



Swiss Young Physicists' Tournament 2017

EPFL Lausanne
18/19 March 2017



Source: Alain Herzog

Swiss Young Physicists' Tournament

Where tomorrow's scientists meet.

Welcome to the SYPT 2017

Dear participants, teachers and jurors

When we organised the first **Swiss Young Physicists' Tournament** in 2008, we did not really know what to expect. Today we are looking back to an impressive track record: Several hundred students participated in this challenging competition and managed to impress dozens of experienced jurors with their thorough understanding of surprising and interesting physical phenomena. On an international level the Swiss teams won several medals in recent years, including two gold medals.

On the occasion of the SYPT's tenth anniversary we are proud to go even further. After nine tournaments in or around Zurich, the SYPT 2017 will be the first tournament to be held in the French speaking part of Switzerland. We are pleased that **EPFL Lausanne** agreed to host this year's tournament. It is also the first time students from all four language areas of Switzerland will participate!

With almost one hundred participants and jurors involved in the SYPT 2017 it is obvious that we rely on the generous financial contributions from our supporters, but also on the work of many helpers from both our association and local staff at EPFL.

As the President of Pro IYPT-CH it is my pleasure to welcome you all to an exciting weekend in Lausanne!



Samuel Byland (samuel.byland@sypt.ch), President Pro IYPT-CH

Visit www.sypt.ch for the latest information on the SYPT 2017.



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IYPT

The **International Young Physicists' Tournament** (IYPT, see www.iypt.org), sometimes also referred to as „Physics World Cup“, is a scientific competition among secondary school students interested in physics. A so-called **Physics Fight** lines up three teams of five students each. They in turn present and discuss their solutions to one of the problems, criticise the reporter's solution and review the performances of the other teams. All three teams get scores from a jury.

The **problems** are published a year before the tournament. They are chosen such that no single correct solution exists. Each presentation will show different aspects of the problem. Careful preparation and creativity in solutions are as important for creating a good impression, as are correct school physics and mathematics.

In **preparing** for the IYPT students do not just learn how to tackle difficult physics problems, but also how to work in a **team**, use computers to **collect and analyse data**, **present** scientific results and **debate**. The Physics Fights are **in English**, helping the students prepare for their future at university where an increasing number of lectures and seminars are held in English.

Pro IYPT-CH

The **aim** of Pro IYPT-CH is that of making the idea behind the IYPT better known in Switzerland. It provides support for students and teachers in preparing problems and organises the selection of the Swiss team for the international tournament.

Since the first participation of Switzerland in the IYPT (2002) the number of students, teachers and schools participating has increased steadily. In 2005 Pro IYPT-CH organised the International Young Physicists' Tournament in Switzerland (Winterthur). This will be the eighth **national tournament** modelled on the international archetype.

If you would like to support Pro IYPT-CH and the SYPT and would like to be informed about our activities, you are very welcome to **become a member**. We also appreciate the help of former participants during the preparation for the SYPT and IYPT. Please contact Lioba Heimbach (see below) to get more information about membership or register online (www.sypt.ch).

President: Samuel Byland, MNG Rämibühl Zürich (samuel.byland@sypt.ch)

Members: Lioba Heimbach, ETH Zürich (members@sypt.ch)

Website: www.sypt.ch

Agenda of the SYPT 2017

Date: Saturday/Sunday, 18/19 March 2017

Venue: EPFL Lausanne

Fees: Participation at the SYPT is **completely free**. Lunch (Saturday and Sunday) and dinner (Saturday) are offered by the organiser. Train tickets will be refunded after the tournament. To have your train ticket (return ticket, 2. class, Halbtax) reimbursed, please send a scan of the receipt along with all relevant banking information (such as IBAN, full name, address, ...) to our treasurer, Daniel Keller (treasurer@sypt.ch).

