



IYPT



INTERNATIONAL YOUNG PHYSICISTS' TOURNAMENT



# A few perspectives on the IYPT

Ilya Martchenko

University of Fribourg *and* Lund University

February 12, 2012



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## Participant



14th IYPT (2001)

- Strong and lasting motivation in physics
- Interest in the IYPT itself (since 1999 and not yet exhausted!)



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### A few other visions

#### Further aspects

- Tactical thinking
- Visiting other countries
- Getting to know people from all over the world
- Opportunity to talk to experts in science
- Being proud of representing one's country

→ IYPT experiences are very useful!

■ Georg Hofferek

#### A LOT of stuff learned



- Ways of doing research
- General physics knowledge
- Finding literature
- Manual skills
- Electronics
- Computer programming
- Maths
- Presentation skills
- English language
- Patience
- ...

And a feeling of well-done job!

■ Maciej Malinowski



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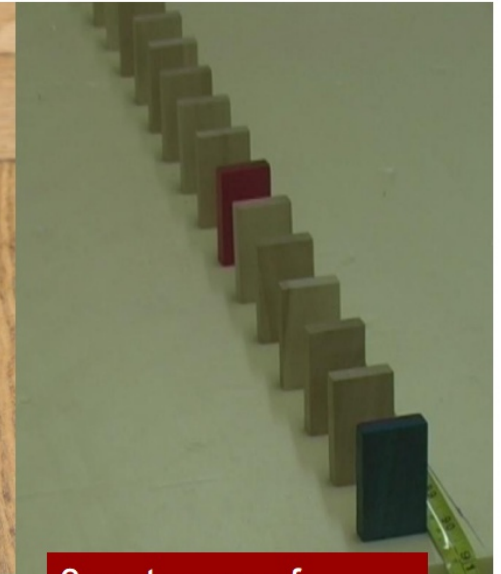


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Its is a bit difficult at first



Adhesive tape car



3-meter row of dominoes

- Feedback from Martin Malinowski (team member, IYPT 2011)



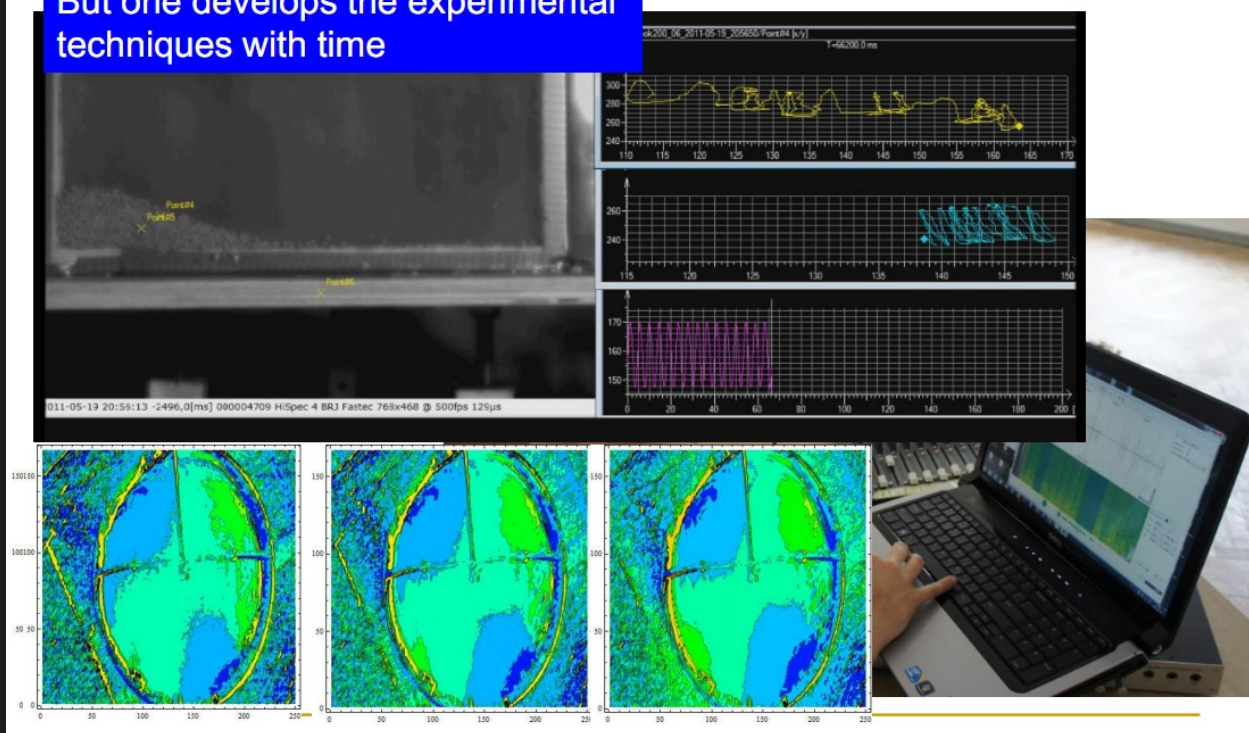


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But one develops the experimental techniques with time



