EUCYS 2020-2021
SALAMANCA

32nd European Union Contest for Young Scientists 2020-2021
The future of science

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EUCYS 2020 SALAMANCA
32nd European Union Contest for Young Scientists 2020-2021

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Welcome to the European Union Contest for Young Scientists 2020-2021
Dear Young Scientists,

Welcome to the 32nd edition of the European Union Contest for Young Scientists and our first ever virtual EUCYS! You are here because you won first prize in your national science competition and are now representing your countries at this prestigious competition. This is a fantastic achievement and you should be very proud! Congratulations!

I am so sorry that you will be unable to travel to Spain to meet your peers and the panel of judges to compete in person and to visit the beautiful city of Salamanca. Your safety is our first concern and in view of the ongoing COVID-19 situation across Europe the difficult decision was taken to move the contest on-line for this year. I am very grateful to our Spanish hosts who have worked very hard to make this happen.

The Corona virus has dominated our lives since early 2020. Europe came to a standstill; workers moved home to work, and homes became classrooms for students. The world became very small again; planes stopped flying and airports stood still. However, thanks to the continuous improvement in technology we continued to work and to communicate with our zooms, our webinars and our on-line conferences.

I have been greatly impressed with the work of our health service personnel and scientists during the past year. They faced huge challenges with this worldwide pandemic but within a year had come up with vaccines to make us all safe again. If the last year taught us anything it was the importance of investing in education, science, technology, and innovation.

EUCYS is about expanding your talents. It is about encouraging you and helping you to pursue careers in science, research, and innovation. Incredible things happen when great minds meet. To solve the great challenges of our time we need more scientists and innovators in Europe. You are our future scientists and innovators and you are the reason why the European Union is investing millions of euros in young scientists and science education by means of its Horizon Europe research and innovation programmes and the ERASMUS programme.

I wish you well in your pursuit of science and I hope that participating in the contest will encourage you to go on to achieve even greater things!

I am sure that this year’s EUCYS will be memorable!

Mariya Gabriel
Commissioner for Innovation, Research, Culture, Education and Youth

Dear Young Scientists,

The University of Salamanca welcomes you to this event being held in this university city par excellence, a place which is both welcoming and dynamic and has devoted more than 800 years to education and research.

It is an honour for me and for the institution I represent that the city of Salamanca is hosting the European Union Contest of Young Scientists (EUCYS), the most relevant event of its kind in Europe. It is an interesting initiative promoted by the European Commission which unites young people like yourselves with the aim of exchanging scientific knowledge.

The current pandemic has highlighted the importance of science as a key component in tackling the major challenges facing humanity. It is you, young researchers, who must take the lead in the pursuit of new advances in research in addition to the designing of innovative strategies for the future. In this sense, for the University of Salamanca research is a strategic issue. We believe that universities should facilitate the development of the capacities of young people in the field of science.

I invite you to take advantage of this excellent opportunity to meet other young people with similar interests and skills and to obtain advice and guidance from leading European scientists.

Welcome!

Ricardo Rivero
Rector of the University of Salamanca
Dear Young Scientists,

Science is the most noble of human activities. Science is the source of our capacity to generate wealth and well-being for people as a whole. It is our defence against illness and catastrophes. It is also what broadens our horizons of discovery in every domain and is thus intertwined with creativity in all its expressions including art, music, and literature.

Furthermore, science stands firm against ignorance, superstition, and the assault on reason so dominant in the fake news of the social media. It is therefore the best antidote we have against the manipulation of minds by would-be tyrants and demagogues. The advancement of science is crucial to foster the positive side of humanity against the demons of destruction which inhabit us. This is why science and ethics are necessary companions in the endless search for our enlightenment.

Youth is the age of discovery and creativity; it is the moment in our life cycle when we feel everything is possible for us and for the world. And it is. It suffices to translate all this young energy in the betterment of our lives, using, as a paramount tool our scientific capacity to understand and act upon this understanding. This is why I truly believe that there is nothing more exhilarating than being a young scientist precisely at a time when knowledge is advancing by quantum leaps and when pandemics, and human-induced catastrophes loom on the horizon. Yet, the difficulties of the task are enormous and you will need all your enthusiasm and determination, but also patience in the pursuit of this noble endeavour. Institutions in all countries usually speak highly of science but do not follow up this praise in terms of their budgetary priorities.

Dark forces of domination need to subdue science to keep people ignoring the true situation of their lives. Bureaucracies, including scientific bureaucracies, often resist innovation, thus stalling attempts by young scientists to shift the paradigms of knowledge in each field. In fact we know that the relentless critique of established beliefs is the very essence of science.

But you are young, and you are scientists, and if you really believe in what you do and want to do, nothing and no one can stop you for the benefit of all of us. Wishing you good luck is wishing luck to all of us humans as a last hope to rise above our sorry state.

**Professor Manuel Castells**

*Minister of Universities, Government of Spain*

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Representing a country is a great responsibility but also the greatest honour a person can be given. You are the winners of your respective countries and are assembled here at the 32nd edition of the European Union Contest for Young Scientists to compete in this European Scientific Olympic Competition to try and get on the podium of Science.

This year’s contest comes in a particularly difficult and challenging period. We are still suffering from the havoc caused by the pandemic and we feel knocked out. But as in the boxing ring, we still have the strength to recover, to stand up, and to continue the fight, because we are resilient and we want to live with our family, friends and colleagues around us.

You are our most precious hope. In you we trust, because your youth, your hard work, and your endeavours will help us win this race against disease. The future of the world is in your hands, in your brains, and in your hearts. Science should constitute the beacon of society, and Europe is ready to launch a far-reaching and shining beam. Your projects and ideas are the fuel that will feed the stream of light. You are a paradigm of strength, enthusiasm and hard work.

**Rocío Lucas Navas**

*Regional Minister of Education, Junta de Castilla y León*
Dear Young Scientists,

Salamanca is deeply proud to welcome you despite the distance. There are few cities such as ours with such a long and established link with knowledge, the discussion of ideas, and research, all of which are strongly related to our daily life.

From the so called School of Salamanca, the origin of Human Rights, the source of sovereignty of peoples, and the starting point for modern economic theory, to our University which is eight centuries old and a world point of reference for teaching including our research centres, our city is a constant laboratory of thinking and analysis. The Municipality of Salamanca is deeply concerned with science and research. In fact, we are the first Spanish local government to develop a specific programme aimed at the promotion, protection, and encouraging of talented young scientists.

Thanks to this programme we help both secondary and university students with scholarships and also allow promising researchers working abroad to be able to return to Salamanca so as to continue with their academic training, encouraging their own research teams and developing highly innovative projects which may improve the city’s quality of life.

I am deeply convinced that this meeting will be extremely useful in order to give greater visibility in Europe to our strong and deep bond with research which will no doubt be strongly reinforced.

Carlos García Carbaya
Mayor of Salamanca

As researchers ourselves, and professionals who dedicate our lives to supporting and disseminating science and research, we sincerely hope that you will enjoy EUCYS2020/2021 as much as possible. Please do not hesitate to contact us; we are here to help you. We wish you all the best for your scientific future.