Saturday, 18 March

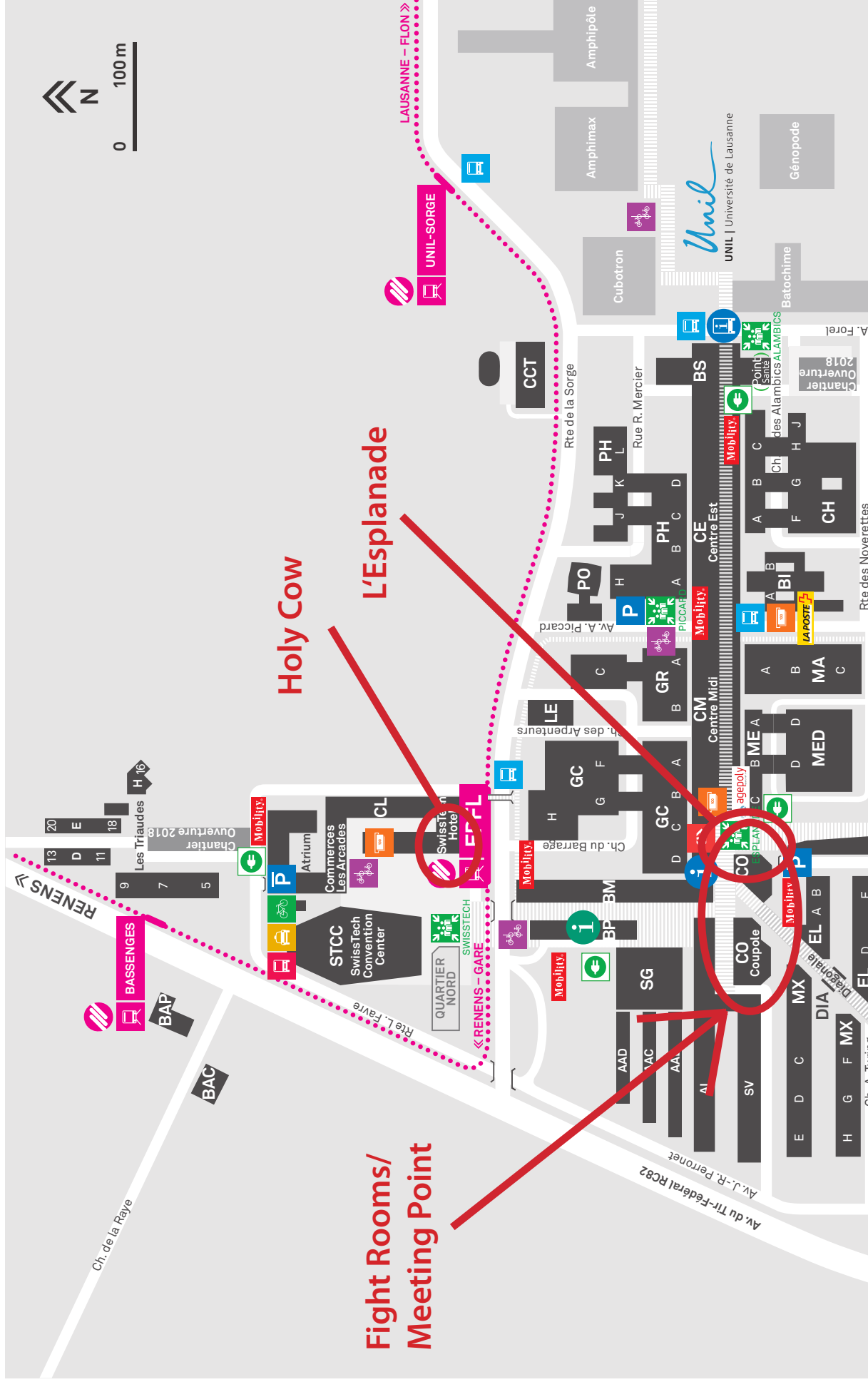
from 7:45	Arrival, coffee & orange juice (in front of Auditorium CO 2)
8:30	Address of welcome from Prof. Jean-Philippe Ansermet, Head of Physics Department (CO 2)
9:00	Team photos (CO 2) / Jury meeting (CO 010)
9:45	Physics Fights round 1 (See Fight Plan p. 9)
13:00	Lunch (Restaurant L'Esplanade)
13:45	Presentation EPFL Physics Department (Meeting Point: Esplanade)
15:15	Physics Fights round 2 (See Fight Plan p. 10)
19:00	Dinner (Chalet Suisse)

Sunday, 19 March

from 8:00	Registration of participants and jurors (in front of Auditorium CO 2)
8:30	Physics Fights round 3 (See Fight Plan p. 11)
12:00	Lunch (Holy Cow)
13:00	Final Fight (Auditorium CO 2)
16:00	Award ceremony, Apéro (in front of Auditorium CO 2)

Plan d'orientation EPFL

EPFL - DII - 08.08.2016














Holy Cow

Fight Rooms/
Meeting Point

L'Esplanade





-  **Accueil/Information**
Reception/Information
-  **Point Santé**
Health Point
-  **Guichet étudiants**
Students Services Desk
-  **Association des étudiants de l'EPFL**
EPFL General Student's Association
-  **Accueil EPFL Innovation Park**
EPFL Innovation Park Reception
-  **Information livraisons**
Delivery Information
-  **Point de rassemblement**
Assembly point
-  **Parking public**
Public Parking
-  **Métro m1**
m1 metro
-  **Bus**
Bus
-  **Station de taxi**
Taxi rank
-  **Dépose-minute bus**
Bus drop-off/pick-up point
-  **Vélo Station**
Bike Station
-  **PubliBike**
PubliBike
-  **Point vélo réparations**
Bike Repair Service
-  **ElectricEasy**
ElectricEasy
-  **Mobility**
Mobility