- Feedback from Martin Malinowski (team member, IYPT 2011)

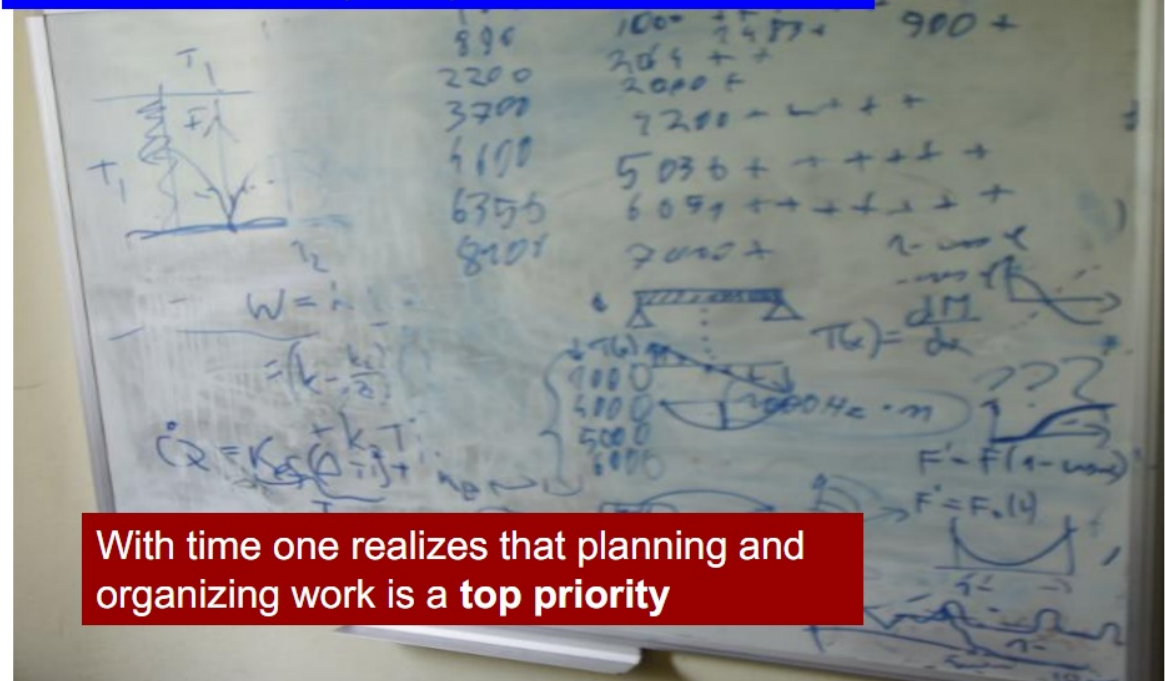


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There is actually very little time for work



With time one realizes that planning and organizing work is a **top priority**

- Feedback from Martin Malinowski (team member, IYPT 2011)



### From participant to team leader

- Good knowledge in basic physics
- Collecting and analyzing experimental data
- Team work
- Making and defending a presentation
- Soft skills: holding a discussion, deadlines, goals and priorities

What your research supposedly looks like:

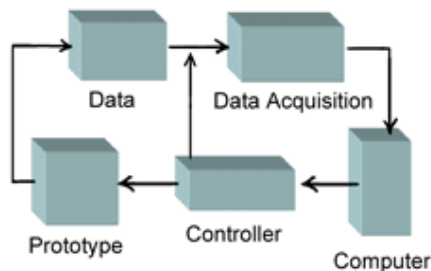


Figure 1. Experimental Diagram

What your research *actually* looks like:

