

# **IYPT Archive: a glimpse into the history, development, and educational expertise of the IYPT**

Ilya Martchenko <sup>1,2</sup>

<sup>1</sup> Adolphe Merkle Institute, University of Fribourg, Rte Ancienne Papeterie, CP 209, 1723 Marly, Switzerland

<sup>2</sup> Physical Chemistry, Lund University, Getingevägen 60, Box 124, 22100 Lund, Sweden

Email: [ilya.martchenko@unifr.ch](mailto:ilya.martchenko@unifr.ch)

## **Abstract**

We report on a research initiative aimed at collecting and centralizing the archives of the competition, the *IYPT Archive*. This personally managed project has the objective to resolve the growing concerns of losing data and competence records of the past. We attempt to identify, locate, verify, and digitally preserve such essential information as teams and participants, problems, regulations, results, and organizational decisions. Among our methods and means are interviews with participants and organizers, data mining, and archiving the original primary sources in over ten languages. As other global educational events, the IYPT has a background that amounts to something more than a list of past winners. We show that the archives of the IYPT do not only clarify the facts, figures, and expertise of the past, but also carry a continuing educational potential. In a next step, we demonstrate that the collection is uniquely positioned to serve as a helpful resource for team leaders, future participants, and researchers in physics education. Historical case studies and progress reports by teachers, analysis by researchers and organizers, original solutions by students, accounts and audiovisual coverage, and the exhaustive IYPT bibliography are among the educationally

and scientifically relevant assets of the collection. The Archive makes thus a strong advance for the visibility and transparency of the IYPT, and may help to expand its outreach and to share its expertise with a wider community.

## Key words

IYPT Archive, data archiving, history of the IYPT, educational impact of the IYPT, physics education resource, research on learning strategies, research on goal-oriented physics education.

## Introduction

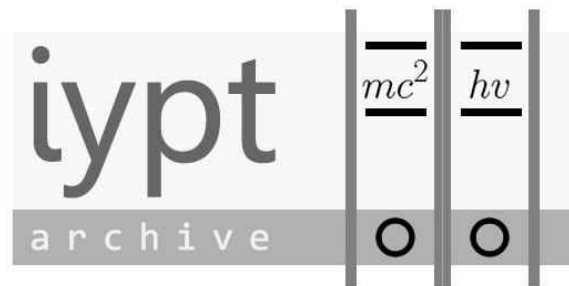


Figure 1. Logo of the project. As of early 2012, the Archive encompasses over 600 digital or digitized primary sources covering each year from 1979 onwards, and over 600 authentic solutions to the problems of each year since 1979. The Archive is an independent project and maintains its information page at [archive.iypt.org](http://archive.iypt.org).



Figure 2. Participants discuss the problem No. 9 “Astronaut” at the 2nd IYPT (1989.) Paper posters, seen on the photograph, were the standard visual aids until the mid-1990s. (Source: Ron Peerlings’ private collection.)

De einduitslag van het internationale toernooi ziet er als volgt uit:

|    |                   |      |
|----|-------------------|------|
| 1. | Bulgarije         | 31,6 |
| 2. | B.R.D.            | 31,5 |
| 3. | school 710 (USSR) | 31,4 |
| 4. | Odessa (USSR)     | 31,3 |
| 5. | Nederland         | 30,8 |
| 6. | Tsjecheslowakije  | 30,7 |
| 7. | Hongarije         | 29,4 |
| 8. | Polen             | 29,1 |

Figure 3. Final ranking of the 2nd IYPT (1989) recorded by participant Ron Peerlings on March 31, 1989.

Handwritten notes are sometimes the only surviving records of essential historical details. (Source: Ron Peerlings' private collection.)



Figure 4. Participants cheering after the Finals of the 4th IYPT (1991) on the stairs of the Department of Physics, Moscow State University. (Source: Sergey Romanchuk's private collection.)

Faded or monochrome photographs from the 1980s show the Physics Fights and students making reports with large paper posters (Figure 2.) Here are the international delegates discussing in 1989 the newly established International Organizing Committee and summarizing their vision of the educational relevance of the IYPT into the concise text used up to now. A large hot air paper balloon is launched at a closing ceremony of one IYPT to serve as a demonstration for a problem and a topic for a small quiz. Aged paper sheets, printed with dot matrix printers, reveal the problems, the regulations, the guidelines, and the

names. The final ranking: a handwritten note made by a participant during the stages (Figure 3.) Written solutions and scanned overhead transparencies that gradually turn into multimedia presentations since the late 1990s. An advanced numerical simulation made with a computer running a 1.77 MHz CPU. The IOC meeting minutes printed with a mechanical typewriter. Small articles in regional journals that describe the experiences, joy, and pride of having attended a Tournament, and the lessons learned.

