26th IYPT TAIVAN 2013 7.24-8.2 TAIPEI





The Physics World Cup



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Greetings from Alan Allinson

A Jelcome to the 26th International Young Physicists' Tournament.

IYPT is a unique educational experience that seems easy to describe but people only really understand once they have been at the tournament. Most of our competitors and many Team Leaders and Jurors will also be at IYPT for the first time.

In 2001 my team reached the Final in Finland, one that was deservedly won by the team from Slovakia. On return to Brisbane the Australian Team was invited onto a live TV show. After receiving a wonderful explanation of the competition from our Team Captain, the TV host turned to me and asked "so it is a lot like chess?" I first led a team to IYPT I thought I knew what was expected, but we came second last. That one trip was certainly a learning experience for me and probably the best professional development I had received as a teacher. New countries are now required to send an observer the year before they enter to gain a clear insight into the requirements of the competition.

Only after seeing the amount of research our competitors have conducted and listened to the quality of the discussion generated is it possible to appreciate the nature of the tournament. The process of research and peer review mirrors the demands of real research.

Only by being party to the meetings of students, guides, teachers, university physicists and local dignitaries do you see the educational experience this tournament provides. This year, we have the honour of one of those physicists being a Nobel Laureate and dignitaries including highly ranked members of the government. Taiwan 2013 promises an amazing experience for us all.



While few would think of it as chess, IYPT certainly is a competition. The alternative name, "The Physics World Cup", clearly indicates this is a team event. Star players are important but a winning team will work together to succeed and design a strategy for deciding challenges and making rejections. How each team manages this process might determine if they get to present some of their best solutions. Each team has had to research seventeen problems but will only get to present five times before the Final.

It is with great pleasure that I greet you at the start of IYPT 2013 here in Taiwan. To all those here at IYPT for the first time, welcome, enjoy and make the most of the opportunity. To those of us who keep returning, welcome back!

Alan Allinson President of IYPT



Greetings from Evgeny Yunosov

Dear friends,

The Young Physicists' Tournament has a long history. It was created much earlier than its present participants were born, and for many years its existence was possible due to the work of a small number of enthusiasts. This year already sees the 26th International Young Physicists' Tournament.

Today, we can say, with all confidence, that the IYPT has taken its place in the global system of physics education. In 2013, the IYPT receives the medal of the IUPAP's International Commission on Physics Education in recognition of the outstanding work that the IYPT has carried out over many years, and the justly high regard in which it is held by physics educators around the world.

What makes the IYPT attractive? What is the secret of its long and sustainable development?

All starts with its problems that are unlike any textbook problems: Why do soap bubbles burst? Why vibrations are felt stronger at the rear of a bus? What determines the visible colors of clouds? How precise one can measure length with a steel ruler? Why do cold air drafts happen?

All such questions appear in everyday life. However to give an answer, one has to realize that such questions are physics problems.

It may happen that a solution is straightforward and well in the scope of a usual school physics curriculum. But it may also happen that even the cutting edge modern science does not know a good answer, and then a long and creative research work is needed.

The IYPT problems are always profound. Their important feature is being relevant at many depth levels. Students, teachers, researchers, entire research groups, all can work on such problems, and all can achieve relevant, respectable and noteworthy results and their level.



Speaking figuratively, there is no need in a hadron collider to solve an IYPT problem. There is no need in complex and expensive instruments (often a necessity in modern research physics.) The IYPT problems provide "first-hand contact", as Feynman said. The work on such problems gives a feeling of an immediate contact with the puzzles of the Nature. That makes the problems attractive not only for the young participants, but also for the leading scientists who happily serve in the jury of the IYPT.

Such problems cannot be solved over a day. It is no much easier to solve them over a month. Therefore the problems are offered for a long term, and very importantly, offered for collaborative team work.

Team work is the second key feature of the IYPT. Working in a team allows developing the creative potential of each team member, upscaling the experimental work, and attracting everyone who can offer help.

Open scientific discussions to defend the solutions are the third key feature of the IYPT. The Physics Fights, PF, is the term that was born over 30 years ago. It reflects the IYPT's spirit of scientific debates and fascinating competition.

The global IYPT movement unites all those who consider the education to be the primary life goal, and considers the scientific research as their special priority in life. Such an attitude is especially important in the today's pragmatic and increasingly consumerist world.

This years' IYPT is organized in Taiwan, the country that only recently joined the IYPT movement (but had an extraordinary successful start, earning silver medals three times.) It comes at no surprise that education is a special national priority in Taiwan.

I wish all participants of the IYPT more success and more victories.

Evgeny Yunosov Founder of IYPT



Greetings from Ilya Martchenko

Great things are better seen from a great distance. 25 years is a sufficiently long temporal distance to see the enormous scale of the Tournament", the IYPT Founder Evgeny Yunosov said in his talk on July 24, 2012.

First held in 1988, the IYPT since then has attracted around 500 teams from over 40 nations on all inhabited continents. We go on growing, and we are happy to see the new countries at the IYPT 2013 joining our family. Throughout the 26 years, our entrants have worked on 442 thought-provoking problems, and we are now excited to hear the 17 new solutions prepared for the 26th IYPT.

The bright and successful history of the IYPT amounts to something more than a list of past venues and past winners.

Over the years, the IYPT has become a focus of excellence that offers its expertise to many students and teachers worldwide. Hundreds of papers, many in professional refereed journals, and dozens of books have been written about the IYPT, about its problems, and about the impact the IYPT can make on everyday physics teaching and on promoting the science in the society. Indeed, no more than some 150 best students gathered here at the final event of the IYPT, but thousands have worked on our problems and presented them at regional and national events, sharing the joy and fascination with physics.

