ANNEX 1

Prize-winners

28th European Union Contest for Young Scientists
Brussels

A. CORE PRIZES

Three first prizes (€7 000 per project)

Country: Norway
Contestant: Ane Espeseth (18) and Torstein Vik (17)
Field: Mathematics
Project title: Motivic Symbols and Classical Multiplicative Functions
Abstract: 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.

Country: Italy
Contestants: Valerio Pagliarino (16)
Field: Computing
Project title: LaserWAN: laser broadband internet connection
Abstract: 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.

Country: USA
Contestant: River Grace (17)
Field: Biology
Project title: 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
Abstract: 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.

Three second prizes (€5 000 per project)

Country: Germany
Contestant: Tassilo Schwarz (17)
Field: Computing
Project title: Drone detection system: Detection, tracking and classification of potentially dangerous flight objects for multicopter defence
Abstract: 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.

Country: Canada
Contestant: Kayley Ting (16)
Field: Medicine
Project title: Analysis of Electrodermal Activity to Quantify Stress Levels in Autism
Abstract: 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.

Country: Germany
Contestant: Ivo Zell (18)
Field: Physics
Project title: A wing is enough: An improved flying wing based on a bell-shaped lift distribution
Abstract: 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.

Three third prizes (€3 500 per project)

Country: Ireland
Contestant: Diana Bura (16) and Mari Louise Fufezan (17)
Field: Environment
Project title: An Investigation into the Effects of Enzymes used in Animal Feed Additives on the Lifespan of Caenorhabditis Elegans
Abstract: 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 βglucanase, xylanase and phytase, behavioural assays were performed. It was observed that βglucanase 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.

Country: Czech Republic
Contestant: Tomáš Heger (20)
Field: Medicine
Project title: Biological activity of essential oils and extracts from narrow-leaved lavender (Lavandula angustifolia Mill.) flower
Abstract: 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.

Country: South Korea
Contestant: Yongchan Hong (18) and Yunji Seo (18)
Field: Environment
Project title: Agricultural application of halobacteria and their compatible solutes in enhancing plant salinity endurance
Abstract: 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.

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.

Country: Norway
Contestant: Ane Espeseth (18)
Field: Mathematics
Project title: Motivic Symbols and Classical Multiplicative Functions

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

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

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.

Country: Norway
Contestant: Torstein Vik (17)
Field: Mathematics
Project title: Motivic Symbols and Classical Multiplicative Functions

Country: Italy
Contestants: Valerio Pagliarino (16)
Field: Computing
Project title: LaserWAN: laser broadband internet connection

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
- BBI JU Biobased industries bioeconomy prize
- FoodDrinkEurope bioeconomy prize
- Dupont prize
- Ferrero prize
- Nestlé prize

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

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

EIROFORUM PRIZES

- **CERN** - The European Laboratory for Particle Physics

  One week stay in Geneva, Switzerland

Country	Name of contestant	Age	Field	Project title
Belarus	Uladzislau Hadalau	17	Computing	Geneces – Cloud EcoSystem

- **EUROFusion - JET**

  One week stay at Culham, United Kingdom

Country	Name of contestant	Age	Field	Project title
Spain	Jaime Redondo Yuste	17	Physics	A study of the interaction between a magnetic field and electrolytic ions

- **EMBL** - The European Molecular Biology Laboratory

  One week in Heidelberg, Germany

Country	Name of contestant	Age	Field	Project title
Lithuania	Rūta Prakapaitė	18	Medicine	Antimicrobial bacteriophage dressing in chronic wound treatment

- **ESO** - The European Southern Observatory

  Visit to ESO site in Chile

Country	Name of contestant	Age	Field	Project title
Germany	Tassilo Schwarz	17	Computing	Drone detection system: Detection, tracking and classification of potentially dangerous flight objects for multicopter defence

- **ESA** - The European Space Agency

  Participate at a major European space science conference under the sponsorship of the European Space Agency, including coverage of their travel and accommodation costs.

Country	Name of contestant	Age	Field	Project title
Estonia	Kristjan Kongas	19	Computing	Simulation of the collision of binary white dwarfs using a cubic grid - stability analysis by variation of diffusion constant and resolution

- **ESRF** - The European Synchrotron Radiation Facility

  One week stay in Grenoble, France

Country	Name of contestant	Age	Field	Project title
Czech Republic	Eliška Bršlicová	19	Environment	Subvolcanic intrusions in South Bohemia

- **ILL** - The Institute Laue-Langevin

  One week stay in Grenoble, France

Country	Name of contestant	Age	Field	Project title
Switzerland	Balduin Dettling	20	Engineering	Development of a 3D Display

- **XFEL - the European X-Ray Free-Electron Laser Facility**

  One week stay in Hamburg, Germany

Country	Name of contestant	Age	Field	Project title
Hungary	Péter Udvardi	18	Physics	Microelectromechanical structure for sensing of low frequency sounds and vibrations

Intel ISEF 2017 Prizes

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

Country	Name of contestant	Age	Field	Project title
Israel	Amalya Ben Asher Tal Cohen Yuval Feldman	17 18 18	Medicine	Aggregated Drip Infusion System
Latvia	Daniela Gods-Romanovska Zane Grants	18 19	Engineering	The textile-based tensoresistive sensors' operation and their usage in the innovative technologies
Israel	Naama Schor	18	Social sciences	The morality of larks and owls: relationship between the biological clock and morality in decision making.

EuCheMS special donated prize for chemistry

€1 000

Country	Name of contestant	Age	Field	Project title
Germany	Christian Schärf Paul Rathke Friedrich Wanierke	19 18 17	Chemistry	Alpha-aluminium oxide-based gemstones: Development of a chemical synthesis process prompted 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.

Country	Name of contestant	Age	Field	Project title
Lithuania	Modestas Gudauskas	18	Biology	Acetobacter spp. bacteria producing biopolymers simultaneously

FoodDrinkEurope bioeconomy prize

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

Country	Name of contestant	Age	Field	Project title
Italy	Daniel Copil Sofia Onorato	18 19	Biology	Natural antimicrobial extracted from medicinal plants

Dupont prize

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

Country	Name of contestant	Age	Field	Project title
Ireland	Diana Bura Mari Louise Fufezan	16 17	Environment	An Investigation into the Effects of Enzymes used in Animal Feed Additives on the Lifespan of Caenorhabditis Elegans

Ferrero prize

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

Country	Name of contestant	Age	Field	Project title
European Schools	Adam Urmos	18	Chemistry	Multifunctional application of natural sensor arrays

Nestle prize

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

Country	Name of contestant	Age	Field	Project title
Slovenia	Ana Milovanović Ana Halužan Vasle	19 20	Biology	Designing Synthetic Gene Regulatory Networks

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

Country	Name of contestant	Age	Field	Project title
Finland	Eero Valkama Iiro Kumpulainen	18 18	Computing	Digitalization of Chess Games using Computer Vision

Salvetti Foundation

€2 000

Country	Name of contestant	Age	Field	Project title
United Kingdom	Ethan Dunbar-Baker Po Yin Chau Rogan McGilp	15 18 17	Engineering	David's Wheels; a disability accessible and driveable hot rod for social and physical mobility