

**Prize-winners**  
**27th European Union Contest for Young Scientists**  
**MILAN**

**A. CORE PRIZES****Three first prizes (€7 000 per project)**

<b>Country: USA</b>
<b>Contestant: Sanath Kumar Devalapurkar (15)</b>
<b>Field: Mathematics</b>
<b>Project title: On the Stability and Algebraicity of Algebraic K-theory</b>
<b>Abstract:</b> The purpose of this paper is to establish a new perspective on the algebraic K-theory of exact infinity-categories. If the definition of algebraic K-theory is slightly modified, one can interpret the K-theory of an exact infinity-category as a stable infinity-category, and not as a spectrum. We demonstrate that this formalism significantly simplifies K-theoretic computations.

<b>Country: Poland</b>
<b>Contestants: Michał Bączyk (17) and Paweł Piotr Czyż (17)</b>
<b>Field: Physics</b>
<b>Project title: The studies of behaviour of single and coupled on-off type oscillators on the example of bottle oscillators</b>
<b>Abstract:</b> What is common for clocks, human hearts and... diverted bottles filled with water? All of them exhibit oscillations! We have analysed "bottle oscillators" and obtained a mathematical model describing them. Next, we decided to make more complicated systems like two, three or four bottles linked in a big oscillator! These "coupled oscillators" behave very chaotically, what is described in physics as frustration. If You are curious about incredible hydrodynamics, feel invited to see our work or to write us!

<b>Country: Germany</b>
<b>Contestant: Lukas Stockner (18)</b>
<b>Field: Computing</b>
<b>Project title: Statistical modeling of volume-scattered light</b>
<b>Abstract:</b> How does a light beam scatter in a specific environment and how is it reflected by objects? These are key questions in generating computer graphics that look as realistic as actual photos. A particular challenge in this process is light scattering, which can occur in many typical materials such as wax, marble, skin or certain liquids. To simulate these kinds of effects so they appear as natural as possible, Lukas Stockner implemented a special mathematical method that makes use of statistics. The result for the young researcher: astoundingly realistic images, for example of filled glasses and transparent gemstones.

### Three second prizes (€5 000 per project)

<b>Country: Austria</b>
<b>Contestant:</b> Michael Bayrhammer (19) and Florian Thaller (19)
<b>Field: Medicine</b>
<b>Project title: Tendon Tissue Engineering - Development of a Novel Tissue Bioreactor for Culturing Tendons</b>
<b>Abstract:</b> People frequently damage tendons as a result of various types of accidents which are difficult to treat. To obtain more precise results about the process of tendon regeneration, a bioreactor was developed based on prior experiments with local institutes. As one of the major goals was to refrain from animal experiments, the reactor was designed to cultivate tendons in situations as true to real life as possible. Six cultivation chambers allow for parallel clamping of 1.3-cm-long rat tendons while providing them with circulating nutrient solution. To mimic lifelike conditions, the tendons are strained by an array of motors. A specially developed software monitors the operations based on sensor results and measures tendon growth using a highly accurate optical system. This novel device is expected to assist institutes worldwide in advancing their tendon-research.

<b>Country: Russia</b>
<b>Contestant:</b> Polina Vladislavovna Ledkova (18)
<b>Field: Environment</b>
<b>Project title: Successions of vegetation and recultivation of the anthropogenically changed landscapes in neighborhoods of the Krasnoye settlement and in the Nenets state nature reserve, 2013-2014</b>
<b>Abstract:</b> This was the first time that the successions of vegetation of the anthropogenically changed landscapes of floodplain meadows, tundra and forest tundra had been traced in the territory of the Nenets Autonomous Area. The natural landscapes of the Krasnoye settlement and the Nenets state nature reserve have significantly disrupted as a result of human activity. It is revealed that the restoration of damaged vegetation communities of tundra ecosystems doesn't happen; willow-grass-gramineous cenoses develop on their place. This process proceeds extremely slowly. It is established that the remains of wooden structures in the vicinity of abandoned gas condensate wells are overgrown much faster than on bare sand. The author has developed recommendations for recultivation of anthropogenically modified.

<b>Country: Poland</b>
<b>Contestant:</b> Dominika Katarzyna Bakalarz (18) and Joanna Michalina Jurek (19)
<b>Field: Medicine</b>
<b>Project title: Origami BioBandage - mathematically described multipotential bioimplant based on polymeric nanomaterial modified by hydroxyapatite and stem cells</b>
<b>Abstract:</b> This project has been created to fight against osteoporosis, which is a serious problem affecting whole society. The project is an innovative research describing bioimplant consisting of polymeric nanomaterial covered with stem cells. Material had been modified by the hydroxyapatite, which helps stem cells to differentiate into osteoblasts (bone cells). Our experiments were complemented by mathematical modelling and computational simulations, which included initial data taken from our biological in vitro experiments. Using computers allowed us to describe bioimplant more precisely, consider more cases and control more variables, like folding origami from the material, what is done by cells. Those bioimplants would be applied in a place of bone fracture of the patient with osteoporosis.