### **Why look into and why preserve the IYPT history?**

Over the years, the IYPT has become one of the World's foremost physics education events, in which thousands of students are involved at regional and international rounds. [1; 2; 3] The IYPT features now a vast network of regional groups, enthusiastically involved teachers, and national committees.

The nuanced information on the past IYPTs attracts a special interest in this light.

In the hindsight, the past IYPTs leave behind a legacy of vibrant research problems, educational know-hows, original solutions made by students, and thematic articles of appreciable interest for the physics education research.

Keeping these materials available for the community would help sustaining and enhancing the assets of the IYPT.

At the same time, the IYPT brings benefits to an audience much wider than its own participants and organizers. On the spot, such benefits include the topics for projects [4; 5; 6] or a physics education competence. The knowledge and expertise has turned the IYPT into a collaboration that has an appreciable impact on partner projects and, occasionally, even on everyday physics teaching. [7] Some of the know-hows can be useful even for those teachers or students who never intend to participate at the IYPT itself. [7]

It was not facile for the IYPT, however, to maintain an exhaustive archive of materials published internally and externally. Even the traditionally printed articles or books were disappearing from immediate eyesight within a few years, and were never internationally indexed or brought together. Although existing *somewhere*, such contents were often multilingual, offline, not digitized, and hardly traceable for anyone but their authors. Due to a number of reasons, the opportunities to continuously document the earlier IYPTs have been neglected in the past.

The concerns of data loss were raised within the IYPT community on many occasions, with quite strong statements dating back to 1989. [8] “How can we speak of a serious effect from a science conference for the students, if even the list of participants is not traceable a year later? That is why a coordination center should exist, a *bank manager* that has all the necessary information available for the interested parties. Each participant should also understand that their achievements are not disappearing, but are somewhere recorded”, commented Evgeny Yunosov in an interview about the IYPT to *Komsomolskaya Zizn* in August 1989.

By the 2000s, there was already a feeling in the community that many past details are no longer recoverable and that the systematic archiving should be implemented to reverse the negative trends. [9] “When all important data is published online, it cannot be easily lost. Otherwise information loss is a serious threat to organizations like the IYPT, especially due to the fact that the main work is done by a LOC, which changes every year. To give an example, trying to find out the final team ranking of the IYPT 1993 proves to be a nearly impossible task. This information is not available online anywhere. One could only try to find out who was responsible for this IYPT and contact this person directly. However, a few years from now that may not be possible anymore, because even the responsible persons might not

have the data any more. Data archiving is a responsibility which has to be centralized”, Georg Hofferek suggested in September 2007 when speaking at an IYPT-themed conference.

Even online publications, however, were not a sustainable solution: 7 out of 10 local webpages for the IYPTs 1997-2006 were fully or partly discontinued by that time.

The Archive, as it exists now, was initiated through the efforts aimed at mining, collecting and verifying the IYPT-related historical information and preventing eventual data loss.

These goals have been achieved through several years of systematic research, interviews, analysis, and identification of hundreds original accounts, documents, articles, books, notes, correspondence, manuscripts, and reports in over ten languages. The project was first introduced in a newsletter in March 2010 [3], and formally presented on May 5, 2011. [10]

With a well documented history, we reach a good position to enhance the transparency and visibility of the IYPT. When relevant information is at fingertips, the community can tackle practical issues, demonstrate continuity, profit from the past lessons and experiences, and better understand the highlights and achievements in a retrospective.

At the same time, we acquire a unique portfolio that can be used for various projects, including the promotion of the IYPT.

## **Those were the years**

The IYPT has a rich, dynamic and diverse history. First held in its current status in 1988, the IYPT attracts nowadays between 20 and 30 nations each year. The origins of the competition were in the late Soviet Union that hosted a few first IYPTs.

The IYPT has originated from *Young Physicists' Tournament*, a competition reportedly initiated in early 1979 by Evgeny Yunosov and held initially for Moscow students only. [3; 11; 12; 13; 14]

By the early 1980s, the Tournament has firmly established most of its common distinctive features, such as the switching roles of Reporter, Opponent and Reviewer, the sets of 17 open-ended non-examination research problems, the knight logo designed by Vladimir Babaev, as well as the name and the format that remain commonly accepted ever since. [3; 12] The first formal publication about the concept of the new competition appeared in August 1980 in *Kvant*, a Soviet journal in popular physics and mathematics (Figure 5.)