"I am happy to support the IYPT since I believe that this competition is the best preparation for a good scientist. The Tournament gives insight in the real life of researchers: understanding nature. The problems handled at the competition have no textbook solutions, the combination of theoretical models with experimental results leads to new insights and discussions about the truth of our knowledge", the 1985 Nobel winner in physics Klaus von Klitzing said about the tournament.



In 2013, we are glad to welcome each of you in Taiwan, a vibrant and innovative place that has a special focus on the promotion of education and the development of science and technology.

The participants of the IYPT 2013 have already proven to be young leaders and exceptional young minds. Defending their findings will now be an exciting learning experience and a great responsibility for all of them.

We wish all the participants, team leaders, jurors, visitors, and organizers of the IYPT 2013 to have a great time and memorable experiences here in Taiwan. We wish you to achieve your goals and to accomplish what you truly desire now and in the future.

Last but not least, we thank you for becoming part of the IYPT history.

Ilya Martchenko

Treasurer & Archivist of IYPT



Greetings from Chih-Ta Chia

In 1913, exactly one hundred years ago, Danish physicist Niels Bohr proposed a Bohr Model to explain the absorption spectrum of Hydrogen atom. Bohr Model not only helped him to win the Nobel Price, but also stimulated the advent of Modern Quantum Mechanics. The development of Quantum Mechanics is strongly influenced by the great debate between Albert Einstein and Niels Bohr. Especially, they are in debate of "God Do Not Play Dice" against "Does God play Dice?" at Solvay Conference in 1927 and 1930. Besides the great achievement of Solvay Conference, the Conference shows a very interesting way to communicate and discuss the basic concept of science. Most importantly, it sets up a model or pattern for science discussion and debate.

In 1979, the Young Physicists' Tournament started in Russia, and I think the activity was quite similar to the Solvay Conference. YPT activities are quickly recognized by European physicists, and soon becomes the International competition. The IYPT activities rapidly spread out from Europe to the other Continents, especially to the Asian region in recently years. Now, the IYPT merges all kind of ideas and discussions of IYPT problems on the basis of logical and scientific thinking. The Solvay Conference was the debate between two greatest physicists in the last century, and, in my opinion, International Young Physicists' Tournament is going to help the future scientists worldwide.

IYPT do have strong positive impact on physics education worldwide, and Taiwan is honored to host the 26th International Young Physicists' Tournament this year. The 26th IYPT is supported by Ministry of Education of Taiwan and National Science Council of Taiwan. In addition to the governmental support, the Far Eastern Y. Z. Hsu Science and Technology Memorial Foundation is the major force behind the scene of the 26th IYPT. Personally, I truly appreciate the help and support from the part-time staff of Far Eastern Y. Z. Hsu Science



and Technology Foundation, especially to the Chairman Douglas Tong Hsu.

Finally, I'd like to thank Nobel Laureate, Professor Douglas Osheroff, founder of IYPT, and the Young Physicists' from all the countries for joining the 26th IYPT. Wish all of you enjoy you stay and feel the warm heart of Taiwan in all aspects.

Chih-Ta Chia Chairperson of 2013 LOC



Greetings from Douglas Tong Hsu

To participants from all over the world:

nternational Young Physicists' Tournament (IYPT) has been held for 26 years since its establishment in 1988, and yet people in Taiwan might not have been so familiar with it since we only started to join this contest until in 2010, which was less than 4 years ago. Therefore, we are particularly excited and honored to host the world's largest and most prestigious international physics contest in Taiwan this year.

My late father Mr. Yu-ziang Hsu was an eminent entrepreneur who contributed significantly to the "Economic Miracle" of Taiwan. The Far Eastern Group founded by him has now grown into Taiwan's most diversified conglomerate with gross asset of US\$65 billion in 2012. The Group comprises 9 public listed companies and a total of 240 affiliates spanning from petrochemicals & energy, textile & polyester fiber, cement/building material, sea/land transportation, financial services, construction, telecommunications, retail/department stores and hotels, as well as family foundations that involve social responsibilities and the establishment of Taiwan's leading technical institute, private university, and hospital.

But we have never forgotten our social responsibilities and have generously committed our resources to areas covering education, health care, art, culture, technology, innovation and so forth. The reason for this unflagging commitment to the socio-cultural dimensions of our society is because among other things we believe in "innovation", and "innovation" must come from the passion and curiosity toward the neglected and the unknown. Among all our socio-cultural endeavors, the Yuan Ze University, which was founded by the Far Eastern Group in 1989 and where the 2013 IYPT will be held, caps it all. This university is the major venue where we try to cultivate our youth's passion and curiosity toward what commonsense cannot see and mainstream values neglect.

In a little more than two decades, Yuan Ze University has grown into one of the best universities in Taiwan and worldwide. In addition to being awarded the "National Quality Award", Yuan Ze University is also listed among the top 400 by Times Higher Education's World University Rankings. And it is worth special mention that our university has been certified as the world's first ISO 50001 "Green University" (Energy Management System) by SGS (Societe Generale de Surveillance).



Working closely with the Yuan Ze University, the Mr. Y. Z. Hsu Science and Technology Foundation, established in memory of my father's entrepreneurial and founding spirit, has also contributed tremendously to our socio-cultural endeavor. A case in point is the concerted effort of the foundation and National Taiwan Normal University to introduce the IYPT competition program to local high schools. Ever since the competition was first introduced in Taiwan in 2009, I have spared some time each year to watch the final round of competition online and I have been very impressed that even though English is not their mother tongue, the participating students from Taiwan can express their views eloquently during their debate; moreover, they know how to use experimental tools to supplement their arguments. This kind of debate contest based on facts not only serves to cultivate their logical thinking and extend imagination into the as yet vast and uncharted waters, but also is the best model to help cultivate future talents. Of course, such interactive debate also makes learning physics more fun.

