

## Annex 1

### PRIZE-WINNERS

#### 25th European Union Contest for Young Scientists

#### FIRST PRIZES (€ 7.000 per Project)

<b>Country</b>	<b>Finland</b>
<b>Contestant</b>	<b>Perttu Pölönen (18)</b>
<b>Scientific Field</b>	<b>Social Sciences</b>
<b>Project Title</b>	<b>Music A' Clock</b>
<b>Short Summary</b>	<p>Music A'Clock is a musical innovation and a tool to studying music theory. It is a device and teaching method that looks like a round clock face with twelve keys on it. With pointers and stencils the student can learn names and use of notes, chords, intervals, scales and grades visually instead of having to memorize them.</p> <p>Music A'Clock revolutionizes the traditional approach to teaching music theory, because it is a sensible, logical and above all a visual tool to perceive music theory, which is often considered complicated and difficult. This is due to the fact that in the current system theoretical concepts are taught to too young children without connection to their playing skills and developmental stage. Music A'Clock fills this pedagogical gap, prevents students from frustration, helps to motivate and maintain interest – with visuality, practicality and playability. A'Clock enables the student to concentrate on music and musicality during the learning process. Patent for Music A' Clock is pending (Jan 2013) and marketing research is currently in process. Music A'Clock includes various applications. There are Piano A'Clock, Rhythm A'Clock, Guitar A'Clock and Xylo A'Clock.</p>

<b>Country</b>	<b>Ireland</b>
<b>Contestant</b>	<b>Ciara Judge (15), Emer Hickey (15) and Sophie Healy-Thow (16)</b>
<b>Scientific Field</b>	<b>Biology</b>
<b>Project Title</b>	<b>A statistical investigation of the effects of diazotroph bacteria on plant germination</b>
<b>Short Summary</b>	<p>Diazotroph bacteria are well known to have a symbiotic relationship with the legume plant family whereby the bacteria thrive while providing energy to the plant itself via the nitrogen fixation process. The project outlines an extensive experimental program to assess the impact of such bacteria on</p>

non legume crop species. The results show that two types of the rhizobium family of Diazotroph bacteria produce a statistically significant acceleration (increase of 17% for Rhizobium leguminosarum and 28% for Rhizobium japonicum;  $p < 0.001$ ) in the rate of barley crop germination. The results are based on an analysis of the performance of over 5,290 seed samples in 105 experimental runs over a 6 month period. In barley field trials, Rhizobium japonicum bacteria inoculated at  $6 \times 10^6$  cfu/ seed also increased growth rates and gave a 13.2% ( $p = 0.0328$ ) dry mass yield improvement. The studies have significant potential for improving the productivity of valuable food crops by increasing yields, reducing fertiliser use, and by reducing losses due to disease and weather. Opportunities to commercially scale up bacterial treatment of seeds treatment are being investigated. Investigations continue into the application of diazotroph bacteria in the germination phase of the malting process in brewing.

<b>Country</b>	<b>United Kingdom</b>
<b>Contestant</b>	<b>Frederick Turner (18)</b>
<b>Scientific Field</b>	<b>Engineering</b>
<b>Project Title</b>	<b>Genetics at home: Building a PCR machine and other equipment for setting up a home genetics lab</b>
<b>Short Summary</b>	The aim of this project was to build the equipment required to carry out some basic genetic tests at home for as little cost as possible. I designed and built a fully working PCR machine which copies specific regions of DNA many times as well as several other pieces of lab equipment which can be used to test for SNPs or mutations in genes.

#### SECOND PRIZES (€ 5.000 per project)

<b>Country</b>	<b>Austria</b>
<b>Contestant</b>	<b>Thomas Steinlechner (20), Dominik Kovacs (19) and Yuki Trippel (20)</b>
<b>Scientific Field</b>	<b>Engineering</b>
<b>Project Title</b>	<b>Anastomose Robot Tool - ART</b>
<b>Short Summary</b>	Anastomosis Robot Tool (ART) is an advancement of the surgical instrument "circular stapler". It may be used in surgery to reconnect two ends of bowel after a bowel resection (i.e. cutting out a segment of large bowel that is affected by cancer). In order to realise a minimally invasive operation for all parts of the large bowel it was necessary to miniaturize the circular stapler and execute all movements and actions in an electromechanical way. Remote control and the small dimension allow the surgeon to move ART through the whole large bowel.