(help) urgences  **115**
 Sécurité, prévention et santé (DSPS) 24h/24 021 693 3000

 <http://m.epfl.ch>

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Problems for the SYPT 2017

- Invent Yourself:** Construct a passive device that will provide safe landing for an uncooked hen's egg when dropped onto a hard surface from a fixed height of 2.5 m. The device must fall together with the egg. What is the smallest size of the device you can achieve?
- Balloon Airhorn:** A simple airhorn can be constructed by stretching a balloon over the opening of a small container or cup with a tube through the other end. Blowing through a small hole in the side of the container can produce a sound. Investigate how relevant parameters affect the sound.
- Single Lens Telescope:** A telescope can be built using a single lens, provided that a small aperture is used instead of an eyepiece. How do the parameters of the lens and the hole influence the image (e.g. magnification, sharpness and brightness)?
- Magnetic Hills:** A small amount of a ferrofluid placed in an inhomogeneous magnetic field forms hill-like structures. Investigate how the properties of these structures depend on relevant parameters.
- Leidenfrost Stars:** In the Leidenfrost effect, a water drop placed on a hot surface can survive for minutes. Under certain circumstances, such a drop develops oscillating star shapes. Induce different oscillatory modes and investigate them.
- Fast Chain:** A chain consisting of wooden blocks inclined relative to the vertical and connected by two threads is suspended vertically and then released. Compared to free fall, the chain falls faster when it is dropped onto a horizontal surface. Explain this phenomenon and investigate how the relevant parameters affect the motion.
- Spiral Waves:** Spiral waves and other types of wave patterns may occur on a thin liquid film flowing over a rotating disk. Investigate these wave patterns.
- Visualising Density:** Schlieren Photography is often used to visualise density variations in a gas. Build a Schlieren setup and investigate how well it can resolve density differences.
- Ball in a Tube:** A sealed transparent tube is filled with a liquid and contains a small ball. The tube is inclined and its lower end is attached to a motor such that the tube traces a conical surface. Investigate the motion of the ball as a function of relevant parameters.
- Pulling Glasses Apart:** Put a thin layer of water between two sheets of glass and try to separate them. Investigate the parameters affecting the required force.
- Hair Hygrometer:** A simple hygrometer can be built using human hair. Investigate its accuracy and response time as a function of relevant parameters.
- Torsion Gyroscope:** Fasten the axis of a wheel to a vertical thread that has a certain torsional resistance. Twist the thread, spin the wheel, and release it. Investigate the dynamics of this system.
- Resonating Glass:** A wine glass partially filled with liquid will resonate when exposed to the sound from a loudspeaker. Investigate how the phenomenon depends on various parameter.
- Gee-Haw Whammy Diddle:** A gee-haw whammy diddle is a mechanical toy consisting of a simple wooden stick and a second stick that is made up of a series of notches with a propeller at its end. When the wooden stick is pulled over the notches, the propeller starts to rotate. Explain this phenomenon and investigate the relevant parameters.
- Boiled Egg:** Suggest non-invasive methods to detect the degree to which a hen's egg is cooked by boiling. Investigate the sensitivity of your methods.
- Metronome Synchronization:** A number of mechanical metronomes standing next to each other and set at random initial phases under certain conditions reach synchronous behaviour in a matter of minutes. Investigate the phenomenon.
- Vacuum Bazooka:** A *vacuum bazooka* can be built with a simple plastic pipe, a light projectile, and a vacuum cleaner. Build such a device and maximise the muzzle velocity.

(Problems from www.iypt.org)