We continue the research to clarify the origins of the IYPT concept and the circumstances under which the first *YPT* was held in 1979. [13] It appears likely that the key novelty made in 1979 was in providing students with specifically research-oriented tasks and allocating a sufficient time to proceed with long term projects. The concept of a fully theoretical Physics Fight seems to have existed well ahead of 1979, with reports pointing out that such events were held in 1966. [13]

The IYPT came to life when the first non-Soviet teams joined the already well-established competition in 1988, thus gradually catalyzing such changes as separating the national and international rounds in 1990, expanding gradually the role of English language, and stimulating the development of national competitions outside the USSR. [12]

The first IYPTs saw the turbulent political changes in the Eastern Europe, when many nations were switching their political status and even eligibility to take part at the event. The West German team attended and won at the 2nd IYPT prior to the German reunification; the gold-winning team Moscow team observed their nation declaring State Sovereignty from the USSR in the midst of the 3rd IYPT on June 12, 1990. [12]

The sources provide many vibrant details that may be used in the future to complete a historical narrative about the IYPT. The following is one of the examples. Yury Yufryakov, winning participant in 1988, completed the first ever computer-based numerical simulation, in the IYPT history, of physical phenomena applied to model gravitational waves on water.

During summer holidays later that year, Yury finally made systematic experiments on the Black Sea, re-visited the physical conclusions of his project, and soon retracted them as incorrect. A few years later he wrote a detailed and vibrant English-language report on the entire story. [12]

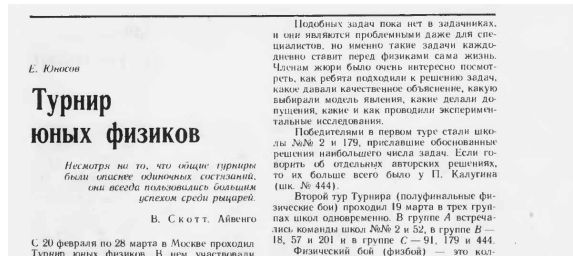


Figure 5. The first ever publication on the concept of the Young Physicists’ Tournament, *Turnir junyh fizikov* by Evgeny Yunosov, appeared in Russian language in August 1980 in the popular science journal *Kvant*. [11]



Figure 6. A selective PF at the 3rd IYPT (1990) shows an early grading system (2...5+), jury chair and active problem author of the time period Sergei Varlamov (center), and winning participant Konstantin Yufryakov (left) holding a paper poster just detached from the blackboard. (Source: Evgeny Yunosov’s private collection.)

The IYPT continued to grow gradually, with the International Organizing Committee established in April 1989, the first competition held outside of the former East Block in 1994, and the first outside of Europe in 2004. The organizational structure equally saw many changes, with the positions of the President and Secretary General redefined in 1998, and the Executive Committee introduced around 2002. There were many smaller and larger changes in the regulations, with the first 1988 version of the regulations amended stepwise yearly up to now.



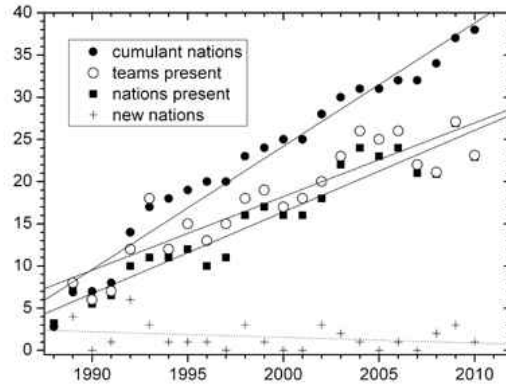


Figure 7. The graph depicts the growth of the IYPT in terms of participating nations and teams. *Cumulant nations*, or the total number of countries that have taken part at a IYPT, grows steadily with time at a *mean rate* of 1.5 new countries per year. The instant fluctuations of this rate are illustrated by the data for *New Nations*, joining the particular IYPT for the first time ever; the deceleration trend (from *expected* 2.2 new countries in 1990 to *expected* 0.9 in 2010) is disputable given the limited statistics and is influenced by many new-born Eastern European nations in 1992—1993. The nations present at a particular IYPT increasingly lag behind the cumulant nations (with their *mean growth rate* of 1.0 per year.) The *teams* present at a particular IYPT usually outnumbered the present nations, until this was formally banned in 2008; the *mean* difference between them, as for 1989—2007, was 2.1, reminiscent of the policy that the host nation and Russia could be represented by two teams, and further teams might be permitted by LOCs.



Figure 8. The map shows the venues of the IYPTs in 1988-2012. (Image courtesy of Timotheus Hell.)

The IYPT has grown now into one of the World’s largest and most prestigious international physics contests (Figure 7, Figure 8) while keeping its concept and format intact from the earliest years.

## **Tasks and efforts**

The activities of the IYPT Archive are focused on, but are not limited to tackling the following tasks.