Carlos Hernández-García
on behalf of the EUCYS2020/2021 team

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Dear Young Scientists,

The road towards EUCYS2020/2021 has not been an easy one. During our preparation of EUCYS2020 in Salamanca, COVID-19 burst into our lives. Now that the entire world has undergone the devastating consequences of a new virus, it has become clearer than ever how our future societies will need to rely on knowledge and science in order to face the challenges that are to come. And science needs people. In particular young people like you, with unique skills such as innovation, creativeness, and above all inquisitiveness. Science and our world needs you and we are here to support your first steps as scientists.

This EUCYS edition has its unique signature. We have made a special effort to organise EUCYS thinking of you, the participants. Apart from the contest itself, which will take place on a virtual platform, we have drawn up a programme of very attractive activities—a round table with prestigious scientists, a Nobel prize plenary lecture, outreach talks—which we hope will benefit your careers. We hope that these activities will allow you to detect the challenges you will face as young scientists and to learn how to tackle them within our state-of-the-art scientific environment.

Science, like music or art, is universal. And by being universal, nowadays we cannot devote ourselves to science without team work, which makes cooperation and collaboration very valuable—if not mandatory—skills for scientific research. We know how delightful it is to win a EUCYS prize, but bear in mind that the best prize you can obtain from EUCYS2020/2021 is the friendship of your peers. In this edition we cannot benefit from face-to-face interaction in Salamanca, but we strongly encourage you to take advantage of the virtual platform to interact as much as possible with your peers, and, hopefully to establish meaningful friendships with future colleagues. We hope that you remember EUCYS Salamanca as one of the milestones of the beginning of your scientific careers.
Iberdrola, the utility of the future

With a history of over 170 years, today Iberdrola is a global energy leader, the number-one producer of wind power and one of the world’s biggest electricity utilities by market capitalisation. The group supplies energy to almost 100 million people in dozens of countries, has more than 600,000 shareholders, and a workforce comprising more than 38,000 employees. Iberdrola is leading the transition towards a sustainable energy model through investments in renewable energy, smart grids, large-scale energy storage and digital transformation, offering the most advanced products and services to our customers.

IBERDROLA, LEADERS IN DRIVING THE SDGS

SDG 13: CLIMATE ACTION

- Iberdrola is leading the energy sector that produces and supplies electricity to some 100 million people.
- Iberdrola is moving forward in the international commitment to offshore wind power.
- 100% of our generation assets (48 GW of capacity, of which around 30 GW renewables) is already managed digitally and automatically.
- Sustainable Mobility Plan with the investment of 150 million euros to boost electric mobility over the next five years.
- Iberdrola is spearheading the development of green hydrogen to meet the electrification and decarbonisation needs of sectors such as industry and heavy transport.

LEADERS IN SUSTAINABLE INNOVATION

- Iberdrola is the leading private utility in Europe and the second in the world by investment in R&D, according to the European Commission.
- In 2020, Iberdrola invested in R&D 300 million euros, with an accumulated investment of more than 2 billion euros in the last decade.
- By 2022 this investment will rise to 330 million euros per year and by 2025 to 400 million euros per year.
- R&D in renewables, the production of green hydrogen, the development of floating wind and photovoltaic installations, pumped hydroelectric plants, batteries and new solutions for customers.

2021-BUSINESS

- Iberdrola develops and expands smart grids and grid digitisation.
- Thanks to smart grids, Iberdrola can give us a heads-up on possible incidents and help to resolve them with greater speed and efficiency.

Dear Young Scientists,

Welcome and congratulations. Having reached the final stage of this European contest is already a reason for celebration. Most of all however it must be an incentive to continue innovating and to prepare for the challenges of tomorrow, always with the aim of improving the quality of life in our communities.

In addition, this competition is hosted by the University of Salamanca, the oldest in Spain and one of the three oldest in Europe. For more than 800 years of history, this university has maintained its position among the most prestigious in the world thanks to its openness and innovative spirit; there couldn’t be a better educational institution for a competition such as this one.

At Iberdrola, one of the largest utilities worldwide and the largest renewable player globally, we firmly believe that the new generations are the driving force for transformation. For instance, your enthusiasm has been essential to convince the world of the importance of fighting climate change. Without your inspiration, the Paris Agreement would never have been reached and we would not have more and more movements calling for action and urgent solutions all around the globe, in particular in the European Union, which continues to lead the way to decarbonization.

For these reasons, it is an honour for Iberdrola to support this European Competition which over the years has become the best stage for the most promising research students to present their scientific achievements and share innovative ideas and proposals.

We do so as part of our global university programme ‘Iberdrola U’, which includes collaborations with prestigious centres such as the Massachusetts Institute of Technology and Yale University, in the United States; the University of Strathclyde, in Scotland; the Technology Institute of Monterrey in Mexico; the University of Pernambuco, in Brazil; the Hamad Bin Khalifa University, in Qatar; and, in Spain the Comillas Pontifical University and the University of Salamanca.

‘Iberdrola U’ connects some 300,000 students in different fields related to the energy transition and includes initiatives such as University Chairs, R&D projects, scholarships, and different schemes to support entrepreneurship in areas as renewable energy, sustainable development, electric mobility, biodiversity, and smart grids.

I am sure that the participants in this Congress will show once again that supporting young talent is the best way to promote employability for jobs in the future, especially in STEM disciplines. Iberdrola is also developing initiatives for the promotion of gender equality in these studies, in which the presence of women has been traditionally lower. Examples of this are the creation of specific Schools of Electricians for women in Brazil; the “Impulso STEM” programme in Mexico; the POWERful Women initiative, in the United Kingdom; WowEnergy, in the United States; and the STEAM Alliance for female talent “Girls for science”, in Spain.

Dear Young Scientists, you are all called to a wonderful mission: to create, develop and implement projects to make this world, the world you will inherit, a better place. Let us start to make a difference here and now. I wish you all a great time during the competition and the very best of luck to all those participating in this wonderful learning experience.

Ignacio S. Galán
Chairman and CEO of Iberdrola
The European Union Contest for Young Scientists in Salamanca
The European Union Contest for Young Scientists, better known as ‘EUCYS’, rewards and celebrates Europe’s best young scientific talent. Every year, the event gathers promising young scientists from all over Europe and beyond, to present their projects to a panel of international judges. Over the years some astonishing inventions and creative ways of using science in everyday life have been presented. Be prepared to be amazed! The Contest is a good example of an activity that serves not only to encourage interest in science but also to promote the exchange of ideas among Past participants have often expressed the positive impact of this aspect of the Contest. They believe that it has opened up the gateway to Europe and further afield for their careers, and has also fostered a strong interest in learning other European languages. The Contest is also a useful tool in the development of a pan-European scientific community. It has contributed significantly to popularizing science among young people. This year marks the 32nd edition of the Contest and will be a contest like no other!

The 32nd edition was due to take place in Salamanca in 2020 but due to the worldwide COVID 19 pandemic, the European Commission took the necessary but difficult decision to postpone. The University of Salamanca kindly agreed to host the contest in 2021 instead. Thus the 32nd edition of the contest is unusual in many ways: it combines two contests 2020 and 2021, and is a hybrid event for the first time. Due to the evolving COVID situation in Europe, and indeed worldwide, a decision was taken to welcome the jury to Salamanca and to have the contestants and National Organisers in their home countries.

The Contest is co-funded under Horizon 2020: The EU Framework Programme for Research and Technological Development and is part of a broader initiative to reinforce the links between science and society, responsible research and innovation, and to further the emergence of a European Research Area and the Innovation Union.

