### A. CORE PRIZES

**Three first prizes (€7 000 per project)**

<table>
<thead>
<tr>
<th>Country: Norway</th>
<th>Contestant: Ane Espeseth (18) and Torstein Vik (17)</th>
<th>Field: Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project title:</strong> Motivic Symbols and Classical Multiplicative Functions</td>
<td><strong>Abstract:</strong> The notion of a multiplicative function is one of the central building blocks of modern number theory, and were studied by Euler, Gauss and Ramanujan among others. Classical multiplicative functions work as machines giving key information about various properties of positive integers. For example, there is a function which outputs 1 if the input is a square number, and 0 otherwise. We study a specific class of multiplicative functions related to the famous Riemann zeta function, and find new algebraic structure and symmetries on these functions, which greatly simplifies and generalises many deep relations that number theorists had proven before us. To arrive at our results, we use many advanced tools of modern mathematics, including lambda-rings and category theory.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country: Italy</th>
<th>Contestants: Valerio Pagliarino (16)</th>
<th>Field: Computing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project title:</strong> LaserWAN: laser broadband internet connection</td>
<td><strong>Abstract:</strong> LaserWAN is a revolutionary technology that uses the infrared rays, emitted by specific lasers to convey a high speed internet connection even to the most isolated places in the world, deleting the Digital Divide. LaserWAN is able to bring everywhere a 500 Mbit/s internet connection mounting special transceivers on the top of pylons of high tension lines which bring the electric power from the power distributions plants near to the cities (usually provided of optical fiber networks) to the small villages. In this way the internet connection is conveyed on the power lines using laser beams that can replace an optical fiber, with the same signal quality, without needing to make expensive excavations. LaserWan is a green solution because laser beams does not emit any kind of EMC pollution.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country: USA</th>
<th>Contestant: River Grace (17)</th>
<th>Field: Biology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project title:</strong> Shining a Light on the Blind: Evolutionary Regression and Adaptive Progression in the Micro-vertebrate Ramphotyphlops braminus, a Model for Understanding Brain Organization and Complex Neurological Disorders</td>
<td><strong>Abstract:</strong> Many current efforts aim at understanding the depth of our nervous systems. However, complexity imposes impediments, while simpler systems can provide fundamentally important insight. The brahminy blindsnake (Ramphotyphlops braminus) is among Earth’s smallest vertebrates, and has a tiny central nervous system (CNS). This study produced a R. braminus brain atlas, assessed its eye architecture, and determined the effects of light on behavior. Microscopy revealed a miniaturized brain and eye. The retina contained all normal layers, with both rod and cone opsins, and behavioral experiments demonstrated negative phototaxis. This research provides new knowledge of the fundamental vertebrate CNS and creates insight into evolutionary regression and adaptive progression in micro-vertebrate life.</td>
<td></td>
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</tbody>
</table>
### Three second prizes (€5 000 per project)

<table>
<thead>
<tr>
<th>Country</th>
<th>Contestant</th>
<th>Field</th>
<th>Project title</th>
<th>Abstract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>Tassilo Schwarz (17)</td>
<td>Computing</td>
<td>Drone detection system: Detection, tracking and classification of potentially dangerous flight objects for multicopter defence</td>
<td>Small civilian drones are very popular right now - whether as toys or professional tools for recording videos. However, this also increases the risk of misuse, such as conducting espionage or even for carrying out terrorist attacks. In response, Tassilo Schwarz has developed a special defence system-technology that can identify unwanted drones and determine their position. The principle is as follows: Two digital cameras record the airspace to be monitored in stereo. If a drone penetrates this airspace, the system uses a sophisticated software program to keep it in view and to track its flight path. Using a directional microphone, the drone detection system is capable of even distinguishing buzzing multicopters from passing birds.</td>
</tr>
<tr>
<td>Canada</td>
<td>Kayley Ting (16)</td>
<td>Medicine</td>
<td>Analysis of Electrodermal Activity to Quantify Stress Levels in Autism</td>
<td>The objective of this research is to establish a method by which skin resistance readings could serve as early warning signs of a sensory meltdown in autism. Through monitoring electrodermal activity in correspondence with the introduction and reduction of stressors, this research aimed to determine the way in which different types of stress are exhibited in skin resistance readings. Methods of quantifying the severity of a stressor as well as assessing the efficacy of recovery methods were determined. These methods of calculation can be applied towards the prevention of, estimating the duration of, and isolating the causes of sensory meltdowns. I hope to apply my findings towards the development of a wearable device and app to assist individuals with autism.</td>
</tr>
<tr>
<td>Germany</td>
<td>Ivo Zell (18)</td>
<td>Physics</td>
<td>A wing is enough: An improved flying wing based on a bell-shaped lift distribution</td>
<td>Flying wings are aircraft without a fuselage and tail assembly. They stand out from conventional aircraft due to their optimised aerodynamics and significantly lower fuel consumption. But these special aircraft also have downsides. They are difficult to steer and are prone to entering a spin. Based on a design developed by the Horten brothers in the 1930s, passionate model aircraft flyer Ivo Zell constructed a flying wing with stable flight behaviour. The young researcher tested the flight characteristics of this flying wing experimentally and theoretically. Therefore own flight test sensors and instrumentations were developed and built. His research results could contribute to making civilian air travel less harmful to the environment.</td>
</tr>
</tbody>
</table>