<b>Country</b>	<b>Germany</b>
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<b>Contestant</b>	<b>Lennart Kleinwort (15)</b>
<b>Scientific Field</b>	<b>Computing</b>
<b>Project Title</b>	<b>FreeGeo – the world's first dynamic Android mathematics system app</b>
<b>Short Summary</b>	Smartphones and tablet computers enjoy immense popularity. They are not only practical due to portability, but their touch-sensitive screens also make them convenient and intuitive to operate. Lennart Kleinwort has taken advantage of these features for his project: He has written a software program that makes it possible to draw and modify geometric figures on smartphones and tablets. The program enables the user to move, rotate or enlarge circles simply by swiping multiple fingers across the screen simultaneously. In addition, users can draw geometric objects on the screen in free-hand mode, which the computer then adds to an existing figure automatically.

<b>Country</b>	<b>Switzerland</b>
<b>Contestant</b>	<b>Jasmin Allenspach (17)</b>
<b>Scientific Field</b>	<b>Mathematics</b>
<b>Project Title</b>	<b>LSLLSLSLLSLSLS – Modern Mathematics in Islamic Mosaics</b>
<b>Short Summary</b>	“Islamic artists were 500 years ahead of Western scientists” –headlines like this one appeared all over the world when an acclaimed Science paper investigated Islamic mosaics in 2007. These so-called girih patterns were suggested to have been conceived as tilings, the jigsaw-like geometrical concept of putting shapes together to cover the plane. The Science authors argued that some of these Islamic tilings have a quasi-periodic structure – whereas in the Western world, such complex structures were not invented until the 1970s. However, my analysis of the Science patterns and six additional mosaics from Iran suggests that this sensational claim should be revised: The Science proof of the quasiperiodicity is not convincing. In addition, the mosaics were not constructed in the 15th but rather in the 18th or 19th century. My discovery of Ammann bars – a feature of quasi-periodic tilings – in girih patterns might serve as an alternative proof of their quasi-periodicity.

### THIRD PRIZES (€ 3.500 per Project)

<b>Country</b>	<b>Hungary</b>
<b>Contestant</b>	<b>Balázs Zsombori (18)</b>
<b>Scientific Field</b>	<b>Computing</b>
<b>Project Title</b>	<b>PictoVerb – Giving Everyone a Voice</b>
<b>Short Summary</b>	<p>PictoVerb is currently a bilingual (Hungarian-English) Android application that breaks down the walls of communication separating the mentally disabled, vocally impaired, hard of hearing and foreign language speakers. The system uses universally recognizable symbols to produce fully correct audio sentences. This intuitive communication tool has three levels. Level one was designed specifically for hospital patients. Level two facilitates negotiating, asking questions and making specifications (quantity, quality, etc.). At level three the user can type anything not facilitated at the first two levels and save useful phrases that are particular to that user. With PictoVerb one can easily make emergency calls without any knowledge of one's location or the local language.</p>

<b>Country</b>	<b>Germany</b>
<b>Contestant</b>	<b>Daniel Pflueger (18)</b>
<b>Scientific Field</b>	<b>Physics</b>
<b>Project Title</b>	<b>Measuring water waves</b>
<b>Short Summary</b>	<p>These slow-motion photographs never cease to amaze: A drop falls onto the surface of the water, which is smooth as glass. While part of the drop disappears into the water, the rest bounces out again. Invisible to the human eye, this spectacle repeats itself many times within fractions of a second. Usually, high-speed cameras are used to make this process visible. However, such cameras are expensive - which is why Daniel Pflueger thought of a more cost-effective method. His method does not photograph the drop hitting the water directly, but analyses the water waves generated in the process. By precisely measuring the height of the waves using a laser and digital camera, Daniel Pflueger was able to provide an initial approach to measuring the complex water play when the drop hits the water.</p>