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

<b>Country: New Zealand</b>
<b>Contestant:</b> Timothy Matthew Logan (18)
<b>Field: Environment</b>
<b>Project title: To Graze or Not to Graze?</b>
<b>Abstract:</b> Traditional New Zealand grazing practices with a low-moderate stock rate have allowed the survival of many non-palatable native plants within grasslands now dominated by exotics. However, agricultural intensification and weed invasions easily disrupt and out-compete the low-stature grasslands plants, which make up much of the last native biodiversity on the Canterbury Plains. The investigation focus was whether stock grazing enhances survival of native prostrate plant species. Results show that biotic variation between grazed and un-grazed sites is substantial, with grazed areas showing higher diversity and abundance of native plants, with the biggest effect occurring on deep soils through the thinning of dense exotic grasses that would otherwise out-compete most native species.

<b>Country: Germany</b>
<b>Contestant:</b> Anselm von Wangenheim (18)
<b>Field: Physics</b>
<b>Project title: Monopod - Physics at the tipping point</b>
<b>Abstract:</b> Six-legged robots capable of traversing difficult terrain are popular objects of research. But is it possible to build a robot that stands on just a single leg, is stable and moves forward by jumping? This is the question Anselm von Wangenheim sought to explore. Using complex simulations, he was able to show that it is physically possible to build what he refers to as a monopod—a one-legged robot—capable of movement by tipping forward while avoiding toppling over by the rotation of a flywheel. The young researcher is also able to announce his first experimental successes: He has already succeeded in building a duopod out of skewers, hot glue and sensors.

<b>Country: Estonia</b>
<b>Contestant:</b> Katariina Kisand (18)
<b>Field: Chemistry</b>
<b>Project title: Synthesis and biochemical characterization of covalent fluorescent probes targeting mitotic protein kinase Aurora A</b>
<b>Abstract:</b> Aurora A is an enzyme that contributes to the cell cycle regulation; the over-expression of Aurora A has been reported in cancer cells and it is an important drug target. In this work 3 novel fluorescent probes were synthesized targeting Aurora A, of which 2 compounds (Probes 1 and 2) possessed low nanomolar affinity to Aurora A. Upon UV-irradiation, 2 probes incorporating photo reactive moieties (Probes 2 and 3) formed successfully covalent complex with recombinant Aurora A, whereas no signal was detected for the control compound (Probe 1). Overall, Probe 2 formed the complex most effectively and readily (15 min irradiation time).

## B. HONORARY AWARDS

### Stockholm International Youth Science Seminar 2015

Selected winners attend the 2015 Nobel Prize ceremonies, meet the Nobel Laureates and take part in a series of other scientific/cultural activities during the week.

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<b>Field: Computing</b>
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<b>Country: Russia</b>
<b>Contestant: Polina Vladislavovna Ledkova (18)</b>
<b>Field: Environment</b>
<b>Project title: Successions of vegetation and recultivation of the anthropogenically changed landscapes in neighborhoods of the Krasnoye settlement and in the Nenets state nature reserve, 2013-2014</b>

### London International Youth Science Forum 2016

Selected winners meet young scientists from around the world and take part in the annual two-week intensive summer science festival during July-August 2016.

<b>Country: USA</b>
<b>Contestant: Sanath Kumar Devalapurkar (15)</b>
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<b>Country: Poland</b>
<b>Contestant: Michał Bączyk (17) and Paweł Piotr Czyż (17)</b>
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## C. SPECIAL DONATED PRIZES

There are 15 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 2015 Prizes
- EuCheMS

### JRC - Joint Research Centre

3 prizes: one week stays at the JRC's Institutes in Ispra, Italy

Country	Name of contestant	Age	Field	Project title
Estonia	Katariina Kisand	18	Chemistry	Synthesis and biochemical characterization of covalent fluorescent probes targeting mitotic protein kinase Aurora A
Lithuania	Gabrielė Bumbulytė Lukas Petreikis	19 19	Biology	Herbal Extracts to Control Granary Weevil ( <i>Sitophilus granarius</i> L.)
Italy	Alvaro Maggio	20	Chemistry	Metals - Catchers: "A banana a day keeps the heavy metals away"

### EIROFORUM PRIZES

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

One week stay in Geneva, Switzerland

Country	Name of contestant	Age	Field	Project title
Turkey	Baris Volkan Gürses	17	Physics	Generation of Artificial Gravity by Using Electrostatic Force for Prevention of Muscle Atrophy and Osteoporosis Occurring in Gravity-Free Environment

- **EUROFusion - JET**

One week stay at Culham, United Kingdom

Country	Name of contestant	Age	Field	Project title
Hungary	Péter Zsolt Pázmándi	20	Physics	Detecting particles with TPC detector

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

One week in Heidelberg, Germany

Country	Name of contestant	Age	Field	Project title
Czech Republic	Michaela Kajsova	19	Chemistry	The Effect of Cholesterol on Biological Membranes

- **ESO** - The European Southern Observatory

Visit to ESO site in Chile

Country	Name of contestant	Age	Field	Project title
Poland	Paulina Małgorzata Drożak	18	Environment	Research of the relationship between temperature anomaly on Earth and chosen parameters of solar activity