Fight Plan SYPT 2017														
Round 1 (Saturday, 18 March, 9:45 - 12:30)														
Fight 1.1	Reporter			Opponent		Reviewer								
	The Golden RaTrio			The Bigbanger		The Matter Horn								
	CO 122	Cyrrill	Kästli	Visualising Density	Luana	Oderbolz	Liam	Castelli						
		The Bigbanger			The Matter Horn		The Golden RaTrio							
Janine			Schai		Pulling Glasses Apart		Luiz	Amaral	Daniel	Repérant				
The Matter Horn			The Golden RaTrio		The Bigbanger		Oliver		Millar	Vacuum Bazooka	Tehya	Birch	Yoel	Morales
Fight 1.2	Reporter			Opponent		Reviewer								
	Physics Chicks			Quantum Gravity		SOV Union								
	CO 123	Viera	Klasovita	Gee-Haw Whammy Diddle	Timo	Gimmi	Senhong	Cao						
		Quantum Gravity			SOV Union		Physics Chicks							
Lukas			Jabornegg		Magnetic Hills		Visnusuthan	Vairavipillai	Ivana	Klasovita				
SOV Union			Physics Chicks		Quantum Gravity		Oliver		Grünig	Visualising Density	Zara	Yenal Vance	Michael	Klein
Fight 1.3	Reporter			Opponent		Reviewer								
	Newton's Fifth Law			The Real Sheldons		Northern Cross								
	CO 124	Jente	Clarysse	Boiled Egg	Tobias	Kälin	Silia	Lüscher						
		The Real Sheldons			Northern Cross		Newton's Fifth Law							
Joseph			Injodikaran		Resonating Glass		Alexander	Hadjistamov	Marianna	Marzetta				
Northern Cross			Newton's Fifth Law		The Real Sheldons		Birk		Kähli	Vacuum Bazooka	Jakob	Storp	Luca	Huber
Fight 1.4	Reporter			Opponent		Reviewer								
	Zurich Isotopes			Kzütilöpts		French Fries								
	CO 010	Alexander	Schmidhuber	Fast Chain	Gianluca	Moro	Henri	Balla						
		Kzütilöpts			French Fries		Zurich Isotopes							
Timon			Aegler		Gee-Haw Whammy Diddle		Vinh Vincent	Nguyen	Natalija	Für				
French Fries			Zurich Isotopes		Kzütilöpts		Anya		Mauron	Visualising Density	Simone	Thiel	Elia	Hvalic
Fight 1.5	Reporter			Opponent		Reviewer								
	TheLegend27			OH Group		Schrödinger's Club								
	CO 011	James	Guillan	Spiral Waves	Florian	Heinzer	Nicci	Frohlich						
		OH Group			Schrödinger's Club		TheLegend27							
Mareike			Brockes		Single Lens Telescope		Kara	Koopman	Nastya	Kolesnikova				
Schrödinger's Club			TheLegend27		OH Group		Rebecca		Popovich	Metronome Synchronization	Léa	Le Bars	Peter	Kuhn
Fight 1.6	Reporter			Opponent		Reviewer								
	Kinemagic			Bosonic Fermions		PPAP								
	CO 015	Talin	Herold	Magnetic Hills	Pierre	Ledan	Mohamed Amine	Rusi El Hassnai						
		Bosonic Fermions			PPAP		Kinemagic							
Smridh			Sood		Visualising Density		Daniil	Lozner	Piotr	Salustowicz				
PPAP			Kinemagic		Bosonic Fermions		Xiao		Yu	Ball in a Tube	Tobias	Huber	Nicolas	Mile
Fight 1.7	Reporter			Opponent		Reviewer								
	AC-DC			Dead Physicists' Society		Gravitational Wave Surfers								
	CO 016	Cornelius	Carlsson	Boiled Egg	Florian	Wirth	Jules	Fischer						
		Dead Physicists' Society			Gravitational Wave Surfers		AC-DC							
Aladin			Bouddat		Leidenfrost Stars		Julian	Flury	Julian	Blackwell				
Gravitational Wave Surfers			AC-DC		Dead Physicists' Society		Damian		Saxer	Single Lens Telescope	Benjamin	Sexton	Johann	Schwabe