1. preserving, mainly digitally, IYPT-related records and artifacts, such as documents, photos, articles, books, transcripts of meetings, manuscripts, letters, diplomas, from IYPT proper and from regional competitions,
2. locating and digitizing items from personal or institutional archives, or libraries, mainly through loan; handling all stages of negotiation, acquisition, storage, copying, and returning the items back; negotiating with authors and publishers the permissions for non-profit, research and educational use of the records,
3. handling a wide range of information for permanent backup and safekeeping; reverting the ongoing data loss while original webpages are discontinued, personal collections of high-value ephemera are thrown away, or libraries get rid of old items,
4. authenticating, organizing, and categorizing items for facile web retrieval, with an eventual aim of developing a searchable database,
5. acquiring, verifying and documenting information through “investigative journalism”, establishing contacts with first-hand participants and organizers to directly clarify with them obscure details, and reliably keep track of the new knowledge collected,
6. preparing reports and writing articles for Wikipedia, printed journals, or the IYPT’s official site, but also writing short descriptions, summaries, and keyword indexes,
7. proofreading and reviewing sources skeptically, and identifying factual inaccuracies throughout the collection,
8. exploring new potential sources for data of high historical or research value, and identifying people to be contacted or items to be traced and preserved,

9. translating from a variety of languages into English, and
10. providing reference assistance, to help people in locating the details they need.

## Using the Archive online

The information webpage of the IYPT Archive features several thematic sections, where particular information is collected and the documents are indexed.

**“Collection.”** This section is central and comprises most sources and accounts that cover each of the years, from 1979 onwards. IYPT bibliography is vast but has been scattered and obscure up to know. The publications of various nature were produced by team leaders, volunteers, organizers, participants, and other contributors. The Collection encompasses various types of documents, ranging from raw handwritten Physics Fights notes, to reports in mass media. Some vibrant, original documents of undisputable importance were never intended for international publication or permanent safekeeping, and can be seen now as examples of *ephemera* or of *gray literature*. We collect the primary sources from their originators and rely on them to restore the full and reliable information if the sources are incomplete, distorted, or mistaken, as happens quite often (Figure 9.)

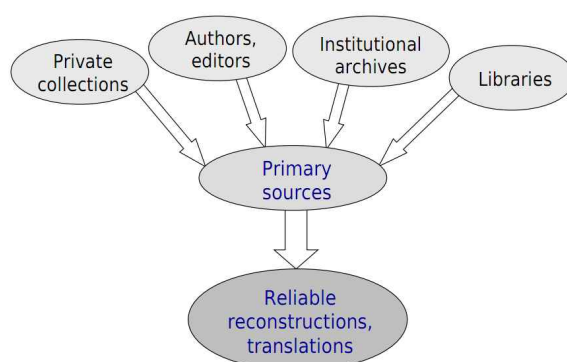


Figure 9. Data structure in the IYPT Archive. The primary sources are acquired from their originators, most often from private collections, and used for further analysis and verification.

Many unique and highly informative records are multilingual, reminiscent of the unusual and international background of the IYPT.

**“Logo.”** The logo with two horses and armed knights (Figure 10) has been an integral part of the competition’s visual identity since the early 1980s, when the Tournament was run as a local event in the USSR, years before attracting the first non-Soviet teams and turning into the IYPT. Readily recognizable, the logo is widely used today at both IYPT and many regional competitions. No known source ever reported the name of the artist, until Evgeny Yunosov disclosed the name in a brief 2008 interview. Author of the logo, Yunosov said, is Vladimir Babaev, a research physicist currently working on carbon nanostructures at Moscow State University. The first currently known public appearance of the logo was in Evgeny Yunosov’s paper that reported the results of the 3rd Moscow YPT and was seemingly itself the second earliest YPT-related article. The raster IYPT logo, commonly known today, dates back to the diplomas of the IYPT 1990 and has survived up to now through the scans performed around 1994.

The Archive traces the evolution of the logo, maintains a detailed record of its various appearances, and deposits high-resolution digital versions.