- **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
Germany	Anselm von Wangenheim	18	Physics	Monopod - Physics at the tipping point

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

One week stay in Grenoble, France

Country	Name of contestant	Age	Field	Project title
Israel	Avner Arie Okun	17	Biology	The structure of the large ribosomal subunit of Deinococcus radiodurans in complex with different antibiotics
	Ori Lavi	17		

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

One week stay in Grenoble, France

Country	Name of contestant	Age	Field	Project title
Russia	Artem Viktorovich Vasilyev	17	Physics	Muon telescope

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

One week stay in Hamburg, Germany

Country	Name of contestant	Age	Field	Project title
Switzerland	Barbara Roos	18	Physics	Analysis and visualisation of space-time models

## Intel ISEF 2016 Prizes

3 prizes: participate at Intel ISEF in May 2015, Pittsburgh (PA), USA

Country	Name of contestant	Age	Field	Project title
Finland	Petteri Timonen	18	Social sciences	Optimizing Mobile Blood Collection with a Computational Tool
Germany	Jakob Paul Ignaz Maria Dichgans	17	Chemistry	Power to gas - an alternative approach
	Daniel Simon Riesterer	18		
	Lumen Latus Haendler	19		
Ireland	Eimear Frances Murphy	17	Social sciences	Alcohol consumption: does the apple fall far from the tree?
	Ian Dominic O'Sullivan	17		

## EuChemS special donated prize for chemistry

€1 000

Country	Name of contestant	Age	Field	Project title
Czech Republic	Michaela Kajsova	19	Chemistry	The Effect of Cholesterol on Biological Membranes

## 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

### University of Milano-Bicocca

3 prizes: Science Internships of one month (November 3<sup>rd</sup> – December 3<sup>rd</sup>).

Country	Name of contestant	Age	Field	Project title
Poland	Dominika Katarzyna Bakalarz	18	Medicine	Origami BioBandage - mathematically described multipotential bioimplant based on polymeric nanomaterial modified by hydroxyapatite and stem cells
	Joanna Michalina Jurek	19		
United Kingdom	Sarah Sobka	18	Medicine	Understanding Lubiprostone's mechanism of action to examine whether it can be prescribed to cystic fibrosis patients
Czech Republic	Thi Thu Giang Tran	19	Medicine	More Efficient Cancer Treatment Using Novel Ferrocene and Titanocene Derivatives

### FBK, Bruno Kessler foundation

One week internship in their laboratories in Trento.

Country	Name of contestant	Age	Field	Project title
Italy	Davide Carboni	19	Environment	iBin: a "smart" bin to separate waste collection
	Alessandro Carra	19		

### IIT, The Italian Institute of Technology

One week internship in their laboratories in Genoa.

Country	Name of contestant	Age	Field	Project title
Austria	Michael Bayrhammer	19	Medicine	Tendon Tissue Engineering - Development of a Novel Tissue Bioreactor for Culturing Tendons
	Florian Thaller	19		

### A2A, the multiutility of Milan and Brescia

2.000 EUR

Country	Name of contestant	Age	Field	Project title
Lithuania	Greta Patkauskaitė	18	Environment	Scented pelargonium against horse-chestnut leaf miners

**AICA**, the Italian Association for Information and Communication Technologiescia

1.500 EUR

Country	Name of contestant	Age	Field	Project title
Israel	Nadav Meir Shalev	19	Computing	ImproApp – an Application that Transforms Live Music into Sheet Music
	Roi Gil	18		

**FAST**, the Italian Federation of Scientific and Technical Association and FOIST, the Foundation for the Development and the Promotion of the Education and the Scientific and Technical

1.000 EUR

Country	Name of contestant	Age	Field	Project title
Switzerland	Giorgio Elias Scherrer	19	Social sciences	The tinfoil crackled: how students in Mussolini's Italy were indoctrinated. Organisation, methods, content

### **SOL Group**

2.000 EUR

Country	Name of contestant	Age	Field	Project title
Egypt	Abdel-Rahman Sharfaldeen	17	Chemistry	Methane Recovery from manure biogas by amine absorption for hydrogen synthesis
	Mohamed Abdelsalam	17		

### **Salveti Foundation**

2.000 EUR

Country	Name of contestant	Age	Field	Project title
Austria	Lorenz Sauerzopf	19	Materials	Fatigue Limit Test Stand
	Stefan Fuchs	19		

### **EXPO 2015 Food projects**

**EXPO 2015 prize** - laptop for each of the participants in the project and participation in EXPO 2015 closing event + 1 day visit in ISPRA

Country	Name of contestant	Age	Field	Project title
Ireland	Mark William O'Dowd	16	Food - EXPO 2015	Injury Increasing Crop Yields

Lithuania	Simonas Pranys	19	Food - EXPO 2015	Winter Rape Germination and Growth Control Using Sound
	Pijus Žagrakalys	18		
Poland	Sara Berent	19	Food - EXPO 2015	The influence of essential oils on selected bacteria and fungi microorganisms as to verify their potential as plant and food protection specificities