Only projects that have won a first prize at a national science competition are invited to participate at EUCYS. Thus, the Contest represents an additional scientific challenge for many young scientists who compete annually in their national contests.

The Contest is more than just a competition. The young people meet others with similar abilities and interests, as well as some of the most prominent scientists in Europe. In this way, the Commission seeks to strengthen the efforts already made in each participating country to attract young people to careers in science and technology.

The first Contest Finals took place in Brussels in 1989. Since then, the event has been hosted in Copenhagen, Zurich, Seville, Berlin, Luxembourg, Newcastle upon Tyne, Helsinki, Milan, Porto, Thessaloniki, Amsterdam, Bergen, Vienna, Budapest, Dublin, Moscow, Stockholm, Valencia, and Copenhagen again for the 20th anniversary of the Contest, Paris, Lisbon, Helsinki, Bratislava, Prague, Warsaw, Brussels again in 2016, Tallinn in 2017, Dublin again in 2018 and Sofia in 2019. Next year, the contest will take place in Leiden in the Netherlands.

This year the European Union Contest for Young Scientists is taking place in Salamanca and we are pleased to be in Spain for the third time.

The European Commission is very grateful to the organisers for their professionalism and support.

For more information on the EU Contest please visit the following web sites:
ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/eucys_en
eucys2021.com

FOR MORE INFORMATION ON THE EUROPEAN UNION CONTEST FOR YOUNG SCIENTISTS PLEASE CONTACT
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The Contestants

All contestants at the European Union Contest for Young Scientists have previously won a first prize at the national young scientist competition in their own country. They are put forward by the “National Organiser”, who is the contact person for their respective national contest. The contestants compete either as individuals or as part of a team. There are strict rules on the age of the contestants, the size of the teams, and the number of contestants and projects that each participating country can send. The Contest accepts projects in all fields of scientific endeavour that have been carried out before the contestants enter university.

Competing in the contest for 2020 are 50 contestants with 41 projects and for 2021 we have 108 contestants with 73 projects.

The Jury

This year, the Jury is composed of 25 highly qualified scientists and engineers with worldwide reputations in their chosen field.

The jury carry out their duties at the contest as independent scientific experts and not as representatives of any institution, organisation or country. The EC appoints the Jury annually basing its selection on the scientific needs of the contest. They are drawn both from academia and industry. The Jury base their work at the contest on the Guidelines established by the EC.

The selection and evaluation process

The European Union Contest for Young Scientists takes place in three stages following national competitions, which are held across Europe from October of the preceding year to May of the current year.

Selection:
Winners of the national competitions are selected by their respective national contest jury and nominated to represent their country at the Contest. The National Organisers submit their projects to the EC in June.

Preview:
During the summer, the Contest Jury members review the written descriptions of the projects that they will assess during the exhibition in September.

Contest:
The Contestants display their projects at exhibition stands, and are interviewed by members of the Jury. The Jury use the following criteria to make their final assessment:

- originality and creativity in the identification of and approach to the basic problem;
- skill, care and thoroughness in designing and carrying out the study;
- follow through of the study from conception to conclusion;
- reasoning and clarity in the interpretation of the results;
- quality of written presentation;
- ability to discuss the project with the Jury members.

In applying all these criteria, allowance shall be made for the age and education level of the contestants, the quality of the resources available to them and their linguistic ability to speak a non-mother tongue language if required.

The decision of the jury is final.

The Prizes

The contestants compete for a number of prizes on the basis of their projects. The core EU monetary Prizes are the main prizes awarded.

These include for 2020 contestants:
- Two First Prizes worth € 7,000 each
- Two Second Prizes worth € 5,000 each
- Two Third Prizes worth € 3,500 each

These include for 2021 contestants:
- Four First Prizes worth € 7,000 each
- Four Second Prizes worth € 5,000 each
- Four Third Prizes worth € 3,500 each

The jury also select the best and most appropriate contestants for several Special Donated Prizes of study visits or similar to leading scientific European organisations as follows:

- a one-week stay at one of the eight EIROforum organisations: CERN, EUROfusion (JET), EMBL, ESA, ESO, ESRF, ILL, European XFEL;
- a two day stay at the Joint Research Centre at Ispra in Italy;
- visits organised by the Bioeconomy BBI undertaking and Food industries;
- visit to a PRACE super computing facility;
- visit to the International Swiss Talent Forum;
- visit to Expo-sciences Luxembourg.

EuChemS kindly offers a prize to the best chemistry project, FoodDrinkEurope and PEPSICO kindly offer prizes to the best food related projects.

These prizes are offered to contestants who, according to the Jury, would benefit from the specific experience that these prizes offer. At the discretion of the Jury, a prize winner can receive both a core Prize and a Special Donated Prize.

The participating countries

The following countries will participate at EUCYS on a competitive basis: Austria, Belarus, Bulgaria, Canada, China, Czech Republic, Denmark, Egypt, Estonia, Finland, France, Georgia, Germany, Hungary, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Norway, Poland, Portugal, Romania, Russia, Slovak Republic, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey and Ukraine.

Serbia and Malta have not sent a team this year. The EC is negotiating with Armenia, Croatia, Macedonia and Moldova to welcome them at future contests.
EUCYS in Spain

Did you know that Spain is the third country in the world with the most UNESCO World Heritage sites?

In Spain there are more than 15,600 monuments, archaeological sites, gardens, and historical sites and ensembles which have been declared Assets of Cultural Interest (Bienes de Interés Cultural, BIC). All this constitutes an extraordinary and extremely valuable heritage which stands out for its richness and diversity and which includes numerous examples of the various civilisations, cultures, and historical periods which developed in Spanish territories ranging from the Iberians and Celts to the Romans and Arabs via the Phoenicians, Greeks, Visigoths...

Moreover, within this whole we can also find unique and characteristic artistic styles such as the pre-Romanesque of Asturias, Mudejar architecture, and Andalusian art. It is thus not surprising that Spain is the third country in the world with the most sites included on the World Heritage list of the UNESCO. From the cave paintings of the Cueva de Altamira and the findings of Atapuerca via the Aqueduct of Segovia, the Alhambra of Granada, and the Mosque of Córdoba to the cathedrals of Seville, Burgos, and the Sagrada Familia of Barcelona to mention but a few, Spain is an essential cultural destination. The 15 Spanish Cultural Cities of Humanity also deserve special mention and are always well worth a visit.

Throughout history many Spanish figures have left their mark on various fields of the arts and culture (Murillo, Zurbarán, Miró, Sorolla, Maruja Mallo, Cervantes, Lorca, Falla, Buñuel, Balenciaga, Ramón y Cajal...). This situation has continued to the present day: Antonio López, Miquel Barceló, Paco de Lucía, Camarón de la Isla, Montserrat Caballé, Pedro Almodóvar, Blanca Li, Manuel PERTEGAZ, Severo Ochoa, Margarita Salas, and Ana María Matute are but a few examples of the long list of men and women devoted to literature, painting, music, the cinema, fashion, dance, science, and arts of all kinds, the prestige and recognition of whom are international.

EUCYS in Salamanca

The golden city of a thousand legends

To speak of culture is to speak of Salamanca. Strolling through the streets of its historical centre which has been declared a World Heritage Site by the UNESCO means exploring centuries of history, art, and knowledge and allowing oneself to be charmed by wonders such as its famous University, which is one of the oldest in Europe and continues to attract thousands of students every year.