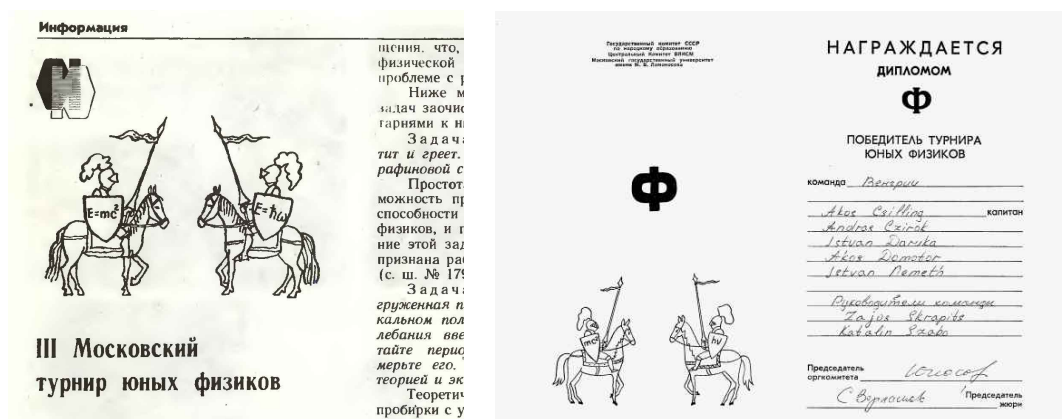


Figure 10. The knight IYPT logo by Vladimir Babaev was first published in February 1982 (left.) The 3rd IYPT (1990) was the first to feature the logo in the today’s version (right), as seen on the diploma awarded to the Hungarian team.

**“Problems.”** The section brings together the problems for the early IYPTs, as they are restored from all traced multilingual sources. Before 1994, the problems were circulating mostly in Russian. In many cases, no “standard” English editions existed, and not all “standard” Russian editions have been yet found. When re-published or translated in the past, the problems suffered from omissions and inaccuracies, and many problems were even misattributed. Our key aim is to provide the “critical editions” of a maximum coherence and reliability. After 1993, the problems already existed in unique, “standard” English versions, that have been continuously available up to now. We plan to complete Russian-English translations of the the pre-International problems for the YPTs 1979-1987.

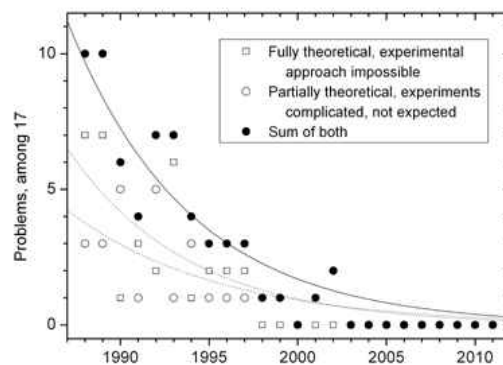


Figure 11. It was quite typical at the early IYPTs to dig into problems about *gold cubic planets*, *Grand Unification*, or Asrtid Lindren’s *Karlsson-on-the-Roof*, where only a theoretical solution was expected. In some cases, the problems were formulated in a way that only limited empirical verification was possible as such. The annual number of theoretical problems, however, has been dropping sharply from *ca.* 10 in late 1980s, to only a few by late 1990s. Starting from 2003, each of the 17 problems was permitting a straightforward experimental investigation. (But not every solution, naturally, was using this opportunity.) The *half-life* of the theoretical

IYPT problems can be estimated as *5 years*, as the graph shows.

**“Factsheets.”** When completed, this section will bring together the coherent and reliable fact lists for all IYPTs. In the case of the earliest IYPTs, such details have been remaining up to now obscure and often disputed, requiring the most of our efforts [12] in historical research.

**“People.”** There are now over 2000 people who have the IYPT on their track record. Relying on the available public sources, this section, still in preparation, will be verifying and

bringing together their names, also providing links to their institutional pages, upon the consent.

What is the demographics of the entrants and how they might have changed over the years?

What entrants go on to do? What are the case studies of winners?

A large number of former participants made careers in academia or industry, sometimes crediting the IYPT as a good schooling or even “a springboard”, but sometimes also sharing nuanced critical feedback about the competition.

The IYPT has seen participants who went on to get published in *Science* or *Nature*, and make front covers. Some have completed a B.Sc. degree in one and a half years, and a few brought their IYPT project to a mainstream publication.

There are participants who went on to become indie movie directors or top executives in major banks. Surprisingly, the IYPT has even seen a team leader who went on to become a National prime minister.

The list of participants speaks for the excellence and success of many individuals who continue to keep the IYPT on their professional CVs. As 25 years passed by from the earliest IYPTs, we may now look how the competition influenced on the professional future of participants in the long run.

When no single past participant is forgotten, the community can better understand the long-term educational impact and relevance of the IYPT, foster the continuity, and recognize the accomplishments and highlights of the IYPT in a retrospective. This strengthens the sense of connection, reveals the trends, and shows vibrant stories of success.

**“Regulations.”** The IYPT regulations were gradually evolving over time, and are generally amended stepwise every year. This section attempts to bring together the original, authentic texts of the regulations as they were available to the participants of each IYPT. The regulations used at the earliest IYPTs had already most of the features that we commonly

know today. Nevertheless, many differences existed against the today's regulations. The examples include the procedure of grading (2...5+, or an *extended Soviet school grading scale*, until 2001); the time allocated for each performance in a Physics Fight; the status of Semi-Finals and how the problems for the Semi-Finals were selected from the entire set of 17 tasks (until 2001); the challenge procedure in the Finals (omitted in 1994 or 1995), or the procedure to calculate and round up the TSPs.