### Three third prizes (€3 500 per project)

<table>
<thead>
<tr>
<th>Country: Ireland</th>
<th>Contestant: Diana Bura (16) and Mari Louise Fufezan (17)</th>
<th>Field: Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project title:</strong> An Investigation into the Effects of Enzymes used in Animal Feed Additives on the Lifespan of Caenorhabditis Elegans</td>
<td><strong>Abstract:</strong> Our project deals with environmental protection. We have investigated what effects the enzymes found in animal feed additives have on the soil nematode C. elegans. Following the culturing of C. elegans in the presence of β-gluconase, xylanase and phytase, behavioural assays were performed. It was observed that β-gluconase and phytase alter sensory abilities, while all shorten lifespan. Once such organisms come in contact with these enzymes in the soil, their efficiency in the ecosystem decreases. In the long term, the fertility of soils where impaired decomposer organisms exist may reduce. Ideally, this enzyme addition to animal feed should be ceased and organically reared chickens promoted, as over 90% of the European agricultural industry uses enzymes for poultry growth enhancement.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country: Czech Republic</th>
<th>Contestant: Tomáš Heger (20)</th>
<th>Field: Medicine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project title:</strong> Biological activity of essential oils and extracts from narrow-leaved lavender (Lavandula angustifolia Mill.) flower</td>
<td><strong>Abstract:</strong> The main objective of this study was to compare the chemical composition and antiproliferative effect of extracts and essential oils from three narrow-leaved lavender (Lavandula angustifolia Mill.) cultivars. Essential oil composition were compared and the drug concentration providing the highest yield of extract was determined. The obtained lavender extracts and essential oils were in vitro tested in HeLa, MCF7, CCRF-CEM and G-361 tumour lines and non-malignant control BJ human foreskin fibroblasts to measure cell viability. Furthermore, some of the extracts were investigated in terms of their inhibitory activity on Na+/K+-ATPase measured via inorganic phosphate concentration determined.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Country: South Korea</th>
<th>Contestant: Yongchan Hong (18) and Yunji Seo (18)</th>
<th>Field: Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project title:</strong> Agricultural application of halobacteria and their compatible solutes in enhancing plant salinity endurance</td>
<td><strong>Abstract:</strong> Halobacteria were tested as solutions for increasing agricultural productivity in high salinity soils. Halotolerants produce osmoprotectants, such as ectoine and betaine, which can be applied to plants to enhance their salinity endurance. Sixteen halotolerant bacteria were isolated from six coastal areas in South Korea. After optimizing culture conditions, lettuce was grown for three weeks with a treatment divided into four groups. By comparing the dry weight and leaf area, it was proven that the bacteria increased plant growth rate and reduced salinity stress. Based on the Optimal Partitioning Theorem, further experiments involving the cultivation of Selenastrum capricornutum in saline environment proved betaine’s effectiveness in replacing other macromolecules in cell tissues.</td>
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</tr>
</tbody>
</table>
B. HONORARY AWARDS

Stockholm International Youth Science Seminar 2016

Selected winners attend the 2016 Nobel Prize ceremonies, meet the Nobel Laureates and take part in a series of other scientific/cultural activities during the week.

|----------------|-------------------------------|--------------------|---------------------------------------------------------------------|

<table>
<thead>
<tr>
<th>Country: Germany</th>
<th>Contestant: Ivo Zell (18)</th>
<th>Field: Physics</th>
<th>Project title: A wing is enough: An improved flying wing based on a bell-shaped lift distribution</th>
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</thead>
</table>

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<tr>
<th>Country: Czech Republic</th>
<th>Contestant: Tomáš Heger (20)</th>
<th>Field: Medicine</th>
<th>Project title: Biological activity of essential oils and extracts from narrow-leaved lavender (Lavandula angustifolia Mill.) flower</th>
</tr>
</thead>
</table>

London International Youth Science Forum 2017

Selected winners meet young scientists from around the world and take part in the annual two-week intensive summer science festival during July-August 2017.