Taking a closer look at the monuments of Salamanca is immersing oneself in a world of legends and stories to be discovered. Begin a fine walk in its world-famous Plaza Mayor, the meeting point of the city par excellence. Having a coffee at the legendary Novelty, contemplating its 88 arches, or relaxing at any of its pavement cafés is extremely worthwhile.

If you feel like investigation you can begin at the two Cathedrals of Salamanca: yes, there are two! At the Puerta de Ramos entrance of the New Cathedral you can search for the figure of an astronaut sculpted in stone and then climb to its towers on the Ieronimus visit which provides matchless views.

The University of Salamanca hides a stone frog on its façade which is said to bring luck to students, the palace known as the Casa de las Conchas is reputed by legend to contain a treasure, the garden of Calixto and Melibea has literary associations, it is said that the Devil taught witchcraft at the Cave of Salamanca...

And a thousand more stories in a city which has dozens of places to discover such as the Casa Lis, the Cielo of Salamanca, the Clerecía, the Roman Bridge...

Plaza Mayor

It is one of the most beautiful plazas in Spain; it was built in the baroque style by Alberto Churriguera. On its north side stands the Town Hall, which is also baroque with its five granite arches and a steeple among four allegorical figures. Its decoration is noted for its iconic circular portraits of Charles I, Alfonso XII, Ferdinand VI, Cervantes, and Saint Teresa, among others. The façades of the buildings have three stories and are supported by a series of round arches and crowned by a balustrade. The Plaza Mayor is currently one of the liveliest and most popular places of Salamanca.

Domus Artium 2002 (DA2)

The Domus Artium 2002 (DA2) was created in the year 2002 to coincide with Salamanca being the European Cultural Capital. The building, which was formerly used as a prison, was renovated and extended. The main themes of this museum are contemporary art and new technologies.
Cathedrals

The Cathedral of Salamanca includes two buildings joined together: the Old Cathedral of the 12th-13th centuries and the New Cathedral of the 16th century. The Old Cathedral is Romanesque in style and is noted for the Torre del Gallo, the Chapel of San Martín or of El Aceite, the 15th-century main altarpiece which was created by several painters under Dello Delli, the mural of the vault by Nicolás Florentino, and the fine sepulchres of bishops and figures of the nobility in the interior.

The New Cathedral, which was completed in the 18th century by Churriguera, contains the image of the Virgin of La Asunción which was carved in 1626 by the sculptor Esteban Rueda. It is noted for the choir stalls designed by Joaquín Churriguera in 1727 and the baroque retrochoir with its Renaissance images such as the Virgin of Loreto and those of St John the Baptist.

Casa de las Conchas

The Casa de las Conchas is Gothic in style. Its construction was initiated in the late 15th century although it also contains Renaissance and Mudéjar elements; it is classed as Isabelline art.

Over three hundred shells cover its walls. In the 18th century it suffered from cracking which led to the remodelling of its upper part, which lacks the shells which decorate the remainder of the façade. It is noted for its entrance with its Gothic coat of arms above containing representations of the fleurs-de-lys. It currently houses the Salamanca Public Library and an information office.

Casa Lis Art Nouveau and Art Deco Museum

This museum is located in the Casa Lis which was the first modernist building in the city (1905).

The museum displays 19 collections of decorative art from the late 19th and early 20th centuries. It contains some 2,500 exhibits including glass pieces; porcelain dolls; chryselephantine, enamel, bronze, and ivory figures; paintings; furniture; jewels; toys; a Fabergé egg... It also holds an important pictorial collection of 19th-century Catalan works and paintings by Salamanca artists such as Celso Lagar and Mateo Hernández.

EUCYS in the University of Salamanca

Universitas Studii Salmanticensis

The University of Salamanca, which was founded in 1218 by King Alfonso IX of León, is one of the oldest universities in Europe and has been an academic point of reference for its eight centuries of existence and for countless generations of students from all over the world.

The University attained its greatest splendour in the 15th and 16th centuries when it became the centre of the world debate on people’s rights. Its teachers discussed Colombus’ project and once America had been discovered debated whether the natives should be given full rights. Some of the women who studied in its lecture halls are considered to be among the first female university students in the world such as Lucía de Medrano and Beatriz Galindo. The former subsequently became the first woman university lecturer.
The construction of the Historical University Building began in 1411 and was completed in 1533. It is one of the most important monuments in Spain and one of the most valuable examples of Spanish Renaissance art. It is noted for its plateresque façade built of the golden stone of Villamayor. The interior of the building includes very special places such as the Fray Luis de León Hall and the spectacular Noble Staircase. Other unique spaces of great importance include the Ancient Library which contains very valuable manuscripts and other incunabula. Adjacent to the University buildings others arose such as the Study Hospital, the Escuelas Mayores, the Escuelas Menores, and numerous other schools.

The University of Salamanca has a long humanistic and scientific tradition and a presence in four towns (Salamanca, Zamora, Ávila, and Béjar). Over 30,000 students study at its 26 faculties and university schools each academic year. The University of Salamanca is established in a World Heritage city which is both dynamic and of great architectural value. Its wide range of academic, cultural, and sporting activities have made the USAL the second most important Spanish university with most students from outside its university district. Owing to all this Salamanca is known the world over as one of the major university cities.
Moreover, the University of Salamanca has an important heritage of historical buildings and emblematic spaces still in use for academic activities, including the Escuelas Mayores building.

International character

It is a university with a marked international character which welcomes each year over 7000 students from the five continents thanks to its major programme of international student mobility.

Research in the University of Salamanca

The University of Salamanca is an academic institution devoted to teaching and research in all branches of knowledge: Arts and Humanities, Sciences, Social Sciences and Laws, Health Science and Engineering and Architecture.

It has a present focused on innovation and the quality of teaching / learning, research, knowledge transference and culture, with a clear international vocation; a committed and responsible future with sustainable development. The research activity is organized in Research Groups integrating Departments, Institutes and Research Centers. In the present moment it has various research centers and institutes with a status to apply for the excellence programs of the Government of Spain.

During 2020 the research production of the University of Salamanca gave rise to nearly two thousand of research papers, one hundred of books, one hundred and fifty PhD. Thesis and more than two hundred of communications to congresses. It accounts with a technical unit, Nucleus, which provides research support services.

One of the main assets of the University is the pursuit of excellence in the field of Spanish Language, which was recognized in 2013 with the mention of International Campus of Excellence in Spanish Language and values of the Hispanic World. The University of Salamanca is also a reference institution in the assessment and certification of the Spanish Language.
EUCYS
2020-2021
Programme
**Programme**

**17-19 September 2021**

**FRIDAY 17th**

- **9:30h CEST** | Opening Ceremony
  - Paraninfo University of Salamanca.

- **18:00h CEST** | Plenary Talk by Dr. William D. Philips, Nobel Prize in Physics 1997
  - "A new measure: the quantum reform of the International System of Units"

The metric system began with the French revolution, and now we are experiencing the greatest revolution in measurement since the French revolution. The definitions of the kilogram, ampere, kelvin, and mole are all changed, being based on chosen and fixed values for Planck’s constant, the electron charge, Boltzmann’s constant, and Avogadro’s number. This talk will explain how this is possible and why it was necessary.

**SATURDAY 18th**

- **18:00h CEST** | Round Table with Recognized Scientists
  - Salamanca Congress Palace.
  - Topic: The challenges that young scientists will face in our world.