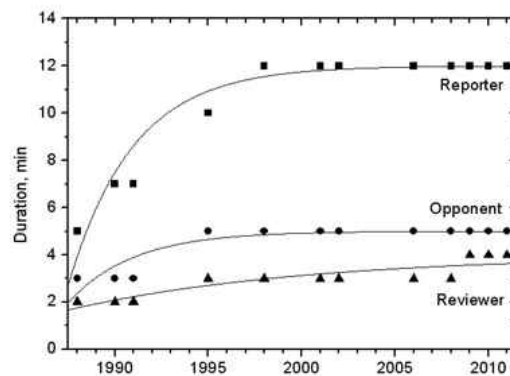


Figure 12. In 1988, the IYPT was starting with only 5 min allocated for Report, 3 min allocated for Opposition, and 2 min allocated for Review. The duration of each stage performance, especially for the Report, was increasing stepwise until the mid-1990s. It was, however, only in 2009 when the Reviewers were allowed to take floor for 4 min.

**“Solutions.”** The solutions presented at the IYPTs, at regional competitions, and at related events, present a vast output of worldwide efforts in the pre-university research.

Although the competition means competition, these international efforts may be considered collaborative, as the participants receive criticism and impetus for further work through the opposition and review stages, and always have a solid feedback from their mates and team leaders, much alike to “real science.”

Some of the IYPT solutions were later skeptically revisited and retracted by authors as incorrect; many have never been preserved for the future; while others led to refereed papers in international journals.



Figure 13. Participant Sergey Romanchuk running in stroboscopic light to tackle the problem No. 7 “Runner” for the 4th IYPT (1991.) (Source: Sergey Varlamov’ private collection.)

The collection of solutions may be of interest to researchers in physics education, giving direct information on the motivation and achievements of students. It may also be helpful for the future team leaders and participants, showing examples of research strategies, structure of a presentation, or competitive levels to be achieved.

We stand for the maximum responsibility in exploring the earlier solutions. They are not a textbook of “ready, free, and correct templates” and reflect, above all, the original ideas, original work, and original research results. “During the competition, teams may draw ideas from presentation of other competing teams; however proper citing is essential”, say the recent guidelines for participants. This applies, certainly, to the old solutions and to any other sources of information.

We encourage thus the students to look into the earlier solutions and draw conclusions. If any idea from the past is of interest, we encourage rigorous attention to cite each concept of datum not of own work. We equally encourage visitors of the Archive’s webpage to film the today’s presentations for the future. Although until recently “taking of audio and video recordings” was allowed “only in the case of own performances,” the restriction has been significantly relaxed as of 2011. The filmed presentations would reflect the today’s IYPTs and would become an increasingly precious record as the time passes by.



Our policy is to catalogue only those solutions that were explicitly and deliberately intended for public access and, when possible, are openly available from their originators or in published sources. A few solutions provided by the problem authors themselves are also indexed in this section.

**Statistics.** There are some hidden, persistent regularities behind the apparently independent and randomly scattered numbers. Relying on multiple sources, this section provides an insight into the long-term IYPT trends and statistics.

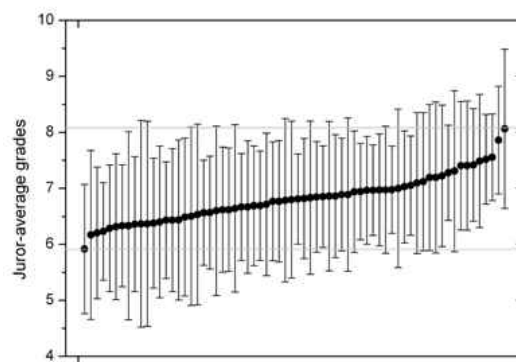


Figure 14. Distribution parameters (*population mean and standard deviation*) for grades of individual jurors at the 23rd IYPT (2010) clearly reveal that the individual grading standards vary among jurors, and result in a marked spectrum of *average* grades in the range from *ca.* 6 to *ca.* 8.

**“Frequently Asked Questions.”** A detailed FAQ section has been developed to clarify such issues as the accuracy and reliability of individual sources, copyright, and how to mine data from the Archive.

**“You can help.”** The Archive gets better with input, information, and enthusiasm of many individual contributors. Any new knowledge in the IYPT history—even very small—makes a difference, and has a big effect towards learning where to look further. The Archive has an open call for contributors and volunteers. Aside from many smaller projects, there are more time-consuming goals, with examples as typesetting the retrospective proceedings for the 8th IYPT (1995) and requiring attention to details and knowledge of software, or establishing, in

English language, a coherent compendium of full-text documents from individual IYPTs and thus requiring an amount of careful Russian-English translation.