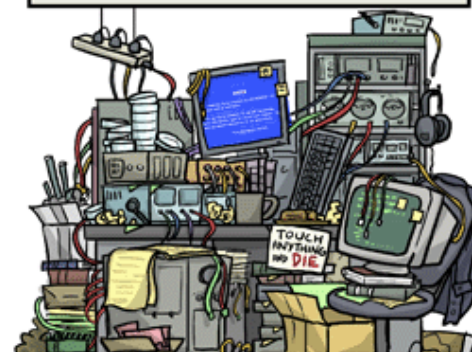


Figure 2. Experimental Mess



2007





1989





# Team leader



- Professional rheometer

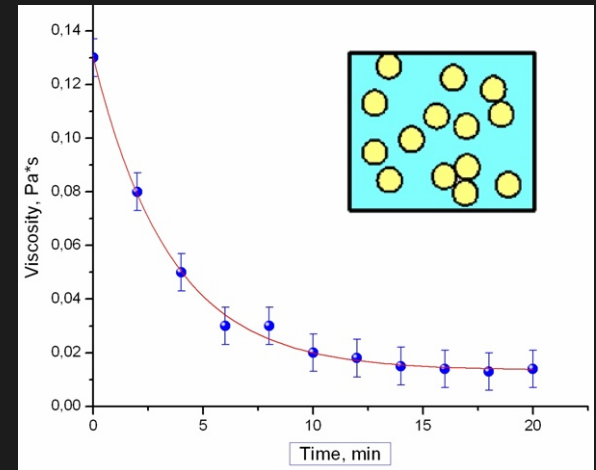


$$(I - I_0)U = k\omega^2$$

$$k \propto \eta$$

$$\eta = \frac{\omega_w^2 \eta_w (I - I_0)}{\omega^2 (I_w - I_0)}$$

$$\eta = \eta_0 \left(1 + \frac{5}{2} \Omega\right)$$



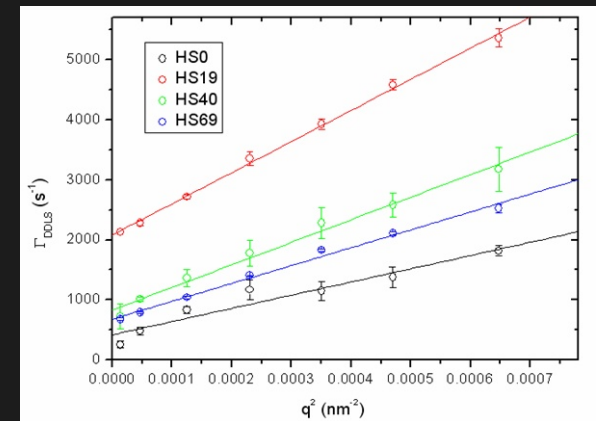
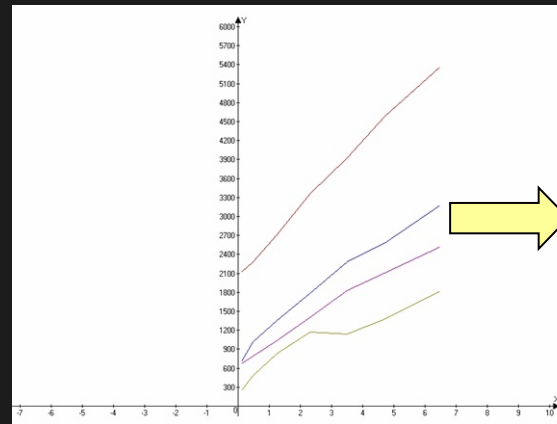
- IYPT: minimalist home-made rheometer

- $\eta$  : sample viscosity
- $\eta_0$  : water viscosity
- $\Omega$  : volume fraction of particles

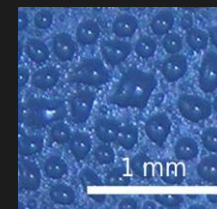
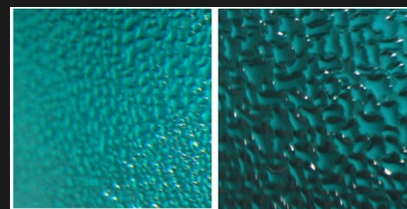
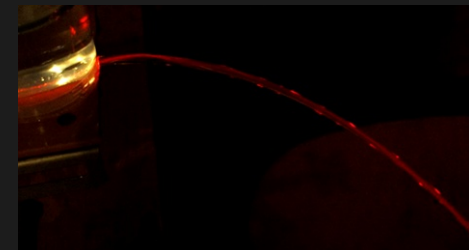
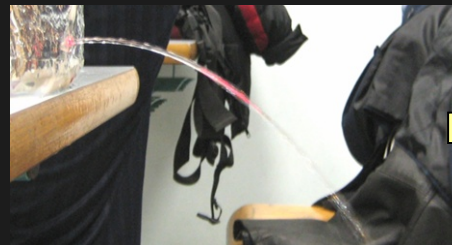