**SUNDAY 19th**

- **12:00h CEST** | Awards Ceremony
  - Salamanca Congress Palace.

**On-site EUCYS 2020-2021 Exhibition in Salamanca**
  - Arzobispo Fonseca College, University of Salamanca.

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**Dr. William Daniel Phillips**

**Nobel Prize in Physics, 1997**

William D. Phillips received a B.S. in physics from Juniata College in 1970, and his Ph.D. from the Massachusetts Institute of Technology in 1976; after two years as a postdoctoral researcher at MIT, he joined NIST (then the National Bureau of Standards) to work on precision electrical measurements and fundamental constants. There, he initiated a new research program to cool atomic gases with laser light. His research group has been responsible for developing some of the main techniques now used for laser-cooling and cold-atom experiments in laboratories around the world. Atomic fountain clocks, based on the work of this group, are now the primary standards for world timekeeping. Among the group’s current research directions are the use of ultra-cold atoms for quantum information processing and quantum simulation of important physical problems.

Dr. Phillips is a member of the American Academy of Arts and Sciences and of the National Academy of Sciences. In 1997, Dr. Phillips shared the Nobel Prize in Physics "for development of methods to cool and trap atoms with laser light.”

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**Dear Young Scientists,**

When I am asked what advice I have for young people, my answer is always “Stay curious”. When we are young, our curiosity is insatiable. We want to experience and to explore everything around us. The necessities of maintaining order in classrooms, of keeping children safe from all sorts of dangers, and the myriad concerns of the adults who care for those children, slowly but surely squeeze out much of that curiosity from most children. Those who retain their childlike curiosity are the ones who become scientists and other adventurers of the mind. Life is an adventure and one of the greatest and sweetest parts of that adventure is learning. I am fond of saying that a good day is a day in which I learn something new. During this time of competition, and more importantly, for the rest of your lives, I wish for you many such good days.
Venue

University of Salamanca Assembly Hall

The assembly hall is located on the lower north gallery of the patio of the Escuelas Mayores on the east corner between the Fray Luis de León Hall and the Francisco de Vitoria Hall. It contains various works of art such as crimson velvet standards, grisailles, portraits (such as that of Charles IV), and tapestries (eight in total dating from the 17th century).

The assembly hall is the venue for numerous academic ceremonies as important as those of the inauguration of the academic year and the Doctor honoris causa investiture ceremony. Owing to its surface area of 350 m² it has even been used for classes of canon law which were in great demand.

Arzobispo Fonseca College,
University of Salamanca

Alonso de Fonseca, a student of the University of Salamanca and archbishop of Toledo, was not only a great patron of the arts but also the founder of the College, the construction of which was initiated in 1521 according to the project of the famous contemporary architect Juan de Alava. This was carried out in various stages with the participation of other architects: Diego de Siloe, the designer of the doorway; Rodrigo Gil de Hontañón who extended the chapel; and Alonso de Covarrubias. In 1557 work was begun on the so-called Hostelry which was used for various purposes over the centuries including as the Faculty of Medicine in the 20th; it currently houses several departments of the University of Salamanca. The expansion of the rectority (today known as the paintings’ room) was carried out in the mid-18th century by Juan de Sagarbinaga who was also the architect of the former San Bartolomé or Anaya College, which currently houses the Faculty of Philology.

Salamanca Conference Centre

The Salamanca Conference Centre, which is one of the buildings of the old part of the city, is an international point of reference in the organising and staging of all kinds of events. Juan Navarro Baldeweg is the prestigious architect who designed this beautiful building. It is noted for its Great Hall which has been designed to provide the best possible acoustics. The canopy of its cupola appears to float over the Hall, displacing the effort and concentrating the loads on the vertexes of the supporting arches. It rests on the latter to combine the constellation of gravity with that of lighting thanks to the filtering of the light overhead. This building in the historical centre is open to the city and its cultural, economic, business, and social life.
Virtual venue contest

Beyond competition, the spirit of EUCYS is allowing young scientists worldwide to meet others with similar abilities and interests. Although the Covid-19 pandemic do not allow to enjoy the face-to-face contact that characterizes this Contest, the Host Organiser has made its best in order to bring this aspect to an online format in the most engaging way. For this reason, EUCYS 2020/2021 features a Virtual Venue in which interaction among Contestants will not only be possible but intensively fostered.

Contestants will only need a web browser, an internet connection, and a microphone. A webcam is also highly recommendable.

There are three main spaces that configure this Virtual Venue:

- the Main Exhibition Hall
- the rooftop Networking and Outreach area
- the Auditorium

The main exhibition hall

The main exhibition hall will host a stand per project containing all the projects from 2020 and 2021 Contestants. Each stand features a short explanatory video of the Project, recorded by the Contestants themselves, as well as a link with more details, including infographic resources in the form of scientific posters. Wander with your robot around this hall, showing your Project to your peers and examining other colleague's work, debate about your achievements, and overall, let your scientific curiosity bloom.

Also, in this same exhibition halls, the interviews with the Jury members will take place by means of private talks, in a very similar way it would happen in an in-person EUCYS. Be on time at your stand and convince the Jury members that your project deserves a Prize.

The rooftop Networking and Outreach area

Not everything in EUCYS is competing and talk about own and others' scientific achievements. The rooftop of the venue is a space with wonderful views which has been designed to encourage more relaxed talks. Here, Contestants will be able to meet each other at a more personal level and maybe establish long lasting and meaningful friendships.

Also in the rooftop a very appealing set of scientific outreach contents created by high-level scientific communicators in Spain, just for you.

Finally, the University of Salamanca has reserved a space to let you know the research that is carried out throughout some of its departments and faculties. Maybe some the EUCYS 2020/2021 Contestant will become a researcher at USAL in the future? We'd would love to!

The Auditorium

The Contest Ceremonies will be carefully streamed for you. Come to them in the company of your peers.
### Biology

**BIOLOGY-01** | 2020  
LUXEMBOURG  
Charlotte Marie Scheideler  
Exploring the similarities and relationship between sugar addiction and opioid addiction

**BIOLOGY-02** | 2020  
ISRAEL  
Noa Frislaec  
The role of ARTS in stem cell apoptosis: identifying a novel compound for regenerative medicine and disease therapies

**BIOLOGY-03** | 2020  
SLOVENIA  
Brina Avsec  
The effect of smoking cannabis and smoking tobacco combined on forced vital capacity and forced expiratory volume in one second of 18-year-old males

**BIOLOGY-04** | 2020  
FINLAND  
Shahla Ilkiluk  
A comparison of direct reversal and nucleotide excision repair in UBV-Treated bacteria

**BIOLOGY-05** | 2020  
POLAND  
Aleksander Leon Łysonimski  
Fisetin, a natural flavonoid, diminishes excision repair in UVB-Treated bacteria

**BIOLOGY-06** | 2021  
ISRAEL  
Tamir Meshorer  
Brain circuits underlying category learning

**BIOLOGY-07** | 2021  
ESTONIA  
Ellis Grigor  
Characterization of the activities and biochemical parameters of maltase AG2 from the non-conventional yeast Blastobotrys adveninovarum

**BIOLOGY-08** | 2021  
SWEDEN  
Milla Linnéa Astrid Glännfjord  
Investigation of silver ions’ antibacterial effect on E. Coli and B. Subtilis