### **A data bank for the Physics Education Research**

Mapping a learning trajectory for an individual student is a challenging task in the pursuits of Physics Education Research. This relies sometimes on taking interviews, collecting the data about problem solving, performing the analysis of students' needs and motivation, and identifying the developed skills and expertise.

The experience of the past IYPTs shows quite clearly that a combination of research-based projects with a conference-type competitive discussion platform may yield good results for a targeted group of students.

Although an *activation energy* is needed for them to join the work, and thus the IYPT is not suited for each and every student, the learning outcomes for tentative participants are well exceeding expectations, case studies demonstrate. Indeed, a fraction of former participants chooses a career not related to physics, but still cite the IYPT as a strikingly helpful learning experience.

The International Young Physicists' Tournament is complex as it implicitly teaches a number of competences at once, including advanced math and physics, ethics and strategies of professional research, foreign languages, critical thinking, goal setting, polemics, and time management.

The IYPT Archive is well positioned to serve as a data bank and an online library for the researchers in physics education who investigate into goal-oriented, research-based learning strategies.

Many aspects of the IYPT are of serious interest for the PER studies, such as interest-guided informal learning for students, a new interaction model between a teacher and a student,

professional development for teachers, or skill and knowledge acquisition in a setting where only a limited supervision or instruction is assumed.

The original solutions give a direct, fine-grained insight into the motivation and achievements of students. A number of case studies and essays by the teachers explain, at the same time, the priorities, motivation, and encountered difficulties during the work.

Another area of interest is the assessment of the presented solutions. The raw data of juror grades is important not only for the future statistical analysis needed to refine the internal standards and guidelines of the IYPT, but also for comparing the IYPT against similar situations, e.g. when essays [15] or research reports [16] are graded by a panel of jurors.

The primary sources, accounts and case studies are helpful not only for understanding the values and constraints behind the IYPT, but also for comparing the IYPT against such activities as science fairs, physics Olympiads, various conferences for young scientists, or informal *physics clubs*.

### **A resource for future participants, teachers, and partner projects**

The Tournament has generated publications based on its problems since the very first years, and the necessity of publishing proceedings or journals has been repeatedly emphasized.

A published solution brings more motivation for a student, especially if significant efforts have been invested into a project but the work was not presented at the IYPT. When published, the solution works as a reference for the next generation of students by showing how to structure a report, how to decide on the priorities and what level is sufficiently competitive at the IYPT. In contrast to guidelines, such solutions are much more visual, but at the same time encourage critical content-based learning.

The Archive collects now over 600 historical solutions. Despite a few concerns, we are not endorsing any of the indexed solutions as *correct*, and did not perform any pre-selection

based on the physical contents, average grades gained, or other criteria. While a retrospective selection among genuine IYPT reports would be appropriate for publishing a special book, we are motivated in indexing all existing solutions.

We have now a sufficient evidence to suggest that reading and critically studying the previous solutions encourages students to cite earlier work and to reserve a great degree of scientific skepticism. By looking at the previous solutions, the students may better realize that “it was not too difficult” and develop stronger motivation.

### **Data mining in the Archive**

In a number of practical situations, a direct access to the past records may help resolving real-life tasks.

**Stories of success.** Many of the past IYPT participants became successful in academia and industry, with particular examples of globally leading careers. Our partner projects, such as IPhO or the EUCYS, systematically use the stories about their former participants as a marketing tool in promotion and fundraising. We accept how delicate is the matter, but suggest that we may not neglect it, given the proud that many of former participants bear in the IYPT experiences and the fact that they still keep the IYPT on their professional CVs. A particular example is the growing number of serious publications by still-participants that show the unrivaled achievement of the IYPT to stimulate pre-university research.

**Expertise records of the past.** Where did the past organizers look for sponsors? How a particular issue was resolved at a past IYPT? What decisions were taken by the past LOCs, IOCs, and ECs? We believe that much time and effort can be saved in the future, if the necessary documents and factfiles are accessible for the future organizers.

**Problem selection.** Although there is open debate on the necessity to avoid duplicates in the newly selected IYPT problems, we assume that any decision related to the selection of a new problem need to be taken consciously, i.e. with full knowledge that a duplicate exists.

**Juror grades,** if properly deposited, may be helpful for the future statistical analysis to improve the guidelines and investigate any suspected trends.

