in regulations, contents of problems, or composition of teams.

1. Selective Fights with the main Tournament problems.
Are conducted according to the Standard Science Fight regulations using the problems selected for this Science Fight from the list of the main IYNT problems. All teams participate.

2. Selective Fights with the additional Tournament problems.
Are conducted according to the Standard Science Fight regulations with changes in sections 1 and 2 using the additional problems selected for this Science Fight. All teams participate.

3. Selective Fight with the problem 'Invent yourself'.
Is conducted according to the Standard Science Fight regulations with changes in sections 1 and 2 using the problem 'Invent yourself' problems. Only those teams participate that have submitted their formulations of the Problem 1 'Invent yourself' to the Organizing Committee by 20h00 on the first day of the IYNT.

4. Semi-Final Science Fights.
Is conducted according to the Standard Science Fight regulations using the problems selected for this Science Fight from the list of the main tournament problems. 9 teams participate.

5. Final Science Fight.
Is conducted according to the Standard Science Fight regulations with changes in section 1 using the problems selected for this Science Fight from the list of the main tournament problems. 3 teams participate.

II. Standard Science Fight regulations

1. Before the beginning of a SF, the Jury and the teams are introduced.

2. In the course of the SF the members of a team communicate only with each other. They are not allowed to use mobile data transfer and the internet. When needed, the organizers may provide laptop computers and other equipment.

3. In the groups of three teams, the SF is carried out in three Stages. In each Stage, each team plays one of the three roles: the Reporter, the Opponent, and the Reviewer.

4. After each Stage, the roles are reassigned in the following order:

3 teams	Stage I	Stage II	Stage III
Team 1	Rep	Rev	Opp
Team 2	Opp	Rep	Rev
Team 3	Rev	Opp	Rep

Here Rep means Reporter, Opp means Opponent, and Rev means Reviewer.

5. Only one team member takes to the floor as Reporter, Opponent or Reviewer on behalf of their teams. All other team members may work as assistants, offer technical support to the presenter, pass notes with short commentaries and if allowed by the chairperson can make short remarks.

6. Team leaders can be observers when their team takes part in a Fight, if they do not work in the Jury in other rooms. They have no right to intervene in the work of the Jury and in any of the actions.

7. In the groups of two teams, the SF is carried out in two Stages. In the first Stage, one team acts as the Reporter, and the second team is divided into two independent subgroups that take the role of the Opponent and the Reviewer, respectively. In the second Stage, the teams change their roles.
After each Stage, the roles are reassigned in the following order:

2 teams	Stage I	Stage II
Team 1	Rep	Opp, Rev
Team 2	Opp, Rev	Rep

III. Limitations on team members to take the floor

1. During any single Science Fight (Selective, Semi-Final and Final) each team member may take the floor only once.

2. Throughout all Selective Science Fights with main and additional problems and Semi-Final Science Fight, as a whole, each team member may take the floor only once in a specific role.

3. In the Selective Science Fight with the problem 'Invent Yourself' and in the Final Science Fight, each team member may take the floor in any role, regardless of the p. 2.

4. Penalties are applied if these limitations are not followed.

IV. Rules of problem-challenge and rejection

1. All problems presented in the same SF must be different.

2. In the Selective and Semi-Final Science Fights, the Opponent can challenge the Reporter on any problem available for such Fight, except for those problems that:
        a. the Reporter has previously reported (in earlier SFs);
        b. the Opponent has previously reported;
        c. the Reporter has previously opposed;
        d. the Opponent has previously opposed.

3. The Reporter can reject the Challenge. Such rejection is recorded in the protocol. In such case, the Opponent makes a new Challenge.

4. It is allowed to make a challenge on the problem that has been previously rejected

5. In a situation that no problems are left for a challenge, the restrictions in the p. 2 are lifted in the following order: first d., then c., then b., then a.

6. In the Science Fights with the main IYNT problems, the total allowed number of rejected challenges not incurring a penalty is two.

7. In the Science Fights with the additional IYNT problems, the total allowed number of rejected challenges not incurring a penalty is two.

8. Penalties will be applied to the Reporter for rejecting a challenge if the Reporter exceeded the allowed number of rejections for a challenge.