<b>Country</b>	<b>Belarus</b>
<b>Contestant</b>	<b>Maksim Bezrukov (18) and Aliaksandr Stadolnik (17)</b>
<b>Scientific Field</b>	<b>Mathematics</b>
<b>Project Title</b>	<b>Percolation games on Cayley graphs of groups</b>
<b>Short Summary</b>	<p>Consider the following deterministic game (a percolation game) suggested by the mathematician Itai Benjamini in 2002. Two species compete on a graph: the red and the blue. Start with one red vertex and one blue vertex. Each</p>

second the blue colour blue all its neighbours which are not yet coloured. The red is lazy and grow only at even times. If both species aim at the same vertex, it becomes blue. A question arises: will the blue surround the red after some finite time? If the red will be able to grow infinitely many times, we say that the blue lose, otherwise the blue win. In our work, we investigate the game on Cayley graphs of finitely generated abelian groups and Cayley graphs of the integer Heisenberg group.

**INTERNATIONAL PRIZE (€ 5.000 per project)**

<b>Country</b>	<b>Canada</b>
<b>Contestant</b>	<b>Jessie MacAlpine (17)</b>
<b>Scientific Field</b>	<b>Medicine</b>
<b>Project Title</b>	<b>Mustard Oil as an Apicomplexan-targeting Drug Therapy for Plasmodium falciparum</b>
<b>Short Summary</b>	<p>Half of the global population is susceptible to malarial infection, with over one million annual deaths occurring as a result of the disease. Plasmodium, the causative agent of malaria, contains a vital plastid-organelle homologous to the chloroplasts of plants, known as the apicoplast. It was determined in previous studies that allyl isothiocyanate (AITC) is able to inhibit plant growth in a variety of species through effects on photosynthetic function. The purpose of this experiment was thus to examine the antimalarial properties of mustard oil, a natural form of AITC used as cooking oil in developing countries. A one-step fluorescence assay used for antimalarial drug screening was employed throughout the experiment; resulting in the discovery that a 2µg/mL solution of pure mustard oil is able to significantly reduce Plasmodium falciparum infection in human red blood cells. Results of an MTT assay and light microscopy indicate that mustard oil exhibits equivalent mammalian toxicity to the common antimalarial drug Doxycycline. AITC is currently sold as an antibiotic, where clinical studies indicate that oral administration results in 90% absorption and rapid urinary drug recovery. With no organic solvent necessary, pure mustard oil (purchased from a local grocery) inhibits over 94% of parasite growth. Thus, the necessary dose of 10mg has potential to be taken orally, a treatment costing one million times less than the next leading antimalarial. Mustard oil production already occurs in malaria-endemic regions such as Brazil and India, making this cooking oil an inexpensive, accessible and effective alternative to current treatments.</p>

## HONORARY AWARDS

### Stockholm International Youth Science Seminar 2013

Country	Contestants	Age	Scientific Field	Project Title
FI	Perttu Pölönen	18	Social Sciences	Music A' Clock
UK	Frederick Turner	18	Engineering	Genetics at home: Building a PCR machine and other equipment for setting up a home genetics lab

### London International Youth Science Forum 2013

Country	Contestants	Age	Scientific Field	Project Title
IE	Ciara Judge Emer Hickey Sophie Healy-Thow	15 15 16	Biology	A statistical investigation of the effects of diazotroph bacteria on plant germination

## SPECIAL DONATED PRIZES

There are 17 special donated prizes:

- a five-day visit of a technical and cultural nature to the **European Patent Office** in Munich
- a one-week stay at each of the seven members of **EIROforum** listed here:
  - CERN: The European Laboratory for Particle Physics
  - EMBL: The European Molecular Biology Laboratory
  - ESA: The European Space Agency
  - ESO: The European Southern Observatory
  - ESRF: The European Synchrotron Radiation Facility
  - ILL: The Institut Laue-Langevin
  - European X-Ray Free-Electron Laser Facility GmbH
- one week stay in one of JRC's seven Institutes in Belgium, Germany, Italy, Spain or the Netherlands
- Participation at INTEL ISEF 2014 Los Angeles, California, USA, 11/5-16/5 2014