### **Operational costs: you can help**

As of 2012, the biggest constraint to growth is a lack of financing to cover the necessary operational costs. The expenses of maintaining and expanding the Archive are so far financed only privately. The examples of the necessary but financially challenging projects include the following:

1. paying external developers for the necessary web applications (e.g.: the specialized submission manager *solutions.iypt.org* implemented in September 2011 by a Kraków-based startup *odpo.eu*, or a searchable database that has not been yet ordered);
2. hiring a student for digitizing hard copy items, technical editing, translation, data mining, writing small reports, and similar tasks;
3. travel costs for the projects that cannot be otherwise operated distantly (e.g.: a dedicated international made in April 2011 to collect materials from the IYPT 1995, including the raw drafts of a proceedings book);
4. purchasing auction lots (e.g.: memorabilia and items of the earliest IYPTs acquired from external professional collectors in 2011);
5. shipping costs (receiving and sending back hard copy materials belonging to private collections.)

### **Outlook**

The Archive is not made and released once and forever. We are working to eliminate possible inaccuracies and to locate and digitize the missing sources, in order to gain deeper insights and to keep our information webpage as useful for the users as it can be.

We expect that a growing number of studies will utilize the Archive and its collection. We will happily try to help, relying on what we know, to find necessary data for any research article, thesis, or just an essay where the authors would like to get fine-grained and detailed information about particular features or trends of the IYPT that become better visible in a retrospective. We hope that our bibliography and digital repositories may equally help with such projects.

The IYPT Archive is far from being saturated we would gladly appreciate further feedback, support, cooperation, and input.

Last but not least, we are happy to honor the mission to elevate the track record of the IYPT and to reach the goal of having any important historical detail just a few clicks away.

## References

- [1] Zdeněk Kluiber and Ivo Volf. Conference: “20 Years of the Young Physicists’ Tournament” at Czech Republic. *Lat. Am. J. Phys. Educ.* 2, 1, 71-73 (2008)
- [2] Gunnar Tibell. Student’s skills developed by participation in the International Young Physicists’ Tournament. In: *Proc. Int’l Phys. Educ. Conf. What Physics Should We Teach?* (Ed Diane J. Grayson, July 5-8, 2004, Durban), pp. 257-263
- [3] I. M. International Young Physicists’ Tournament. *World Gifted* 29, 1, 13-15 (2010)
- [4] Gorazd Planinsic, IYPT problems as an efficient source of ideas for first-year project laboratory tasks. *Eur. J. Phys.* 30, 6, S133-S140 (2009)
- [5] Paul Gluck. Project laboratory in a high school. *Physics Education* 45, 5, 505-510 (2010)
- [6] Ann-Marie Pendrill. Gymnasiearbetet (Nationellt ResursCentrum för Fysik), <http://www2.fysik.org/gymnasiet/gymnasiearbetet/>

- [7] Zsuzsanna Rajkovits and Leonid Markovich. The influence of international competitions on the everyday physics teaching. *Physics Competitions* 6, 1, 64-80 (2004)
- [8] Dmitrij Runge. T-s-s, zasedaet duma... *Komsomolskaja Žizn* 23, 1-5 (1989)
- [9] Georg Hofferek. IT aspects of organizing YPT events. In: *Proc. 20 years of the Young Physicists' Tournament* (Ed. Zdeněk Kluiber, Sept. 10-13, 2007.) MAFY, Hradec Králové (2008), pp. 27-35
- [10] I. M. IYPT Archive: launch presentation (AYPT, University of Leoben, May 5, 2011.) [http://ilyam.org/IM\\_IYPT\\_Archive\\_launch\\_May\\_5\\_2011.pdf](http://ilyam.org/IM_IYPT_Archive_launch_May_5_2011.pdf)
- [11] Evgenij Junosov. Turnir junyh fizikov. *Kvant* 8, 57-58 (1980)
- [12] I. M. Detailed history of early International Young Physicists' Tournaments in 1988-1993. IYPT Archive preprint (May 2, 2011.) [http://ilyam.org/Draft\\_IM\\_Detailed\\_history\\_IYPT\\_1988-1993.pdf](http://ilyam.org/Draft_IM_Detailed_history_IYPT_1988-1993.pdf)
- [13] I. M. Origins and history of Young Physicists' Tournaments in 1979-1988. In preparation (2012)
- [14] Zdeněk Kluiber *et al.* The development of talents in physics. JCMF, Prometheus, Prague (1995)
- [15] Irenka Suto and Stuart Shaw. How well can teachers assess pre-university students' research reports? Findings from an empirical study. *Proc. Eur. Conf. for Educ. Res* (Helsinki, Aug. 2010)
- [16] Martin Johnson, Rita Nádas, and John F. Bell. Marking essays on screen: An investigation into the reliability of marking extended subjective texts. *British J. Educ. Tech.* 41, 5, 814–826 (2010)

## **About the author**

I. M. first became familiar with the IYPT in 1999 and has, since then, been active as a participant, team leader, advisor, problem author, juror, and jury chair at IYPTs and also at national tournaments in almost ten countries. He is working in a field of experimental condensed soft matter physics at the University of Fribourg, Switzerland, and at Lund University, Sweden.