<table>
<thead>
<tr>
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<th>Field: Mathematics</th>
<th>Project title: Motivic Symbols and Classical Multiplicative Functions</th>
</tr>
</thead>
</table>

|----------------|--------------------------------------|------------------|---------------------------------------------------------------------|

C. SPECIAL DONATED PRIZES

There are 20 special donated prizes:

- JRC (Joint Research Centre): The European Commission's internal science service
- EIROforum: a one-week stay at each of the eight members of EIROforum:

CERN - The European Laboratory for Particle Physics
EUROFusion - JET
EMBL - The European Molecular Biology Laboratory
ESO - The European Southern Observatory
ESA - The European Space Agency
ESRF - The European Synchrotron Radiation Facility
ILL - The Institute Laue-Langevin
XFEL - the European X-Ray Free-Electron Laser Facility

- Intel ISEF 2017 Prizes
- EuCheMS

Bioeconomy prizes:
- BBI JU Biobased industries bioeconomy prize
- FoodDrinkEurope bioeconomy prize
- Innovation in food and agriculture prize
- Ferrero prize
- Nestlé prize
- Dupont prize

JRC - Joint Research Centre
3 prizes: two-day stays at the JRC’s Institutes in Ispra, Italy

<table>
<thead>
<tr>
<th>Country</th>
<th>Name of contestant</th>
<th>Age</th>
<th>Field</th>
<th>Project title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Daniel Höllerer Jonathan Reisinger</td>
<td>19</td>
<td>Engineering</td>
<td>Slackline Tensioning System</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>Luc Baudinaud Florent Baubet Alexis</td>
<td>18</td>
<td>Physics</td>
<td>Diffusion compensation by anticipation</td>
</tr>
<tr>
<td></td>
<td>Bossard</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Sahar El-Hady</td>
<td>18</td>
<td>Chemistry</td>
<td>How extreme was climate change in South Wales at the end of the last glacial period?</td>
</tr>
</tbody>
</table>

EIROFORUM PRIZES

- CERN - The European Laboratory for Particle Physics
  One week stay in Geneva, Switzerland

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<th>Project title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belarus</td>
<td>Uladzislau Hadalau</td>
<td>17</td>
<td>Computing</td>
<td>Geneces – Cloud EcoSystem</td>
</tr>
</tbody>
</table>

- EUROFusion - JET
  One week stay at Culham, United Kingdom
<table>
<thead>
<tr>
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<th>Field</th>
<th>Project title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spain</td>
<td>Jaime Redondo Yuste</td>
<td>17</td>
<td>Physics</td>
<td>A study of the interaction between a magnetic field and electrolytic ions</td>
</tr>
<tr>
<td>Lithuania</td>
<td>Rūta Prakapaitė</td>
<td>18</td>
<td>Medicine</td>
<td>Antimicrobial bacteriophage dressing in chronic wound treatment</td>
</tr>
<tr>
<td>Germany</td>
<td>Tassilo Schwarz</td>
<td>17</td>
<td>Computing</td>
<td>Drone detection system: Detection, tracking and classification of potentially dangerous flight objects for multicopter defence</td>
</tr>
<tr>
<td>Estonia</td>
<td>Kristjan Kongas</td>
<td>19</td>
<td>Computing</td>
<td>Simulation of the collision of binary white dwarfs using a cubic grid - stability analysis by variation of diffusion constant and resolution</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>Eliška Bršlicová</td>
<td>19</td>
<td>Environment</td>
<td>Subvolcanic intrusions in South Bohemia</td>
</tr>
</tbody>
</table>
• ILL - The Institute Laue-Langevin
One week stay in Grenoble, France

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<th>Age</th>
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<th>Project title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switzerland</td>
<td>Balduin Dettling</td>
<td>20</td>
<td>Engineering</td>
<td>Development of a 3D Display</td>
</tr>
</tbody>
</table>

• XFEL - the European X-Ray Free-Electron Laser Facility
One week stay in Hamburg, Germany

<table>
<thead>
<tr>
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<th>Project title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hungary</td>
<td>Péter Udvardi</td>
<td>18</td>
<td>Physics</td>
<td>Microelectromechanical structure for sensing of low frequency sounds and vibrations</td>
</tr>
</tbody>
</table>