### Relevant skills through practice

Plotting the data



Visualizing results







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## Team leader



- Students are involved into a “simulation of real research”
- Experiments, theoretical description
- Many months of work into a 12 min presentation

## Problems

- “It is nonsense to search a solution if it does not exist”
- “No: it’s nonsense to search it, when it already exists”
- No known path for what to do
- No textbook solutions
- Topic for an independent research project
- A special role for the supervising teacher





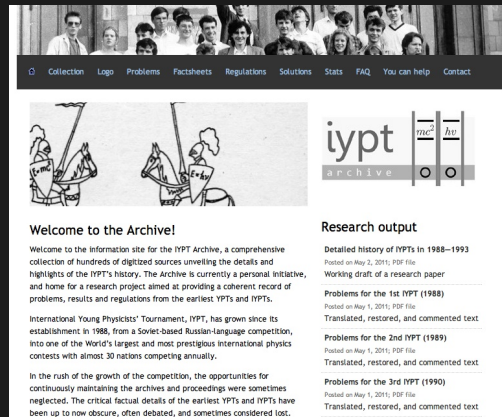
March 31, 1989: Finals of the 2nd IYPT







## IYPT Archive



- Articles and progress reports: knowing earlier experiences
- Solutions: knowing how people handled similar problems
  - Very good for future participants: culture of citations, critical learning, “what those people have done”
- Bibliography in physics education, research focused on the IYPT
- When, what, who, where

<http://archive.iypt.org>



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## 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



## Research output

### Detailed history of IYPTs in 1988—1993

Posted on May 2, 2011; PDF file

Working draft of a research paper

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### Problems for the 1st IYPT (1988)

Posted on May 1, 2011; PDF file

Translated, restored, and commented text

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### Problems for the 2nd IYPT (1989)

Posted on May 1, 2011; PDF file

Translated, restored, and commented text

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## Reference kit

- Supporting reading material
- Bibliography on the phenomena related to the problems
- Practical tips and hints



<http://kit.ilyam.org>

“With this Kit probably more highschool students are encouraged to start with IYPT investigations. [...] Ilya’s Kit gives a very good first impact to start with their own research.”

Rudolf Lehn, LOC president 2012



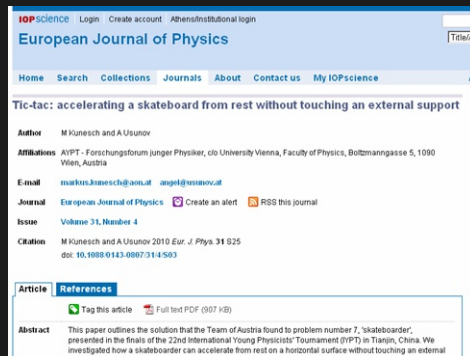
## IYPT references

- For spherical bubbles rising in viscous fluid applies: The final speed  $U$  is given by  $U = \frac{a^2 \cdot g}{9\nu}$  where  $a$  is the radius of the bubble, and  $\nu$  is the dynamic viscosity of the fluid.
- Proportionality of  $a^2$  is equivalent to the proportionality  $V + (2/3)$



## Getting work published

- Peer review by the editorial board
- IYPT Magazine: submissions from any student
- Proceedings of the IYPTs
- Professional journals



## A national network around the IYPT?



- ca. 6 Austrian + **ca. 6 foreign teams**
- all 17 IYPT problems
- English language
- regulations as at the IYPT
- a formal association
- fund raising is not easy, but well implemented
- ca. 15 Belarusian teams
- **12 out of 17 IYPT problems**
- Russian/Belarusian language
- regulations as at the IYPT
- group of enthusiasts, patronage from Ministry of Education
- no centralized fund raising
- **German YPT yet in plans**
- special center oversees preparatory work
- enrolls teachers, advisors
- fund raising from companies, foundations
- patronage by German Phys. Soc.





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## Outlook

- IYPT is a (very) good tool to promote physics
- Helpful even if a student does not join a team
- Unusual problems, know-how, expertise
- Proven educational value, impact on future careers
- Spreading out the YPT to more schools (and more countries)