**The European Patent Office, Munich, Germany**

Country	Contestants	Age	Scientific Field	Project Title
DK	Emilia Wódzka	19	Engineering	Quantification of the effect of contamination in lithium-air batteries
LU	Joé Hoffmann Ben Weber Patrick Lux	18 18 18	Engineering	Development of an anthropomorphic robot hand
PT	Soraia Gaspar Jéssica Santos Jéssica Marques	20 17 17	Medicine	SmartKIT

**EIROForum Prizes**

CERN: The European Laboratory for Particle Physics

Country	Contestants	Age	Scientific Field	Project Title
PL	Michał Gumiela Rafał Kozik	19 20	Physics	Studies of the applicability of CMOS and CCD sensors for detection, dosimetry and mapping of alpha, beta, gamma, X-ray and proton beams

ESA

Country	Contestants	Age	Scientific Field	Project Title
DK	Alexander Mørch	19	Chemistry	Astrobiology: to what extent can life-supporting amino acids form on cosmic dust?

EMBL

Country	Contestants	Age	Scientific Field	Project Title
PL	Arkadiusz Jankiewicz	20	Biology	Honey bee's ( <i>Apis mellifera</i> L.) foraging range based on panynological analysis of the composition of its pollen loads

ESO

Country	Contestants	Age	Scientific Field	Project Title
DK	Martin Sørensen	18	Physics	The Astronomical Unit and the Venus passage

ILL

Country	Contestants	Age	Scientific Field	Project Title
HU	Donát Hegyesi	18	Engineering	Poker robot

European X-Ray Free-Electron Laser Facility GmbH

Country	Contestants	Age	Scientific Field	Project Title
NO	Maria Zakharova	18	Physics	Factors That Affect the Accuracy of 3-Dimensional Acoustic Locating for Sound Emitting Objects

ESRF

Country	Contestants	Age	Scientific Field	Project Title
DE	Michael Laue	18	Chemistry	Preparation of Electrically Conductive Carbon Layers by Chemical Converting Graphene Oxide

**The Joint Research Centre (JRC) Prizes**

Country	Contestants	Age	Scientific Field	Project Title
AT	Lorenz Leutgeb Moritz Wanzenböck	19 19	Computing	Variable Neighborhood Search for the Partition Graph Coloring Problem
FR	Adrielle Rakotomalala	18 17	Engineering	The chameleon robot

	Aymeric Jacquin Benjamin Lazard	17		
LT	Edvinas Misiukevičius	19	Biology	Daylily (Hemerocallis L.). A New Method of Breeding and Cultivation

#### The Intel ISEF 2013 Prizes

Country	Contestants	Age	Scientific Field	Project Title
SK	Emília Petříková	18	Medicine	Aspirin and salicylic acid in the combination with inhibition of PI3K promote cell death in malignant melanoma
PL	Aleksander Horawa	18	Mathematics	Invariants of Finite Metric Spaces
European Schools	Alexander Thanos	17	Engineering	Submergible Energy Apparatus – Linearly Extending Generator

#### EuCheMS special donated prize

Country	Contestants	Age	Scientific Field	Project Title
ET	Mari Liis Pedak	18	Environment	Analysis of the aquatic humic substances in Lake Harku using high pressure liquid chromatography

#### Host Organisation Special Donated Prizes

Prize of President of ASCR of the Czech Republic

Country	Contestants	Age	Scientific Field	Project Title
ET	Kristiin Resik	19	Chemistry	Polymer coating PolyE-323 for capillary electrophoresis of compound lipids

Prize of President of the Senate of the Czech Republic

Country	Contestants	Age	Scientific Field	Project Title
ET	Martin Talvik	18	Social Sciences	Estonian High School Students' Attitude Towards Global Problems and Change of Perception between 1991 and 2012

Prize of Ministry of Education Youth and Sports of the Czech Republic

Country	Contestants	Age	Scientific Field	Project Title
USA	Zeyu Liu	18	Engineering	A Novel Modular Repulsive Type Hybrid Magnetic Bearing for FES Systems

Prize of Mayor of Prague 1 Prize for Innovation

Country	Contestants	Age	Scientific Field	Project Title
New Zealand	Hannah Ng	18	Medicine	Locus of the Focus