Intel ISEF 2017 Prizes

3 prizes: participate at Intel ISEF in May 2017, Los Angeles (CA), USA

<table>
<thead>
<tr>
<th>Country</th>
<th>Name of contestant</th>
<th>Age</th>
<th>Field</th>
<th>Project title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Israel</td>
<td>Amalya Ben Asher</td>
<td>17</td>
<td>Medicine</td>
<td>Aggregated Drip Infusion System</td>
</tr>
<tr>
<td></td>
<td>Tal Cohen</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yuval Feldman</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td>Daniela Gods-Romanovska</td>
<td>18</td>
<td>Engineering</td>
<td>The textile-based tensesistive sensors’ operation and their usage in the innovative technologies</td>
</tr>
<tr>
<td></td>
<td>Zane Grant</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Israel</td>
<td>Naama Schor</td>
<td>18</td>
<td>Social sciences</td>
<td>The morality of larks and owls: relationship between the biological clock and morality in decision making.</td>
</tr>
</tbody>
</table>

EuCheMS special donated prize for chemistry
€1 000

<table>
<thead>
<tr>
<th>Country</th>
<th>Name of contestant</th>
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<th>Field</th>
<th>Project title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>Christian Schärf</td>
<td>19</td>
<td>Chemistry</td>
<td>Alpha-aluminium oxide-based gemstones: Development of a chemical synthesis process prompted</td>
</tr>
<tr>
<td></td>
<td>Paul Rathke</td>
<td>18</td>
<td></td>
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</tbody>
</table>
Friedrich Wanierke 17 by current mining conditions

BBI JU Biobased industries bioeconomy prize
a stay in Brussels, including travel and accommodation. Activities will include visits to biobased plants in Belgium and Norther France.

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>Lithuania</td>
<td>Modestas Gudauskas</td>
<td>18</td>
<td>Biology</td>
<td>Acetobacter spp. bacteria producing biopolymers simultaneously</td>
</tr>
</tbody>
</table>

FoodDrinkEurope bioeconomy prize
Apple MacBook Air for the best project in the field of agri food

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<th>Project title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>Daniel Copil</td>
<td>18</td>
<td>Biology</td>
<td>Natural antimicrobial extracted from medicinal plants</td>
</tr>
<tr>
<td></td>
<td>Sofia Onorato</td>
<td>19</td>
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</table>

Dupont prize
a stay in Denmark, including travel and accommodation. Activities will include visits to Dupont's plants in Denmark and a sightseeing tour.

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<th>Project title</th>
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</thead>
<tbody>
<tr>
<td>Ireland</td>
<td>Diana Bura</td>
<td>16</td>
<td>Environment</td>
<td>An Investigation into the Effects of Enzymes used in Animal Feed Additives on the Lifespan of Caenorhabditis Elegans</td>
</tr>
<tr>
<td></td>
<td>Mari Louise Fufezan</td>
<td>17</td>
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</tbody>
</table>

Ferrero prize
a stay in Italy, including travel and accommodation. Activities will include visits to Ferrero's research facilities in Alba.

<table>
<thead>
<tr>
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<th>Field</th>
<th>Project title</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Schools</td>
<td>Adam Urmos</td>
<td>18</td>
<td>Chemistry</td>
<td>Multifunctional application of natural sensor arrays</td>
</tr>
</tbody>
</table>

Nestle prize
A stay in the UK, including travel and accommodation. Activities will include visits to Nestle's facilities in the historical city of York.

<table>
<thead>
<tr>
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<th>Age</th>
<th>Field</th>
<th>Project title</th>
</tr>
</thead>
</table>
Innovation in food and agriculture prize
Participation at the FOOD 2030 conference, organised by the European Commission, in Brussels, on 12 and 13 October 2016. Travel and accommodation are included.

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<thead>
<tr>
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<th>Name of contestant</th>
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<th>Field</th>
<th>Project title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slovenia</td>
<td>Ana Milovanović, Ana Halužan Vasle</td>
<td>19, 20</td>
<td>Biology</td>
<td>Designing Synthetic Gene Regulatory Networks</td>
</tr>
</tbody>
</table>

WOLFRAM
Wolfram Research
All Mathematics students are awarded a free one year Mathematica Student Edition license + free one-year subscription to WolframAlpha Pro

D. HOST ORGANISER SPECIAL DONATED PRIZES

PRACE
Visit to Czech Republic

<table>
<thead>
<tr>
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<th>Age</th>
<th>Field</th>
<th>Project title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>Eero Valkama, Iiro Kumpulainen</td>
<td>18, 18</td>
<td>Computing</td>
<td>Digitalization of Chess Games using Computer Vision</td>
</tr>
</tbody>
</table>

Salvetti Foundation
€2 000

<table>
<thead>
<tr>
<th>Country</th>
<th>Name of contestant</th>
<th>Age</th>
<th>Field</th>
<th>Project title</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td>Ethan Dunbar-Baker, Po Yin Chau, Rogan McGilp</td>
<td>15, 18, 17</td>
<td>Engineering</td>
<td>David’s Wheels; a disability accessible and driveable hot rod for social and physical mobility</td>
</tr>
</tbody>
</table>