As Group Chairman and CEO, I travel abroad frequently and feel that the world is changing ever faster; and it re-confirms my belief that nothing other than innovation can facilitate global changes. And I must bring forward my point again that the passion and curiosity toward the neglected and the unknown is key to innovation. My professor, Dr. Peter F. Drucker once said: "I never predict. I simply look out the window and see what is visible but not yet seen." I believe each young participant in IYPT competition must feel a strong passion and curiosity toward the world. They are willing to invest themselves in intellectual adventures and explore the infinite possibilities for the future. Please do not forsake this passion; you might be the next Steve Jobs, who can truly make a difference.

Taiwan is historically called Formosa, meaning "Beautiful Island", with warm hospitality. It is very thoughtful for the organizers to include some touring programs outside of intense competitions for the visitors to learn more about the beauty of Taiwan. Hope you all enjoy this special journey and make the best of it. No matter which teams stand out, I am sure the close contact with young talents from all over the world in this 2013 IYPT@Taiwan will make you all winners in your lives.

Douglas Tong Hsu

Chairman of Far Eastern Group&Far Eastern Y. Z. Hsu Science and Technology Memorial Foundation

Introduction of IYPT Magazine

The IYPT-Magazine is a place to share the brilliant solutions of the seventeen problems suggested by the organization of International Young Physicists' Tournament (IYPT) each year. Although the IYPT competition takes place every year and excellent solutions are presented, it is a pity that these wonderful solutions are mostly not known and distributed before. In order to advance the physics education to the globe collaborations, the IYPT-Magazine is designed to publish the written solutions of IYPT problems that are provided by world-class scholars, teachers and students.

Since each participant country has its own vision and scope in science education. IYPT magazine also provides an international platform for the participant countries to present their worldwide IYPT-related activities and exchange ideas of Physics/Science education.

1~2 issues of IYPT-Magazine will be published in each year, and a reviewing process will be implanted to insure a high quality of publications. The publication of IYPT-Magazine is authorized by Executive Committee of IYPT, and is supported by the National Taiwan Normal University of Taiwan.

Please check the following website of IYPT-Magazine for the details of submission requirements and process:

http://iyptmag.phy.ntnu.edu.tw

Wen-Chin Lin Editor in Chief of IYPT Magazine





Car Car powered by a balloon

Sand What determines its softness

Breaking Spaghetti Dry spaghetti falling on a hard floor doesn't break



Meaning of the Logo



I YPT Taiwan

The logo of the 2013 competition aims to add some Chinese twists into the IYPT chivalrous tradition. The two knights are confronting each other on a horse, wielding a spear and a shield that read "Light (*guang*)" and "Energy (*neng*)" respectively, representing the equations "E=hv" and "E=mc²." These two characters are the artwork of the renowned Chinese calligrapher Su Shi (蘇軾). To integrate more Chinese atmosphere, the title "IYPT Taiwan" at the bottom is also written in calligraphy.



Cultural Meaning of Bamboo



Bamboo is the best representation of traditional Chinese values. Known as one of the Four Gentlemen (四君子: plum, orchid, bamboo, chrysanthemum), bamboo is praised as the behavioral model of gentlemen. In the course of history, it has been a major theme of Chinese painting and poetry.

Su Shi(蘇軾), a famous poet from the Song dynasty, spoke highly of bamboo: "a diet without meat reduces weight; a living environment without bamboo induces mediocrity."

Bai Juyi (白居易), a distinguished poet from the Tang dynasty, summarized four merits of bamboo: its deep root symbolizes mental strength and perseverance; its straight stem stands for objectivity and fair-mindedness; its hollow heart embodies modesty and adjustability; its joints (*jie* in Chinese, meaning integrity) denote virtue and chastity. Held in high regard, bamboo is not just a mere plant, but a token of positive spirits in Chinese culture.

The Specials of Taiwan

Traditional Taiwan



Located in Wai Shuang Xi, Taipei, **National Palace Museum** is the representative cultural establishment of Chinese civilization. The enormous inventory of Chinese imperial collections consists: jade artifacts, ink wash paintings, calligraphy works, silk tapestries, porcelain and rare documents. Besides the excellent preservation of cultural treasures, the adjacent Zhishan Garden itself is also a marvel, reflecting the style of Song and Ming dynasty via the traditional Chinese-graden building techniques.



Creative Taiwan



Established in 1914, **Huashan 1914 Creative Park** used to be a sake distillery under Japan's sovereignty, which slowly fell into decay after World War II. From 1997 onwards, this deserted factory has been an inspiration for alternative artists, for they regard this isolated place as an oasis in big city where they meet friends and stage experimental plays in. The resurgence of Huashan was soon followed by a long-term restoration plan, and now it has officially become a full-fledged organic art center. Huashan of today is a lively melange of contemporary art, stylish restaurants, and creative design.

The Specials of Taiwan

Delicious Taiwan



Commensurate with its surname "paradise for gourmands," the culinary culture of Taiwan is full of surprises. **Shilin night market**, as gourmands' Mecca, is always boiling with chaotic excitement over a large selection of local snacks. The popularity of Taiwanese cuisines is attributed to the perfect combination of aroma, taste, and look, as in pearl milk tea, stinky tofu, oyster omelet, steamed sandwich, crushed ice dessert and more.