**BIOLOGY-09** | 2021  
SWITZERLAND  
Sophie Lynn Wiesmann  
Temperature-dependent toxin production of the cyanobacterium Microcystis aeruginosa

### Chemistry

**CHEMISTRY-01** | 2020  
RUSSIA  
Anna Levchenko  
Synthesis of helper lipid as a component of cationic liposomes for gene therapy

**CHEMISTRY-02** | 2020  
ESTONIA  
Paul Erik Olli  
Metal-air battery

**CHEMISTRY-03** | 2021  
TURKEY  
Mehmet Sertaç Çeküç  
Creating a biodegradable mask from lignin extracted from chestnut

**CHEMISTRY-04** | 2021  
POLAND  
Jakub Lewandowski  
Synthesis and characteristic of a composite based on metal oxides and silica for use in photocatalysis and capturing pollutants

**CHEMISTRY-05** | 2021  
NORWAY  
Mattieu Raphael Raphael Bou  
Optimising fly ash based geopolymer concrete

**CHEMISTRY-06** | 2021  
ROMANIA  
Luiza Natalia Ionescu  
Strong electric field electroosmosis - physical principles and measurements in the strongly nonlinear regime

**CHEMISTRY-07** | 2021  
ITALY  
Andrea Letizia  
GOLD RICE: Gold Nano-sensors for the protection of the Health and the Environment

**CHEMISTRY-08** | 2021  
TURKEY  
Iryna Bobkova  
ANDROID-Application with the function of automatic removing of moving objects

**CHEMISTRY-09** | 2021  
IRELAND  
Gregory Guy Tarr  
Towards detecting state-of-the-art deepfakes

### Computing

**COMPUTING-01** | 2020  
HUNGARY  
Boglárka Ecsedi  
Rip current detection – An orientation-aware machine learning approach

**COMPUTING-02** | 2020  
BELARUS  
Tikhon Belousov  
a Programming language creation

**COMPUTING-03** | 2020  
DENMARK  
William Billie Meyling  
Universal autonomous graph-based image segmentation with near-linear average complexity

**COMPUTING-04** | 2020  
TURKEY  
Ukraine  
Iryna Bobkova  
Proposal for an algorithm for finding the crossing number of a graph

**COMPUTING-05** | 2020  
UKRAINE  
Iryna Bobkova  
ANDROID-Application with the function of automatic removing of moving objects

**COMPUTING-06** | 2021  
IRELAND  
Gregory Guy Tarr  
Towards detecting state-of-the-art deepfakes
**Engineering**

**ENGINEERING-01 | 2020**  
**HUNGARY**  
Mátéás Rózsavölgyi  
Remote controlled mars rover and its applications in the teaching of the mechanical, computer, and physics sciences

**ENGINEERING-02 | 2020**  
**BULGARIA**  
Yordan Tsvetkov Tsvetkov  
Training quadrocopters to walk via evolution strategies and sinusoidal activation functions

**ENGINEERING-03 | 2020**  
**RUSSIA**  
Andrey Igorovich Lebedev  
Complex with an unmanned aerial vehicle «Krestel» to search and rescue people

**ENGINEERING-04 | 2020**  
**DENMARK**  
Nicolai Emil Dam  
Adrian Khair Olegaard  
Markus Valdemar Grankjær Jensen  
The Self-sorting Recycling Bin

**ENGINEERING-05 | 2020**  
**SWITZERLAND**  
Cédric Emmanuel Willemin  
Meteor and aircraft detection

**ENGINEERING-06 | 2020**  
**ROMANIA**  
Andreea Magdalena Sovei  
Robin-Cristian Bucur-Portase  
Study of microbiological structures with the purpose of creating MEMS actuators with various applications in medicine

**ENGINEERING-01 | 2021**  
**HUNGARY**  
Rádó János  
Pen2Snake, development of a writing and drawing tool compatible with arbitrary surface

**ENGINEERING-02 | 2021**  
**GEORGIA**  
Natasha Kajalia  
Marian Tsivladze  
Universal device for people with disabilities

**ENGINEERING-03 | 2021**  
**FRANCE**  
Clément Desjouqueres  
Nahomé Vesvvard  
Marin Luet  
Intra Body Communication

**ENGINEERING-04 | 2021**  
**BULGARIA**  
Hristo Todorov Todorov  
Limited query black box adversarial attacks in the real world

**ENGINEERING-05 | 2021**  
**EGYPT**  
Sarah Mohamed  
Sohaila Mohamed  
Crack detection detector

**ENGINEERING-06 | 2021**  
**AUSTRIA**  
Diana Scharbi  
Fabio Wiesinger  
EyeSpeaker

**ENGINEERING-07 | 2021**  
**CZECHIA**  
Adam Schuppler  
Oliver: open source MSLA 3D printer

**ENGINEERING-08 | 2021**  
**PORTUGAL**  
Rita Fernandes de Matos  
Hugo Daniel Oliveira Vieira Remelgado  
Hugo Ferreira Costa  
Development of an integrated ionizing radiation detection and alert system

**ENGINEERING-09 | 2021**  
**DENMARK**  
Filipp Kleikensborg Kikkenborg  
Thorbjørn Valdemar Raeder Clausen  
Asger Ren Nordbjerg  
Error detection by sound recognition in automated pipetting

**ENGINEERING-10 | 2021**  
**SWITZERLAND**  
Julian Benjamin Weber  
Asger Ren Nordbjerg  
Thorbjørn Valdemar Ræder Clausen  
Filip Kikkenborg Kikkenborg  
Development of an integrated ionizing radiation detection and alert system

**ENGINEERING-11 | 2021**  
**ROMANIA**  
Grigoras Rares Antonie  
Codina Gergiu  
Hulubeac Alexandru Mihai  
InoShoes

**Environment**

**ENVIRONMENT-01 | 2020**  
**EGYPT**  
Abdelrahman Waleed  
Mostafa Ahmed  
Detect The Defect (D.D)

**ENVIRONMENT-02 | 2020**  
**BELARUS**  
Lizaveta Zhyk  
Induction of phytoimmunity by peptide elicitors PEP13 and AVR9

**ENVIRONMENT-03 | 2020**  
**LUXEMBOURG**  
Mara Rachel Manieri  
Water quality in Luxembourg and its consequences on aquatic microorganisms

**ENVIRONMENT-04 | 2020**  
**POLAND**  
Jaroslaw Jakub Brodecki  
An assessment of the pollution of urban rivers by microplastics and their penetration of food webs based on the example of the river system in the Łódź agglomeration (central Poland)

**ENVIRONMENT-01 | 2021**  
**CANADA**  
Calvin Karthik  
A mighty mushroom and the power of poop: testing biogas production using spent mushroom substrate phase 2

**ENVIRONMENT-02 | 2021**  
**ITALY**  
Leonardo Cerioni  
Linda Paolinelli  
Matteo Santoni  
Laying waste to energy problems

**ENVIRONMENT-03 | 2021**  
**LUXEMBOURG**  
Paula Elisabeth Van de Paverd Bartolomé  
An investigation into the effect of ibuprofen on chlorella pyrenoidosa growth

**ENVIRONMENT-04 | 2021**  
**SOUTH KOREA**  
Hyejin Jun  
A study on removal of heavy metal and green algae in river using chestnut by-products