V. Standard Stage regulations

1. In the selective and Semi-Final Science Fights, the Stages are carried according to the following regulations.
* Positions where Standard Regulations of a Stage should be amended as necessary.

#	Performance	Duration
1*	**Challenge***	2 min
2*	**Preparation** of the Reporter*	3 min
3	**Presentation** of the report	8 min

4	**Clarifying** questions of the Opponent to the Reporter	3 min
5*	**Preparation** of the Opponent*	3 min
6	**The Opponent** takes the floor	4 min
7	**Discussion** between the Opponent and the Reporter	5 min
8	**Clarifying questions** of the Reviewer to the Reporter and the Opponent	2 min
9	**Preparation** of the Reviewer	2 min
10	**The Reviewer** takes the floor	3 min
11	**Discussion** of the Reviewer with the Opponent and the Reporter	3 min
12	**Concluding remarks** of the Opponent	1 min
13	**Concluding remarks** of the Reporter	1 min
14	**Clarifying questions** of the Jury to the speakers	5 min
15	**The grading**	3 min
16	**Concluding remarks** of the Jury	4 min
17	**Summary and results** of the Stage	1 min
18	**Break**	10 min
Total for one stage (no break incl., appx.)		**50 min**
Total for a 3-team SF with 2 breaks (appx.)		**3 h**
Total for a 2-team SF with 1 break (appx.)		**2 h**

1*. In the Science Fights with additional problems, the consecutive challenge by all teams is carried out in the beginning of the Science Fight. 10 minutes are allowed for the challenge procedure. In the Selective Science Fight with the problem 'Invent Yourself' and in the Final Science Fight the challenge procedure is omitted.

2*. In the Science Fights with additional problems the preparations for the report consist in performing a task. Between 45 and 90 minutes are allowed for the work on the task, the exact timing is specified in the schedule.

5*. In a two-team Science Fight, p. 5 (the preparations of the Opponent), the Opposing team is divided into two independent subgroups, of which one

continues the role of the Opponent, while the other becomes a Reviewer. In total of 6 minutes are given to the Opponent in p. 5.

VI. Team performance in the Stages

1. **The Reporter** presents orally the solution to the problem by their team. The Report must contain the formulation of the problem, the basic ideas and methods for the solution, including the description of the observations and the experiments, and also the clear conclusions. The visual aids for the report are PowerPoint slides. All basic points of the Report must be presented visually as tables, graphs, mathematical formulae, photos and videos, etc.

2. **The Opponent** criticizes the report, including its contents and form. The Opponent points to possible inaccuracies and errors in the understanding of the problem and in the solution by the Reporter. The Opponent should emphasize the strong sides of the Report. The Opponent should express their agreement or disagreement with the Reporter's conclusions. **The presentation of the Opponent should not become a presentation of their own solution.** The Opponent initiates the discussion with the Reporter.

3. **The Reviewer** presents a short evaluation of the presentations by Reporter and Opponent, pointing to the strong sides and to the possible drawbacks and disadvantages. The Reviewer initiates the discussion with the Reporter and the Opponent.

VII. Results of a Science Fight

1. The results of the Science Fight for the teams (with penalties applied) are determined with the following grading parameters.
> **SP,** Sum of Points in the Science Fight.
> **V,** Criterion of Victory for the team in the Science Fight.

2. The following grading parameters are assigned to the teams that have not taken part at the Selective Fight:
> **SP** = 3, **V** = 0.

Chapter 5. Distribution of teams in the groups

1. For the first three Selective Science Fights, the distribution of teams among the groups is by the lot.

2. The lots are drawn at the Opening Ceremony. The scheme of the drawing lots is made public prior to the procedure. The lots will allow for such distribution of teams in the groups that:

      no two teams shall meet more than once throughout all Selective SFs,

      the teams having the highest ratings based on the provisional results, or results at preceding National rounds, shall not meet each other in the Selective SFs. The number of such teams equals the number of groups,

      when possible, each team has to change rooms so that each time it is graded by a different group of experts,

      the Organizers can decide to introduce additional rules for the lots to exclude specific teams from meeting each other in one group.