IYPT Taiwan

EC Members

EC Member	Position
Alan Allinson	President
Martin Plesch	Secretary General
Ilya Martchenko	Treasurer
Georg Hofferek	Member
Chuanyong Li	Member
Horst Bittner	Member (LOC 2012)
Chih-Ta Chia	Member (LOC 2013)
John Balcombe	Member (LOC 2014)



LOC Members

LOC Mem	nber/ Position	LOC Mem	ber/ Position
	Chih-Ta Chia Chairperson		Wen-Chin Wu Member
	Hsien-Chung, Kao Member		Wah-Keung Sze Member
	Wen-Chin Lin Member		Yung-Yuan Hsu Member

IOC Members

IOC Member	Country
Philip O'Neill	Australia
Ulrike Regner	Austria
Ivan Antsipau	Belarus
Victor Ando	Brazil
Assen Kyuldjiev	Bulgaria
Feng Song	China
Kreso Zadro	Croatia
Stanislav Panos	Czech Republic
Nicolas Chevalier	France
George Laskhishvili	Georgia
Rainer Reichle	Germany
Mihaly Hömöstrei	Hungary
Jong Tan	Indonesia
Dina Izadi	Iran
Hong Jung	Korea



IOC Member	Country
Gavin Jennings	New Zealand
Kingsley Imade	Nigeria
Andrzej Nadolny	Poland
Sandu Mirel Golcea	Romania
Valentin Lobyshev	Russia
Theresa Thor	Singapore
Frantisek Kundracik	Slovakia
Rok Capuder	Slovenia
Kim Freimann	Sweden
Samuel Byland	Switzerland
Hsien-Chung Kao	Taiwan
Prapun Manyum	Thailand
Nava Zokaie	United Arab Emirates
John Balcombe	United Kingdom

IYPT Taiwan

Leader Jurors



Philip O'Neill Australia



Ginka Exner

Bulgaria



Thomas Lindner Austria



Xuewei Cao China



lgor Timoshchenko Belarus



Kreso Zadro

Croatia



Ronaldo Fogo

Brazil



Stanislav Panos

Czech Republic





Nicolas Chevalier

France



Dina Izadi Iran

Chan Oung Park



George Laskhishvili Georgia

Florian Ostermaier Germany



Uno Uno Nigeria

Korea



Jong Tan Indonesia



Gavin Jennings New Zealand



Leader Jurors







Hsien-Chung Kao

Taiwan



Massoud Torabiazad Iran



Narumon Suwonjandee

Thailand



Wah-Keung Sze Taiwan



Steve Adams United Kindom



Stanislav Krasulin

Belarus



Thiago Serra Brazil

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Independent Jurors





Rainer Reichle Germany	Francis Ekwenta Nigeria	
Horst Bittner Germany	Valentin Lobyshev Russia	
Mihály Hömöstrei Hungary	Ye Yeo Singapore	
Kuang Joo Kim Korea	František Kundracik Slovakia	



Independent Jurors



Slovakia

Martin Plesch



Mattias Andersson

Sweden



Damjan Štrus Slovenia



Andreas Vaterlaus

Switzerland



Sweden

Lars Gislén



Pornrat Wattanakasiwich

Thailand



Kim Freimann

Sweden



John Balcombe United Kindom





Stephane David France



Sureerat Homhuan

Thailand



Georgia

Ilia Lomidze



Sarawut Thountom

Thailand



Teimuraz Chichua Georgia



Nirut Pussadee Thailand



Kerry Parker New Zealand

I YPT Taiwan

Local Jurors



Cheng-Hsun Nien

National Central University



Ming-Fong Tai

National Tsing Hua University



Jong-Ching Wu

National Changhua University of Education



Shi-Ming He Concordia Middle School



Fang-Yuh Lo National Taiwan Normal University



Jyh-Shen Tsay

National Taiwan Normal University



Chung Yuan Christian

University

Wen-Yu Wen



Hsiang-Lin Liu

National Taiwan Normal Unviersity





Lih-Yir Shieh

National Chung Cheng University



Chen-Hsiu Liu

National Taiwan Normal University



Jung-Ren Huang National Taiwan Normal University



Pei-Hsun Jiang

National Taiwan Normal University



Pei-Ming Ho National Taiwan Univerisity



Hai-Pang Jiang

National Taiwan Ocean University



National Taiwan Normal University

Fu-Jiun Jiang

Australia Austria Belarus

Nation	Team leader	Members
LISTRAL OF	Philip O'Neill Carmen Parton	Heather Hunt Allissa Li Michael Chen Katie Ward Sophie Weir
	Thomas Lindner Angel Usunov	Paul Worm David Schöngrundner Stefan Kitic Fabian Exner Marc Gyongyosi
CONTRACTOR OF CONT	lgor Timoshchenko Stanislav Krasulin	Artsiom Bury Anton Khvalyuk Stanislau Latushko Alexey Makarevitch Frantishak Dziadow



Brazil Bulgaria China

Nation	Team leader	Members
	Ronaldo Fogo Thiago Serra	Liara Guinsberg Denise Sacramento Christovam Gabriel Demetrius Bertoldo da Silva A m a n d a Maria Marciano Leite Oliveira Vitor Melo Rebelo
	Ginka Exner Aslihan Shenol	Iskren Vankov Kaloyan Darmonev Nikolay Nikolov Nikolay Nikolov Victor Kouzmanov
	Xuewei Cao Zheng Wang	Bowen Yao Hanchao Sun Canxun Zhang Xirui Wang Jiarui Chen
Croatia Czech Republic France

Nation	Team leader	Members
	Kreso Zardo Damir Klicek	Vasilije Perovic Filip Keri Stjepan Petrusa Domagoj Pluscec Lara Vrbanec
	Stanislav Panos Petr Pavlicek	Jan Mazac Tomas Lamich Dalibor Repcek Marcel Rodak Daniel Sterba
	Nicolas Chevalier Patrice Bottineau	William Briand Alexis Bacot Lucy Bernardaud Amandine Rossignol Nicolas Théry