**ENVIRONMENT-05 | 2021**  
**LITHUANIA**  
Dominika Lalakojis  
Sustainable solution for crop damage caused by drought
Materials

MATериалы-01 | 2021
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ТУНИСИЯ
Марием Нажаль Бараха Абдаллах Бараа Чраки
Растительный материал семян подсолнечника (ПСС)

Mathematics

MATематика-01 | 2020
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БЕЛАРУС
Дмитрий Горохов
На графах с уникальным геодезическим или антиподами

MATематика-02 | 2020
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ФИНЛЯНДИЯ
Валттери Аурела
Сэмплирование из дискретных вероятностных распределений

MATематика-03 | 2020
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ПОЛЬША
Адам Станислав Бараньский
Определение радиоактивных изотопов

MATематика-04 | 2020
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ЧЕХИЯ
Зденек Пезлар
Зарядки в сопоставлении с теорией чисел

MATематика-05 | 2021
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ПОРТУГАЛЯ
Сара Рибейр Кутуо Клара Софа Варга Жоао Карлос Перейра Карвало
Автоматизированная математическая система

Mathematics

MATематика-06 | 2021
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ИЗРАИЛЬ
Ноа Рэчел Гонен
Эффекты фона и мутаций в морских организмах

Medicine

LITUАНИЯ
Моника Слуцэдиня
Доны частот - источник потенциального угрозы в среде

ФИНАНДИЯ
Люксембург
Дэвид Эмануэль Лейвер Элис Андре Леро Сарах Мэккл
Конструирование для ALS

СЛОВЕНИЯ
Исмаил Лумина Гика
Демиелинизация: исследование использования математических моделей в исследовании демиелинизирующих заболеваний

РУССИЯ
Юлия Николаевна Каравашкина
Развитие и производство новых моделей в области медицины

ФИНАНДИЯ
Кипр
Кристи Кристапс Рочан
Угроза Мало- сферных болезней в среде

СЛОВАКИЯ
Матея Рандица
Влияние нарушения функции головы

PHYSICS

ФИНАНДИЯ
Кипр
Кристи Криптарс Рочан
Угроза Мало- сферных болезней в среде

ЗЕЙНЕП ПАРЛА ПАРМАКСИЗ
Математическая модель алгоритмов в диагностике, лечении и профилактике гриппа COVID-19

УКРАИНА
Іллія Навілковський
Властивості можливої різниці з першого порядку до тому, що Семирічна Друга Набіжна Конфігурація

CZЕХІЯ
Зденек Пезлар
Зарядки в сопоставлении с теорией чисел

МОДТИВАЦИЯ
Рената Блажек
Развитие и производство новых моделей в области медицины

ИЗРАИЛЬ
Элдад Давид
Структура и функция мозга

ПОРТУГАЛЯ
Сара Рибейр Куто
Автоматизированная математическая система

ФИНАНДИЯ
Кипр
Кристи Криптарс Рочан
Угроза Мало- сферных болезней в среде

СЛОВЕНИЯ
Деспина Лулиана Гика
Демиелинизация: исследование использования математических моделей в исследовании демиелинизирующих заболеваний

СЛОВАКИЯ
Матея Рандица
Влияние нарушения функции головы

PHYSICS

AUSTRIЯ
Александр Бруннер
Органическое утепление

ИЗРАИЛЬ
Элдад Давид
Структура и функция мозга

ПОРТУГАЛЯ
Сара Рибейр Куто
Автоматизированная математическая система

ФИНАНДИЯ
Кипр
Кристи Криптарс Рочан
Угроза Мало- сферных болезней в среде

СЛОВАКИЯ
Матея Рандица
Влияние нарушения функции головы

PHYSICS

БЕЛАРУС
Дмитрий Горохов
На графах с уникальным геодезическим или антиподами

ИЗРАИЛЬ
Элдад Давид
Структура и функция мозга

ПОРТУГАЛЯ
Сара Рибейр Куто
Автоматизированная математическая система

ФИНАНДИЯ
Кипр
Кристи Криптарс Рочан
Угроза Мало- сферных болезней в среде

СЛОВАКИЯ
Матея Рандица
Влияние нарушения функции головы

PHYSICS

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Дмитрий Горохов
На графах с уникальным геодезическим или антиподами

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Структура и функция мозга

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Сара Рибейр Куто
Автоматизированная математическая система

ФИНАНДИЯ
Кипр
Кристи Криптарс Рочан
Угроза Мало- сферных болезней в среде

СЛОВАКИЯ
Матея Рандица
Влияние нарушения функции головы
EUCYS 2021 SALAMANCA

PHYSICS-07 | 2021
UKRAINE
Dmytro Zakharov
Simulation of light propagation in an optically inhomogeneous medium

PHYSICS-08 | 2021
SWEDEN
William Daniel McGillivray
Linus Karlsson
Viktor Karl Niklas Brink
The Aerodynamics of Paper Airplanes

Social Sciences

SOCIAL-SCIENCES-01 | 2020
IRELAND
Cormac Thomas Harris
Alan Thomas O’Sullivan
A statistical investigation into the prevalence of gender stereotyping in 5-7 year olds and the development of an initiative to combat gender bias.

SOCIAL-SCIENCES-02 | 2020
SPAIN
Eduardo Gabriel Guerrero Riesco
Transhumanism: will we still be human?

SOCIAL-SCIENCES-03 | 2020
CHINA
Yiwei Liang
Tanqing Li
Research on early risk prediction and implementation paths of children with autism based on affective computing

SOCIAL-SCIENCES-04 | 2020
SWITZERLAND
Anusha Chiara Lorraine Spescha
Madmen on a journey: a comparison of Homer’s Odyssey and the science fiction series Doctor Who

SOCIAL-SCIENCES-01 | 2021
ESTONIA
Severin Bratus
Gender stereotypes in Estonian word embeddings

SOCIAL-SCIENCES-02 | 2021
NORWAY
Ling Olivia Li
Beauty ideals in China: reconfiguration of the body through the prospect of westernization and modernization
Strokes or physical disabilities often end up in a Locked-in syndrome. Mostly only the blinking of the eyelids is still functional. In order to enable communication with the environment, a table system that can be controlled by blinking has been developed. The EyeSpeaker records the blink movements of a patient with the help of a camera. A program based on a neural network analyses the video and then evaluates when the person closes his/her eyes arbitrarily. Furthermore, an active table system was created using GUI programming. If a closed eye is detected, the table scrolling is interrupted and a character is selected. Frequently written words are stored in a database. Furthermore, there is the possibility for the person to control electronic devices.

eucys2021.com/engineering-06-2021

The disposal of conventional insulation boards is proven to be very complex and expensive, and of course also harmful to the environment, people, and animals. Now with our ingredients, these problems are solved. The binder we use is 100% biological, unfortunately we cannot name the binder because of patent application reasons. Our cooperation company the KRAIBURG Austria GmbH & Co. KG supplied us with construction tools so we could perform our tests and produce our plates. The main insulation characteristics as thermal conductivity, fire behaviour, health aspects, etc. were measured and compared to other products. In all these respects we achieved market-relevant results. The unique selling point however is the unproblematic disposal because of our fully biological ingredients.