3. In all tables below the sequence of performances (Rep-Opp-Rev) is determined by the order in the respective line. Distribution of 18 teams:

SF	Groups																	
	A			B			C			D			E			F		
#1	1	7	13	2	8	14	3	9	15	4	10	16	5	11	17	6	12	18
#2	9	16	6	10	17	1	11	18	2	12	13	3	7	14	4	8	15	5
#3	18	5	10	13	6	11	14	1	12	15	2	7	16	3	8	17	4	9

Here the numbers indicate the team index received in the lots.
Similarly, a group table can be compiled for any other total number of teams.

4. In all the following Selective Science Fights the teams are distributed among the groups according to their ranking, i.e. the index which indicates the Ranking of the teams after the third Selective Science Fight:

SF	Groups																	
	A			B			C			D			E			F		
#4	16	9	4	17	8	5	18	7	6	13	12	1	14	11	2	15	10	3
#5	17	8	2	16	9	3	15	10	4	14	11	5	13	12	6	18	7	1

5. In case a number of teams have not taken part in a Selective Science Fight, the distribution of teams among groups is carried out with a respective smaller number of teams.

6. If the total number of teams in a league is over 11, then nine teams having the highest rankings after the completion of Selective Science Fights are allowed to the Semi-Finals. The distribution of the teams in the groups of Semi-Final Science Fights (the least number corresponds to the highest ranking in the table):

Semi-Final Groups								
A			B			C		
7	6	1	8	5	2	9	4	3

7. One team from each of the three Semi-Finals groups is allowed to the Final Science Fight. Only one winning team is determined in each Semi-Finals room. If there are two of three winning teams in a Semi-Final group, the team with the highest ranking is allowed to the Finals.

8. If the total number of teams in a league is between 8 and 11, then six teams having the highest rankings after the completion of Selective Science Fights are allowed to the Semi-Finals. The distribution of the teams in the groups of Semi-Final Science Fights:

Semi-Final Groups					
A			B		
5	4	1	6	3	2

Based on their results in the Semi-Final SFs, three teams are allowed to the Finals.

9. If the total number of teams in one league is less than eight, the Semi-Finals for the said league are not carried out and the three teams with the highest rankings are allowed to the Finals.

10. The distribution of the teams in the Final Group:

Final Group		
Team with the lowest ranking.	Team with an intermediate ranking.	Team with the highest ranking.

11. Within one hour after the announcement of the Finalists, the Finalists select the problems for their reports from the set of the main IYNT problems. Priority in the choice is determined by the ranking. The list of selected problems is made public.

Foundation for Youth Tournaments

The **Foundation for Youth Tournaments** is focused on promoting and developing youth intellectual competitions based on the framework of a scientific tournament. One of its important activities is to provide a financial infrastructure for the IYNT, including the handling of donations, registration fees, and payments to the LOC.

The Foundation operates in Russian jurisdiction (reg. no. 1147799008719, Unified State Reg. of Legal Entities, full name: "Foundation for Promotion and Development of Intellectual Competitions "Youth Tournaments") and has its headquarters in Moscow. Its operations are governed by the Russian Civil Code and the Russian Federal Law on Non-Commercial Organizations (12.01.1996).

Bank account details
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Bank of the beneficiary: Vesta Investment Bank
SWIFT: VSTARUMM
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Partners

Foundation for Youth Tournaments

http://iynt.org/foundation

Center for Creative Training

http://cct.bg/

Wolfram Research

http://www.wolfram.com/

Municipality of Kyustendil

http://www.kustendil.bg/

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(IYPT 1993 & 1994, team member)

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Schedule

August 22, 2014	Full arrival day Lunch, dinner provided
August 23, 2014	Breakfast Opening ceremony Contest in team introduction Juror meeting Lunch Selective Science Fight 1: problems 2—17 Dinner
August 24, 2014	Breakfast Selective Science Fight 2: problems 2—17 Lunch Selective Science Fight 3: problems 21—26 Dinner
August 25, 2014	Breakfast Selective Science Fight 4: problem 1 Lunch Final Science Fight Dinner
August 26, 2014	Breakfast Closing ceremony and Awards Check out from hotel Optional apéro Departure
August 27, 2014	Full departure day (optional)

http://iynt.org