Georgia Germany Indonesia

Nation	Team leader	Members
	Teimuraz Gachechiladze Guram Mikaberidze	Giorgi Kvantrishvili Erekle Arshilava Elene Kharitonashvili Giorgi Tsereteli Beka Tevdorashvili
	Florian Ostermaier Michael Steck	Michael Kern Lars Dehlwes Marcel Neidinger Mats Ole Ellenberg Yiyang Huang
	Jong Tan Alexander Rodo Jusakman Silalahi	Himawan Wicaksono Winarto Kristo Nugraha Lian Andramica Priastyo Stella chrisantha Yogawisesa Josephine Monica

Iran Korea New Zealand

Nation	Team leader	Members
(Ŭ)	Dina Izadi Masoud Torabiazad	Sana Shajarisales Yalda Samimi Kimia Fereidooni Fardad Mokhtari Erfan Pirmorad
	Chan Oung Park Sung Yeon Yang	Min Gyu Kang Ki Ryang Kwon Sung Wook Kim Ji Seon Min Heon Joon Park
	Gavin Jennings Kent Hogan	Oliver Hughes Anthony Greer Jackson Beagley Lily Mason-Mackay Jared Lee



Nigeria Poland Romania

Ν.Λ.

Natio

Induori	Teannieadei	INIEITIDEI S
	Uno Uno Peter Adie	Dero Cosmos Michael Awarri
		Abdallah Liman
UTT A O HATE RACE AND PACINGS		U m m u k h u l s u m Ibrahim
		Terfa Akpagher
	Andrzej Nadolny	Marcin Kalinowski
	Łukasz Gładczuk	Mateusz Dziwulski
		Mateusz Eggink
7957		Tomasz Schmidt
		Jakub Supel
	Sandu-Mirel Golcea Victor Paunescu	Dan-Cristian Andronic
		Tudor Ciobanu
		Alex-Mihai Kis
Ť		Sebastian Dumitru
		Stefania-Lucica

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Moroianu

Russia Singapore Slovakia

Nation	Team leader	Members
	Andrey Shchetnikov Yury Bashkatov	Vladislav Tumanov Ivan Chaika Roman Doronin Mikhail Luptakov Vitalii Matiunin
A CONTRACTOR OF	Kah Wan Joy Wong Guan Kheng Sze	Kai Yen Jee Jau Tung Chan Cheng Yao Chik Yong Hui Lim Nishant Verma
	Katarína Tureková Boris Vavrík	Marco Bodnár Michal Hledík Matej Badin Kamila Součková Nikola Illášová



Slovenia Sweden Switzerland

Nation	Team leader	Members
	Rok Capuder Tin Troha	Aleš Zupancic Žiga Nosan Matej Logar Filip Koprivec G a š p e r D o m e n
	Felicia Ullstad Jakob Lavröd	Yue Wang Andrea Lidberg Max Parkosidis D a m i r B a s i c Knezevic Junyu Gao
	Samuel Byland Daniel Keller	Eric Schertenleib Laura Guerrini Florian Koch Patrick Meister Alex Vanstone

Taiwan Thailand United Kindom

Nation	Team leader	Members
	Hsien-Chung Kao Wah-Keung Sze	Jordan Wang
		Yi-Feng Luo
		Neng Chun Chiu
		Ning Han
		Wei-Chieh Huang
	Narumon Suwonjandee Worawarong Rakreungdet	Bannawit Pimpanuway
	Pornrat Wattanakasiwich	Yanakawee Siripongvutikorn
		Soramon Chaichan
		Naline Bellier
		Pawin Taechoyotin
	Steve Adams Charles Burson-Thomas	James Brent
		Chun Shin Lam
		Shun Him Kung
		Sebastian James
		Georgios Topaloglou



Schedule

Wednesday, July 24

	All day Arrival and check-in of all teams
	EC meeting
18:00	Welcome Dinner at Ler-Shue Cuisine Plaza, Yuan Ze University, Taoyuan

Thursday, July 25

09:00	Opening Ceremony at Yu-Ziang Hall, Yuan Ze University
	Juror Meeting, Organizers and Guests
	Photo session for the teams
14:30	Start of Competition: 1st Physics Fight

IYPT Taiwan

Schedule

Friday, July 26

08:30	2nd Physics Fight
14:00	Tour(I): four groups, each group allows 80 visitor at most.
	1. National Synchrotron Radiation Research Center, Taiwan
	2. Institute of Physics, Academia Sinica, Taiwan
	3. Science Park Exploration Museum, Taiwan
	4. National Space Organization, Taiwan

Saturday, July 27

08:30	3rd Physics Fight
14:00	4th Physics Fight
19:30	Invited Speech of Nobel Laureate : Prof. Osheroff



Sunday, July 28

08:30	5th Physics Fight
14:00	Tour(II): Shihsanhang Museum of Archaeology

Monday, July 29

08:45	Final of the Tournament at Chung-Cheng Hall in Gong-Guan Campus, National Taiwan Normal University, Taipei.
15:00	Award Ceremony at Far Eastern Grand Ballroom of Plaza Hotel, Taipei
19:00	Taiwan Food Court Night at Ler-Shue Cuisine Plaza, Yuan Ze University

Tuesday, July 30

08:30	Tour(III): Yehliu Geopark & Yangmingshan National Park
19:00	Farewell Party

I YPT Taiwan

Schedule

Wednesday, July 31

All day Departure
1. Scenery Train from Taipei to Hualien (Departure at 10:30 AM)
 IOC meeting at at Dong-Hwa University: 2:00 to 8:30 PM (dinner included)

Thursday, August 1

IOC Meeting	1. Morning: IOC meeting	
	2. EC meeting and IOC meeting	
	3. Campus Tour	

Friday, August 2

IOC Meeting	1. Morning: Scenery tour in Taroko National Park
	2. Afternoon: Departure at 14:30 by Train, arrival at Taoyuan International Airport at around 18:00



Excursion

Instrument Technology Research Center

With the rapid exploitation and extension of technology research and industrial development, the request for high-quality instrument has been dramatically increased as well as the complexity and precision of equipment. Instrument technology improvement has already become a major task of the nation.