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Fight Plan SYPT 2017							
Round 2 (Saturday, 18 March, 15:15 - 18:00)							
Fight 2.1	Reporter			Opponent		Reviewer	
CO 122	SOV Union			AC-DC		OH Group	
	Visnusuthan	Vairavipillai	Boiled Egg	Julian	Blackwell	Mareike	Brockes
	AC-DC			OH Group		SOV Union	
	Benjamin	Sexton	Leidenfrost Stars	Peter	Kuhn	Oliver	Grünig
CO 123	OH Group			SOV Union		AC-DC	
	Florian	Heinzer	Invent Yourself	Senhong	Cao	Cornelius	Carlsson
	Dead Physicists' Society			Newton's Fifth Law		Kzütlöpts	
	Florian	Wirth	Pulling Glasses Apart	Marianna	Marzetta	Timon	Aegler
CO 124	Newton's Fifth Law			Kzütlöpts		Dead Physicists' Society	
	Jakob	Storp	Magnetic Hills	Elia	Hvalic	Aladin	Bouddat
	Kzütlöpts			Dead Physicists' Society		Newton's Fifth Law	
	Gianluca	Moro	Metronome Synchronization	Johann	Schwabe	Jente	Clarysse
Fight 2.3	Reporter			Opponent		Reviewer	
CO 124	PPAP			Physics Chicks		The Real Sheldons	
	Daniil	Lozner	Single Lens Telescope	Ivana	Klasovita	Joseph	Injodikaran
	Physics Chicks			The Real Sheldons		PPAP	
	Zara	Yenal Vance	Leidenfrost Stars	Luca	Huber	Xiao	Yu
CO 010	The Real Sheldons			PPAP		Physics Chicks	
	Tobias	Kälin	Magnetic Hills	Mohamed Amine	Rusi El Hassnai	Viera	Klasovita
	Northern Cross			The Golden RaTrio		Quantum Gravity	
	Alexander	Hadjistamov	Visualising Density	Daniel	Repérant	Lukas	Jaborneegg
CO 011	The Golden RaTrio			Quantum Gravity		Northern Cross	
	Tehya	Birch	Balloon Airhorn	Michael	Klein	Birk	Kähli
	Quantum Gravity			Northern Cross		The Golden RaTrio	
	Timo	Gimmi	Spiral Waves	Silia	Lüscher	Cyrill	Kästli
Fight 2.5	Reporter			Opponent		Reviewer	
CO 011	Schrödinger's Club			Zurich Isotopes		The Bigbanger	
	Nicci	Frohlich	Invent Yourself	Natalija	Für	Janine	Schai
	Zurich Isotopes			The Bigbanger		Schrödinger's Club	
	Simone	Thiel	Leidenfrost Stars	Yoel	Morales	Kara	Koopman
CO 015	The Bigbanger			Schrödinger's Club		Zurich Isotopes	
	Luana	Oderbolz	Boiled Egg	Rebecca	Popovich	Alexander	Schmidhuber
	Bosonic Fermions			Gravitational Wave Surfers		TheLegend27	
	Nicolas	Mile	Magnetic Hills	Damian	Saxer	Léa	Le Bars
CO 016	Gravitational Wave Surfers			TheLegend27		Bosonic Fermions	
	Jules	Fischer	Invent Yourself	James	Guillan	Pierre	Ledan
	TheLegend27			Bosonic Fermions		Gravitational Wave Surfers	
	Nastya	Kolesnikova	Pulling Glasses Apart	Smridh	Sood	Julian	Flury
Fight 2.7	Reporter			Opponent		Reviewer	
CO 016	French Fries			The Matter Horn		Kinemagic	
	Vinh Vincent	Nguyen	Magnetic Hills	Oliver	Millar	Tobias	Huber
	The Matter Horn			Kinemagic		French Fries	
	Liam	Castelli	Resonating Glass	Talin	Herold	Anya	Mauron
CO 016	Kinemagic			French Fries		The Matter Horn	
	Piotr	Salustowicz	Vacuum Bazooka	Henri	Balla	Luiz	Amaral

Fight Plan SYPT 2017							
Round 3 (Sunday, 19 March, 8:30 – 11:30)							
Fight 3.1 CO 122	Reporter			Opponent		Reviewer	
	Quantum Gravity			Kinemagic		AC-DC	
	Michael	Klein	Invent Yourself	Piotr	Salustowicz	Benjamin	Sexton
	Kinemagic			AC-DC		Quantum Gravity	
Fight 3.2 CO 123	Reporter			Opponent		Reviewer	
	The Real Sheldons			TheLegend27		Dead Physicists' Society	
	Luca	Huber	Balloon Airhorn	Nastya	Kolesnikova	Florian	Wirth
	TheLegend27			Dead Physicists' Society		The Real Sheldons	
Fight 3.3 CO 124	Reporter			Opponent		Reviewer	
	The Matter Horn			Northern Cross		Zurich Isotopes	
	Luiz	Amaral	Visualising Density	Birk	Kähli	Simone	Thiel
	Northern Cross			Zurich Isotopes		The Matter Horn	
Fight 3.4 CO 010	Reporter			Opponent		Reviewer	
	Gravitational Wave Surfers			SOV Union		Newton's Fifth Law	
	Julian	Flury	Gee-Haw Whammy Diddle	Oliver	Grünig	Jakob	Storp
	SOV Union			Newton's Fifth Law		Gravitational Wave Surfers	
Fight 3.5 CO 011	Reporter			Opponent		Reviewer	
	Kzütilöpts			Schrödinger's Club		Physics Chicks	
	Elia	Hvalic	Vacuum Bazooka	Nicci	Frohlich	Zara	Yenal Vance
	Schrödinger's Club			Physics Chicks		Kzütilöpts	
Fight 3.6 CO 015	Reporter			Opponent		Reviewer	
	OH Group			PPAP		The Golden RaTrio	
	Peter	Kuhn	Boiled Egg	Xiao	Yu	Tehya	Birch
	PPAP			The Golden RaTrio		OH Group	
Fight 3.7 CO 016	Reporter			Opponent		Reviewer	
	The Bigbanger			French Fries		Bosonic Fermions	
	Yoel	Morales	Hair Hygrometer	Anya	Mauron	Smridh	Sood
	French Fries			Bosonic Fermions		The Bigbanger	
Fight 3.8 CO 017	Reporter			Opponent		Reviewer	
	The Real Sheldons			TheLegend27		Dead Physicists' Society	
	Léa	Le Bars	Invent Yourself	Aladin	Bouddat	Tobias	Kälin
	Dead Physicists' Society			The Real Sheldons		TheLegend27	
Fight 3.9 CO 018	Reporter			Opponent		Reviewer	
	The Matter Horn			Northern Cross		Zurich Isotopes	
	Natalija	Für	Vacuum Bazooka	Liam	Castelli	Alexander	Hadjistamov
	Northern Cross			Zurich Isotopes		The Matter Horn	
Fight 3.10 CO 019	Reporter			Opponent		Reviewer	
	Gravitational Wave Surfers			SOV Union		Newton's Fifth Law	
	Senhong	Cao	Leidenfrost Stars	Jente	Clarysse	Damian	Saxer
	Newton's Fifth Law			Gravitational Wave Surfers		SOV Union	
Fight 3.11 CO 020	Reporter			Opponent		Reviewer	
	Kzütilöpts			Schrödinger's Club		Physics Chicks	
	Ivana	Klasovita	Visualising Density	Timon	Aegler	Rebecca	Popovich
	Schrödinger's Club			Physics Chicks		Kzütilöpts	
Fight 3.12 CO 021	Reporter			Opponent		Reviewer	
	OH Group			PPAP		The Golden RaTrio	
	Daniel	Repérant	Gee-Haw Whammy Diddle	Mareike	Brockes	Daniil	Lozner
	PPAP			The Golden RaTrio		OH Group	
Fight 3.13 CO 022	Reporter			Opponent		Reviewer	
	The Golden RaTrio			OH Group		PPAP	
	Mohamed Amine	Rusi El Hassnai	Torsion Gyroscope	Cyrril	Kästli	Florian	Heinzer
	OH Group			PPAP		The Golden RaTrio	
Fight 3.14 CO 023	Reporter			Opponent		Reviewer	
	The Bigbanger			French Fries		Bosonic Fermions	
	Henri	Balla	Invent Yourself	Nicolas	Mile	Luana	Oderbolz
	French Fries			Bosonic Fermions		The Bigbanger	
Fight 3.15 CO 024	Reporter			Opponent		Reviewer	
	The Real Sheldons			TheLegend27		Dead Physicists' Society	
	Pierre	Ledan	Boiled Egg	Janine	Schai	Vinh Vincent	Nguyen
	Dead Physicists' Society			The Real Sheldons		TheLegend27	

Swiss Young Physicists' Tournament

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Regulations for the SYPT 2017

1. Swiss Young Physicists' Tournament

The **Swiss Young Physicists' Tournament** (SYPT) is a physics competition for students in secondary school. Participants are challenged to prepare a theoretical and experimental solution to a complex problem and to present and defend their solution in a debate (Physics Fight) against the opposing team's scrutiny.

The SYPT takes place on two consecutive days (e.g. Saturday and Sunday) before the International Young Physicists' Tournament (IYPT) of the same year (i.e. usually between March and May). The tournament is organised by the association Pro IYPT-CH.

In order to facilitate preparation for students wishing to participate at the SYPT, Pro IYPT-CH organizes the SYPT Physics Week. The **SYPT Physics Week** is a week-long preparation course during which participants can conduct measurements and learn the basic skills required at the SYPT.

The **problems** for the SYPT are identical to the ones at the IYPT. However, due to organizational reasons, Pro IYPT-CH might offer preparation courses only to a selection of the problems during the SYPT Physics Week. The problems are published on www.iypt.org and on www.sypt.ch at least four months before the SYPT.

2. Website

Important information (deadlines, problems, results, etc.) about the SYPT and the Swiss team at the IYPT are published on the SYPT website (www.sypt.ch).

3. Preregistration and Application

We encourage a pre-registration by 30 November 2016. The final deadline for registration is 15 January 2017. This date applies both for students wishing to participate at the SYPT and the SYPT physics week as well as for students who only wish to participate at the SYPT.

An application is only valid if the terms of participation arrives on time (as mentioned above) and with the respective signatures. The terms of participation can be found on www.sypt.ch. The terms of participation have to be mailed to:

Samuel Byland
Verein Pro IYPT-CH
MNG Rämibühl, Physikinstitut Rämistrasse 54
8001 Zürich

There are two possible ways to apply. In any case the deadline mentioned above apply:

- School teams: Any secondary school (including international schools, private schools and others) in Switzerland can nominate one or several **teams of three students**. As an exception the organiser may allow teams of two students.
- Individual participants: The organiser will try to match students applying as **individuals** with other students to form teams of three students.

Every student in a team has to present the solution to a different problem.