In an attempt to promote national science & technology and fulfill economic needs, ITRC supposes its responsibility for continuously improving research infrastructure, supporting academic research and expanding high-tech industry. Its objectives are to construct instrument technology platform, to furnish with advanced techniques and equipment, to encourage international research, and to upgrade national research quality and high-tech industrial level. ITRC has gotten involved, with its core technologies, in FORMOSAT-5 project and other integrated programs such as biomedical instrument, , and technology of disaster precaution and handling. Meanwhile, ITRC will be sustainably dedicated to innovating the instrument service platform, serving with computer graphical user interface, and making progress to advanced instrument technology.



Article and Photo from Instrument Technology Reseach Center http://www.itrc.narl.org.tw/index-e.php

I YPT Taiwan

Excursion

National Syncrotron Radiation Research Center

As part of advanced light source, synchrotron radiation has become an important tool for use in diverse research fields such as physics, chemistry, biology, materials science, chemical engineering, environmental engineering, energy resources, mechanical engineering, and electronics.

NSRRC's mission is to operate a cutting-edge synchrotron radiation facility for pioneering scientific research. The light source at NSRRC was designed and constructed domestically and became operational in October of 1993. In April 1994, its beamlines were opened for service to researchers in diverse basic and applied fields. In recent years, many new research instruments have been added to the light source, turning the center into a world-class facility with state-of-the-art research capabilities in the vacuum-ultraviolet and soft X-ray energy regions. In 1998, additionally two hard X-ray beamlines were constructed at SPring-8 light source in Japan to provide researchers from Taiwan access to hard X-rays.

The TPS will be the largest cross-field cutting-edge experimental facility in Taiwan. It can offer one of the world's brightest synchrotron X-ray sources, open numerous prospective scientific research opportunities, enhance worldclass academic research to attain international competence, and assist the high-tech industry in improving its research and development capability while it creates Taiwan's scientific research marvels in the 21th century.

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Institution of Physics, Academia Sinica

Current research areas can be grouped into three main categories: Nanoscience, Complexity, Medium and High Energy Physics. Specific interests are in the areas of particle physics and cosmology, experimental high-energy physics, nuclear physics, condensed-matter and surface physics, statistical and computational physics, biophysics, as well as fluid mechanics and nonlinear physics. The Institute of Physics is expected to play an increasingly important role in the development of physics and technology in Taiwan.



Article and Photo from Institution of Physics, Academia Sinica http://www.phys.sinica.edu.tw/about_phys.php?about=history&eng=T

Excursion

Science Park Exploration Museum

The Science Park Exploration Museum, established in 2007 by the Park Administration, was originally a first-generation factory until its conversion into a modern exhibit. The museum introduces the Park's history as well as showcases many of its notable products in today's competitive high-tech industry. One gallery traces the growth of industry in the 1960s, accounting for this Park's establishment and details its vigorous development into one of the most prominent industrial centers in the world. Another gallery describes the emergence of industry in Taiwan and Hsinchu, and shows how this development leads to Taiwan's prominence in the global scene.



Article and Photo from Science Park Exploration Museum http://www.sipa.gov.tw/explore/english.html



Shihsanhang Museum

Shisanhang Museum preserves and showcases the ancient relics unearthed in the Shisanhang archaeological site. The Shisanhang site was first discovered in 1957 to the south of the estuary of Tamsui River, and was later named after the village where it was found. It is believed that the Shisanhang culture dates back to the 3rd century A.D., and their offspring being Kebalan people (凱達格蘭族, 1 of the 13 Taiwanese aborigine ethnic groups.) The abundant archeological findings such as porcelain, stonewares, ironwares, and glasswares all prove the advancement of this culture.



Photo from Shisanhang Museum

Excursion

Yehliu Geopark

Located on the Northern cape of Taiwan, Yehliu is highly subject to sea water and northeast monsoon, hence the rich aeolian and marine abrasion landforms. The stunning geological landscape becomes the main feature of Yehliu Geo Park, with the most famous must-sees being: Sea Candles, The Queen's Head, Ginger Rock, Fairy Shoe, Mushroom Rock and so on.



Photo from North Coast & Guanyinshan National Scenic Area http://www.northguan-nsa.gov.tw/att/pic/11000297.jpg



Yangmingshan National Park

Previously known as Grass Mountain, Yangmingshan was renamed in 1950 to commemorate the Ming Dynasty scholar Wang Yang-ming (Ξ 陽 明). Located in the Northern suburb of Taipei city, Yangmingshan is a dormant volcano formed by collision between the Philippines oceanic plate and the Eurasian continental plate. The tectonic movements also resulted in rich volcanic geology and topographical sights in the park: hot springs, geothermal steam, fumaroles, crater lakes, and geological faults. Other than its geological beauty, Yangmingshan National Park is also home to a prosperous ecosystem of flora and fauna, attracting hikers and animal-lovers all year round.



Problems

1. Invent yourself

It is more difficult to bend a paper sheet, if it is folded "accordion style" or rolled into a tube. Using a single A4 sheet and a small amount of glue, if required, construct a bridge spanning a gap of 280 mm. Introduce parameters to describe the strength of your bridge, and optimise some or all of them.

2. Elastic space

The dynamics and apparent interactions of massive balls rolling on a stretched horizontal membrane are often used to illustrate gravitation. Investigate the system further. Is it possible to define and measure the apparent "gravitational constant" in such a "world"?

3. Bouncing ball

If you hold a Ping-Pong ball above the ground and release it, it bounces. The nature of the collision changes if the ball contains liquid. Investigate how the nature of the collision depends on the amount of liquid inside the ball and other relevant parameters.