4. Fees

The participation at the SYPT and SYPT physics week is free. The costs for train tickets (only "Halbtax"), food and if necessary accommodation are covered by the organiser and/or the host in accordance with the "Spesenreglement" of Pro IYPT-CH.

Pro IYPT-CH has a limited budget for experimental equipment. Please contact the president in due time if you would like to benefit from financial support. The exact procedure is defined by the "Beschaffungsreglement" of Pro IYPT-CH.

5. Preparation

Pro IYPT-CH seeks the support of **universities and research institutes** (e.g. ETH, Empa, etc.) in order to allow the students to use adequate experimental equipment where the schools cannot provide this or to get in contact with experts in the respective field. In addition, Pro IYPT-CH organizes the SYPT Physics Week during which students receive coaching and can prepare for the tournament.

6. Fight Plan

All teams participate in three rounds of **preliminary Physics Fights**. The fight plan is published two weeks before the start of the SYPT. Every student in a team takes the role of Reporter, Opponent and Reviewer exactly once. The Physics Fights are in **English**. In justified cases the organiser may allow exceptions.

7. Physics Fight Regulations

7.1. Stages and Time Schedule

At the start of a round the jury members and the teams briefly introduce themselves.

A Physics Fight with three teams is divided into three stages. In each stage the roles of the **Reporter**, **Opponent** and **Reviewer** are assigned according to the table below. If there are teams with more or less than three students or Physics Fights with more or less than three teams, similar schemes apply.

Physics Fight with three teams			
Stage	1	2	3
Team 1	Rep	Rev	Opp
Team 2	Opp	Rep	Rev
Team 3	Rev	Opp	Rep

The tasks for the three students actively involved in a fight are as follows:

- The **Reporter** presents his/her solution for the selected problem. The solution is expected to cover at least an important aspect of the problem with a theoretical model and experimental results verifying this model. The solution should be understandable for a secondary school student.
- The **Opponent** asks clarifying and critical questions and points out possible shortcomings and mistakes in the solution presented by the Reporter. He/She shows the presentation's strengths and weaknesses. The discussion has to be based on the solution presented by the Reporter (not on the Opponent's). A good Opponent should lead the discussion in a way that both participants can learn something new.
- The **Reviewer** comments on the performances of both Reporter and Opponent.

The Physics Fight follows a strict timetable (see table below). After the time reserved for a phase has been used up no new thought may be added. If the preparation time is exceeded, the time for the next phase is shortened accordingly.

Swiss Young Physicists' Tournament

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Phase	Time (total 45')
Presentation of the Reporter	12'
Clarifying questions of the Opponent to the Reporter	2'
Preparation of the Opponent	3'
Review of the presentation (maximum 5') and discussion between Opponent and Reporter	11'
Summary of the discussion by the Opponent	1'
Questions of the Reviewer to the Reporter and the Opponent	3'
Preparation of the Reviewer	2'
Review of the performances of the Reporter and the Opponent by the Reviewer	4'
Concluding remarks of the Reporter	2'
Questions of the jury to all three teams	5'

7.2. Team Work and Aids

During a Physics Fight the team members are allowed to communicate with each other. Support from outside the team (e.g. from their physics teacher) is strictly forbidden. The use of internet during a fight is strictly forbidden.

During every stage of a Physics Fight there is only one active participant per team. The other team members are allowed to help with short comments or give technical support).

8. Jury

The Jury is organised by Pro IYPT-CH. There are at least three jurors in every Physics Fight of which one acts as chairperson and ensures that the SYPT regulations are obeyed

At the end of every stage the jury assesses the performances and every juror shows marks from 1 to 10 for each of the teams involved in the stage. The **score** for a team corresponds to the weighted average (highest and lowest mark with 50 %, all others with 100 %) multiplied by 3 (Reporter), 2 (Opponent) and 1 (Reviewer).



9. Ranking

The grades of each fight are used to make a team and an individual ranking. Participants are only ranked on the individual ranking according to article 12. Both rankings will be published.

10. Final Fight

The three teams with the **highest total score** after three rounds qualify for the **Final Fight**. In case of two teams in third place with the same total score the more balanced individual scores are preferred. In the Final Fight the third team after three rounds presents first, the first team last.

Within thirty minutes after announcing the participants of the Final Fight, the teams notify the organiser of their favourite problem. If two teams intend to present the same problem, the better-placed team has higher priority. The accepted problems are announced immediately.

The Final Fight follows the same regulations as the normal Physics Fights. Every team member has to be on stage in at least one role. In a team of two the reporter may be on stage only once.

11. Team Qualification

The organiser (in cooperation with the jury) invites up to nine (in exceptional cases ten) participants (SYPT champion and up to six or seven more) for the team qualification where the Swiss team for the IYPT is selected.

Only participants who can be ranked on the individual ranking according to article 12 are eligible to participate at the team qualification.

12. Absence of a Team Member

In case one or more team members are unexpectedly unable to attend the SYPT the team must inform the organizers immediately.

The team is expected to perform the roles of the missing team members. The grades the remaining team members receive in these stages count as follows:

- The grades in the opposition count 25% and the grades in the review count 50% for the team ranking. The grades in the report do not count for the team ranking.
- The other fractions (75% opposition, 50% review) are made up out of the average grades the present team members received in their originally planned stage. The weighted average of these marks is then counted as the final grade for the team ranking.
- The grades in these stages do not influence the individual ranking.

In case a team is reduced to only one team member, the remaining team member may find one additional helper who is eligible to participate at the SYPT and is not active in another fight. The helper is not allowed to take a role on stage. The organizers then must be informed immediately.

A participant must perform at least one report and one opposition in the three preliminary physics fights, in order to be ranked on the individual ranking.

13. Disciplinary Action and Violations of Regulations

Participants or teams that violate the SYPT regulations can be sanctioned by a point deduction of up to 10 points per participant or disqualification.

Swiss Young Physicists' Tournament

Where tomorrow's scientists meet.

All participants must behave in an appropriate manner. Unfair behaviour can lead to point deduction of up to 10 points per participant or disqualification.

The final decision on any possible sanctions is taken by Pro IYPT-CH.

14. Appeal

In case one or several participant or juror feels an action or behaviour of an individual or group does not comply with the SYPT regulations, he or she may choose to report this. The procedure is as follows:

For incidents not concerning grading:

- For incidents that occurred during a fight round:
The incident must first be reported to the chair of the jury. In case the matter cannot be resolved the incident may be reported to the organizers. Pro IYPT-CH will decide on further actions or consequences.
- For incidents that occurred outside a fight room:
The incident must be reported to the organizers. Pro IYPT-CH will decide on further actions or consequences.

For incidents concerning grading:

- The incident must be reported to the organizers no later than one hour after the respective fight round finished. The report must include a justification why the grading should be reconsidered. Pro IYPT-CH will then make a final decision. Pro IYPT-CH will in any case justify its decision towards the involved parties.

Note: A retrospective change of a grade or its weighting will only be considered in extreme cases. Due to organisational reasons any change of grades will only influence the individual ranking.

11. Responsibilities

The regulations have been approved by the association Pro IYPT-CH.

Zurich, 14.12.2016



Ranking, Team Qualification and Awards

In addition to the **team ranking** a ranking of the scores of all participants (**individual ranking**) is published. The latter is based on the weighted sum of all individual scores in the first three rounds.

The team with the highest score in the Final Fight wins the **SYPT Team Competition**.

Nine participants qualify for the **IYPT Team Qualification**. They are selected by Pro IYPT-CH (in cooperation with the jury) based on their skills shown during the physics fights. Students participating in the team qualification have to prepare a second problem and participate in the team qualification event (MNG Rämibühl Zürich, 11/12 April). The invitation has to be accepted within one week.

All participants receive a **certificate** confirming their successful participation at the SYPT, and a small gift. The final teams and up to five additional teams will be awarded with medals and attractive prizes.

Rankings are published on www.sypt.ch.



Marking Guidelines

Presentation:

- Structure (balanced theoretical and experimental parts, focus on relevant results)
- Comprehensibility (adequate level, good visuals, clear statements)
- Completeness (greater context of problem, theoretical prediction for relevant aspect, comparison with own measurements, questions in task answered, bibliography)
- Correct physics (valid approach, correct formal solutions, consistent notation, units)
- Diagrams (correct axis labels, error bars, justified fit functions, fit parameters with correct units)
- Errors (reasonable error estimates, properly rounded results, comparison with theoretical predictions and/or literature)
- Layout (appealing and consistent design, titles, captions for figures and table, formulae set with formula editor)

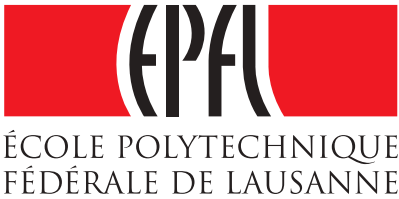
Discussion :

- Analytical skills (grasp strengths and weaknesses, reaction to new ideas)
- Understanding of physics (broad and deep knowledge base, quickly grasps new concepts)
- Politeness (objective feedback, polite and calm discussion)

Personal Skills:

- Language (understandable English, clear pronunciation, vivid speech, convincing body language)
- Teamwork (shares and explains own results, helps team with own skills, persuasive and motivating personality)
- Reaction to critique (can accept critique and reacts in a positive way)

Pro IYPT-CH and the SYPT are greatly supported by:



the **cogito** foundation