4. Soliton

A chain of similar pendula is mounted equidistantly along a horizontal axis, with adjacent pendula being connected with light strings. Each pendulum can rotate about the axis but can not move sideways (see figure). Investigate the propagation of a deflection along such a chain. What is the speed for a solitary wave, when each pendulum undergoes an entire 360° revolution?

"Soliton" © 2012 Andrei Klishin



5. Levitation

A light ball (e.g. a Ping-Pong ball) can be supported on an upward airstream. The airstream can be tilted yet still support the ball. Investigate the effect and optimise the system to produce the maximum angle of tilt that results in a stable ball position.

6. Coloured plastic

In bright light, a transparent plastic object (e.g. a blank CD case) can sometimes shine in various colours (see figure). Study and explain the phenomenon. Ascertain if one also sees the colours when various light sources are used.



"Coloured plastic" © 2012 Evgeny Oleinik

7. Hearing light

Coat one half of the inside of a jar with a layer of soot and drill a hole in its cover (see figure). When light from a light bulb connected to AC hits the jar's black wall, a distinct sound can be heard. Explain and investigate the phenomenon.



"Hearing light" © 2012 Kathryn Zealand, QOTU

Problems

8. Jet and film

A thin liquid jet impacts on a soap film (see figure). Depending on relevant parameters, the jet can either penetrate through the film or merge with it, producing interesting shapes. Explain and investigate this interaction and the resulting shapes.



"Jet and film" © 2012 Stanisłaŭ Piatruša

9. Carbon microphone

For many years, a design of microphone has involved the use of carbon granules. Varying pressure on the granules produced by incident sound waves produces an electrical output signal. Investigate the components of such a device and determine its characteristics.

10. Water rise

Fill a saucer up with water and place a candle vertically in the middle of the saucer. The candle is lit and then covered by a transparent beaker. Investigate and explain the further phenomenon.

11. Ball bearing motor

A device called a "Ball Bearing Motor" uses electrical energy to create rotational motion. On what parameters do the motor efficiency and the velocity of the rotation depend? (Take care when working with high currents!)



12. Helmholtz carousel

Attach Christmas tree balls on a low friction mounting (carousel) such that the hole in each ball points in a tangential direction. If you expose this arrangement to sound of a suitable frequency and intensity, the carousel starts to rotate. Explain this phenomenon and investigate the parameters that result in the maximum rotation speed of the carousel.

13. Honey coils

A thin, downward flow of viscous liquid, such as honey, often turns itself into circular coils. Study and explain this phenomenon.

14. Flying chimney

Make a hollow cylindrical tube from light paper (e.g. from an empty tea bag). When the top end of the cylinder is lit, it takes off. Explain the phenomenon and investigate the parameters that influence the lift-off and dynamics of the cylinder.

15. Meniscus optics

Cut a narrow slit in a thin sheet of opaque material. Immerse the sheet in a liquid such as water. After removing the sheet from the liquid, you will see a liquid film in the slit. Illuminate the slit and study the resulting pattern.

16. Hoops

An elastic hoop is pressed against a hard surface and then suddenly released. The hoop can jump high in the air. Investigate how the height of the jump depends on the relevant parameters.

I YPT Taiwan

Problems

17. Fire hose

Consider a hose with a water jet coming from its nozzle. Release the hose and observe its subsequent motion. Determine the parameters that affect this motion.

Authors of the original proposals: Ivan Antsipau, John Balcombe, Samuel Byland, Jürgen Durst, Łukasz Gładczuk, Gavin Jennings, Heinz Kabelka, Rudolf Lehn, Maciej Malinowski, Ilya Martchenko, Björn Miksch, Florian Ostermaier, Stanisłaŭ Piatruša, Martin Plesch, Qian Sun, Hassan Bagheri Vloujerdi.

The selection of problems was prepared and suggested on July 12, 2012 by the IYPT Committee for Problem Selection (John Balcombe, Samuel Byland, Ilya Martchenko, Feng Song.) The problems were discussed, edited and approved by the IYPT IOC on July 28, 2012.



Regulation

I. International Young Physicists' Tournament

The International Young Physicists' Tournament (IYPT) is a competition among teams of secondary school students in their ability to solve complicated scientific problems, to present solutions to these problems in a convincing form and to defend them in scientific discussions, called Physics Fights (PF).

II.The Problems of the IYPT

The 17 problems are formulated by the International Organizing Committee (IOC) and sent to the participating countries not later than in October. These problems may be used in any competition that could lead to selection of a national team. They may be used in International tournaments that involve foreign teams not taking part in IYPT.

III.The Participants of the IYPT

1. The national teams

Any invited country, as well as the host country, is represented by one team. A country can only take part in the IYPT if it is nominated and accompanied either by the country's IOC representative or by the representative of a candidate IMO.

2. The membership of the teams

A team is composed of five secondary school students. All members of the team must either be citizens of the country they represent, or be enrolled as students in a school of the country they represent. Secondary school graduates can participate in the IYPT in the year of their graduation. The participation of university students is not allowed. The LOC may allow participation of teams of four or three students. The composition of the team cannot be changed during the Tournament. The team is headed by a Captain who is the official representative of the team during the PFs.

3. The team is accompanied by one or two team leaders.



IV.The Jury

The Jury is nominated and organized by the LOC in cooperation with EC. The Jury consists of at least five members, if possible from different countries. Team leaders, at least one from each team, are included in the Jury. The team leaders cannot be members of the Jury in the PF where their teams participate and should not, if possible, grade the same team more than twice.

V.The Agenda of the IYPT

The IYPT is carried out in a period determined by the LOC (from May to July).

All teams participate in five Selective PFs. Selective PFs are carried out according to a fixed schedule as detailed in the attachment to these Regulations. Numbers are ascribed to teams by lot. The best teams participate in the Final PF.

The host country provides a cultural program for the participants.

Regulation

VI.The Physics Fight Regulations

Three or four teams participate in a PF, depending on the total number of teams. In the course of a PF the members of a team communicate only with each other.

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

The PF is carried out in three (or four) Stages. In each Stage, a team plays one of the three (four) roles: Reporter, Opponent, Reviewer (Observer). In the subsequent Stages of the PF, the teams change their roles according to the schemes:

	stage 1	stage 2	stage 3
team 1	Rep	Rev	Орр
team 2	Орр	Rep	Rev
team 3	Rev	Орр	Rep

	stage1	stage 2	stage 3	stage 4
team 1	Rep	Obs	Rev	Орр
team 2	Орр	Rep	Obs	Rev
team 3	Rev	Орр	Rep	Obs
team 4	Obs	Rev	Орр	Rep



VII.The Stage Regulations

The performance order in the Stage of a PF: Reserved time in minutes
The Opponent challenges the Reporter for the problem 1
The Reporter accepts or rejects the challenge
Preparation of the Reporter
Presentation of the report
Questions of the Opponent to the Reporter
and answers of the Reporter
Preparation of the Opponent
The Opponent takes the floor, maximum 4 min.
and discussion between the Reporter and the Opponent 14
The Opponent summarizes the discussion
Questions of the Reviewer to the Reporter
and the Opponent and answers to the questions
Preparation of the Reviewer 2
The Reviewer takes the floor
Concluding remarks of the Reporter
Questions of the Jury

In the Final PF the procedure of challenge is omitted. The official language of the IYPT is English.

Regulation

VIII.The Team Performance in the Stages

The Reporter presents the essence of the solution to the problem, attracting the attention of the audience to the main physical ideas and conclusions.

The Opponent puts questions to the Reporter and criticizes the report, pointing to possible inaccuracy and errors in the understanding of the problem and in the solution. The Opponent analyses the advantages and drawbacks of both the solution and the presentation of the Reporter. The discussion of the Opponent should not become a presentation of his/her own solution. In the discussion, the solution presented by the Reporter is discussed.

The Reviewer presents a short estimation of the presentations of Reporter and Opponent.

The Observer does not participate actively in the PF.

During one PF only one member of a team takes the floor as Reporter, Opponent or Reviewer; other members of the team are allowed to make brief remarks or to help with the presentation technically. No member of a team may take the floor more than twice during one Selective PF or, as Reporter, more than three times in total during all Selective PFs. During the Final PF any team member can take the floor only once.

The LOC must inform about the devices available for presentations not later than two months before the IYPT.



IX.The Rules of Problem-challenge and Rejection

- 1. All problems presented in the same PF must be different.
- 2. Selective PF

The Opponent may challenge the Reporter on any problem with the exception for a problem that:

- a) was rejected by the Reporter earlier;
- b) was presented by the Reporter earlier;
- c) was opposed by the Opponent earlier;
- d) was presented by the Opponent earlier.

If there are less than five problems left to challenge, the bans d), c), b), a) are successively removed, in that order.

During the Selective PFs the Reporter may reject the challenge of three different problems in total without penalty. For every subsequent rejection the coefficient of the Reporter (see section X) is decreased by 0.2. This reduction continues to apply during the following selective PFs.

3. Final PF

Within four hours after the announcement of the results of the Selective PFs the teams participating in the Final choose their problems. In case teams choose the same problem, priority is given according to the order of presentation in the Final (see section XII). The choice should be made public immediately.

Regulation

X.The Grading

After each stage the Jury grades the teams, taking into account all presentations of the members of the team, questions and answers to the questions, and participation in the

discussion. Each Jury member shows integer marks from 1 to 10. The mean of the highest and the lowest marks is counted as one mark which is then added to the remaining marks. This sum is used to calculate the mean mark for the team. The mean marks are multiplied by various coefficients: 3.0 or less (see section IX) for the Reporter, 2.0 for the Opponent, 1.0 for the Reviewer and then transformed into points.

XI.The Resulting Parameters

1. For a team in the PF

The sum of points (SP) is the sum of mean marks, multiplied by the corresponding coefficients and rounded to one decimal.

2. For a team in the Tournament

The total sum of points (TSP) equals the sum of SP of the team in all Selective PFs. The number of fights won (FW) is the number of Selective PFs, in which a team received the highest SP from all three or four teams participating in the same PFs.



XII.The Final

The three teams having the highest TSP in the Selective PFs participate in the Final. In case teams have equal TSP, their participation in the Final is decided by FW. If team(s) winning all their Selective PFs (FW=5) did not reach the Final by TSP, the best of them (determined by TSP) takes part in the final as fourth team.

The order of presentation in the Final is determined by position by entering the final: the higher the position, the lower the number in the scheme of section VI.

XIII.The Final Team Ranking of the IYPT

Students in the top half (rounded up) of participating teams receive medals. The students of the team winning the Final are awarded the winners' cup. If two or three teams have the same SP result in the Final, the winner is nominated according to the highest TSP, in case of equality by FW. All teams participating in the final are awarded 1st place certificates and gold medals. The five best teams not participating in the final are awarded 2nd place certificates and silver medals. 3rd place certificates and bronze medals are awarded to students in all other teams finishing in the top half. All other students receive certificates of participation. Team leaders obtain certificates indicating the ranking of their team.

XIV.The Status of the Regulations of the IYPT

The regulations are established by the IOC and may be changed only by the IOC.

Accepted in Isfahan on 2011-07-30



Yuan Ze University 元智大學





Map of Yuan Ze University





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I YPT Taiwan

Fight Room Arrangement