eucys2021.com/environment-06-2021

The nuclear accident of March 11, 2011 in Fukushima was a crucial experience for mankind. The whole world was in shock and the effects were still unclear at that time. Later it turned out that numerous waters of the earth and thereby its inhabitants were significantly contaminated. On the occasion of the ten-year commemoration of Fukushima, it was the concern of two students of the HLUW Yspertal (a higher vocational school specialised in science and economy) to examine the aquatic fauna of different regions of the world for radioactive contamination. The results of this diploma thesis show that the radioactive contamination of the freshwater and saltwater fauna is not harmful but still measurable. The radioactive contamination of every measured sample is far below the limit values.

eucys2021.com/physics-04-2021

Compiler design is a fairly complex area of computer science that is studied by the university curriculum and is saturated with mathematical theory. However, I believe that absolutely everyone with a passion for programming can make their own language and have a unique experience. My research answers the question: what are the ways to create your own programming language if you are an ordinary interested amateur. The paper presents two examples, an interpreter and a compiler. Although the languages I have made so far are relatively simple, the principles and methods I used to create them can be used to implement something really serious. I have also provided links to useful sources and tried to explain the project in plain language.

eucys2021.com/computing-02-2020

The disposal of conventional insulation boards is proven to be very complex and expensive, and of course also harmful to the environment, people, and animals. Now with our ingredients, these problems are solved. The binder we use is 100% biological, unfortunately we cannot name the binder because of patent application reasons. Our cooperation company the KRAIBURG Austria GmbH & Co. KG supplied us with construction tools so we could perform our tests and produce our plates. The main insulation characteristics as thermal conductivity, fire behaviour, health aspects, etc. were measured and compared to other products. In all these respects we achieved market-relevant results. The unique selling point however is the unproblematic disposal because of our fully biological ingredients.

eucys2021.com/environment-06-2021

The disposal of conventional insulation boards is proven to be very complex and expensive, and of course also harmful to the environment, people, and animals. Now with our ingredients, these problems are solved. The binder we use is 100% biological, unfortunately we cannot name the binder because of patent application reasons. Our cooperation company the KRAIBURG Austria GmbH & Co. KG supplied us with construction tools so we could perform our tests and produce our plates. The main insulation characteristics as thermal conductivity, fire behaviour, health aspects, etc. were measured and compared to other products. In all these respects we achieved market-relevant results. The unique selling point however is the unproblematic disposal because of our fully biological ingredients.

eucys2021.com/environment-06-2021
Excessive use of pesticides can lead to a variety of impacts, including environmental degradation and harm to human health. It is necessary to find effective, natural active substances in order to reduce the amount of partially harmful substances in crops and products. The use of elicitors in agriculture can reduce the need for pesticide use. In my research I studied the effect of peptide elicitors PEP13 and AVR9 on the resistance of pea seedlings to oxidative stress. I also studied the effect of elicitors on the formation of lipid oxidation products and the efficiency of processing pea seedlings with elicitors. The results showed that the PEP13 peptide is a promising candidate for the development of immunomodulators.

eucys2021.com/environment-02-2020

In 1962, Oystein Ore asked in which graphs there is exactly one geodesic between any two vertices. He called such graphs geodetic. In this paper, we systematically study the properties of geodetic, as well as antipodal graphs, in each vertex of which has exactly one antipode (the vertex farthest from it). We find necessary and sufficient conditions and obtain results related to algorithmic construction, investigate hamiltonian geodetic graphs, introduce and describe maximal hereditary subclass and minimal hereditary superclass of classes of geodetic and antipodal graphs. The main goal of the research is a constructive classification of these graphs.

eucys2021.com/mathematics-01-2020

The most accurate method for studying DNA replication is the labeling of newly synthesized DNA molecules with halogenated nucleosides followed by immunofluorescence and microscopy detection, known as DNA fiber labeling. The major difficulty of the method is the labor-intensive analysis, which requires measuring the lengths of a large number of labelled fragments. There are very few attempts to automate this analysis and software freely available to researchers is not available. In an attempt to solve the problem, the aim of my latest project was to develop an efficient software tool for the automated image analysis of single DNA molecules. The software is currently successfully used in the Institute of Molecular Biology of the Bulgarian Academy of Sciences.

eucys2021.com/biology-02-2021
Abstract reasoning and logic inference are difficult problems for neural networks, yet essential to their applicability in highly structured domains. In this work we demonstrate that a well known technique such as spectral regularization can significantly boost the capabilities of a neural learner. We introduce the Neural Abstract Reasoner (NAR), a memory augmented architecture capable of learning and using abstract rules. We show that, when trained with spectral regularization, NAR achieves 61.13% accuracy on the Abstraction and Reasoning Corpus. We provide intuition for the effects of spectral regularization in the domain of abstract reasoning based on theoretical generalization bounds and Solomonoff’s theory of inductive inference.

We study the creation of physical adversarial examples, which are robust to real-world transformations, using a limited number of queries to the target black-box neural networks. We observe that robust models tend to be especially susceptible to foreground manipulations, which motivates our novel Foreground attack. We demonstrate that gradient priors are a useful signal for black-box attacks and therefore introduce an improved version of the popular SimBA. We also propose an algorithm for transferable attacks that selects the most similar surrogates to the target model. Our black-box attacks outperform state-of-the-art approaches they are based on and support our belief that the concept of model similarity could be leveraged to build strong attacks in a limited-information setting.

Methane produced from animal waste impacts global warming 21 times more than CO2. Globally, around 570 million tons of methane is released and wasted annually. This energy source can be harnessed to produce renewable, sustainable energy. This experiment aimed to optimize anaerobic digestion by (i) comparing biogas production from ruminant vs. monogastric manure and (ii) observing whether adding spent mushroom substrate (SMS) would increase biogas volume. Various combinations of manures and SMS were tested. Results showed that ruminant manure outperformed monogastric when treated with SMS and the addition of SMS always increased biogas yield. Using SMS to efficiently convert manure into useful biofuel could improve its adoption as an energy source and help mitigate climate change.

There are over 240 million cases of preventable blindness globally. Many eye diseases are “silent-killers” of vision and current testing methods are often inaccessible for marginalized patients. Thus, diseases go undetected until it is too late. To combat this issue, I developed Speculor combining low-cost portable retinal imagers and smartphones with artificial intelligence algorithms. Imagers have been tested in a clinic and detect all clinically relevant features required for accurate diagnosis of the disease glaucoma. Novel image processing algorithms improve the acquired image quality. A new transfer learning method was invented to train convolutional neural networks on small datasets that has demonstrated the best reported results in literature for the classification of glaucoma.

We present the fitting results of C2H spectra from selected regions of L1688 and L1689 from the Ophiuchus molecular cloud, finding complex structures in the southern part of L1689 and velocity gradient in the northern part of L1689. Gildas/class was used to fit the spectra lines. The result shows that the northern part of L1689 is a single molecular cloud with velocity gradient at 0.13 km/(s arcminute); The southern part is separated into two parts with a typical velocity difference, which implies the complex structure may exist in most molecular cloud. We suggest that the northern part of L1689 is rotating, and there is a substructure in the southern part of L1689.

Having participated in Adolescent Robotics Competition in which a dactylophasia robot was designed for the surdomute, which inspired us to do the study with a hope that potential risks of early childhood autism can be predicted and identified so that the autistic children will be identified, treated earlier and they will recover earlier. Beginning with the current risks the autistic children suffer, the study builds an indicator system of the early risks for the children, decides a framework of our study, APP+ cloud computing tools and C and JAVA languages to have established a big data analysis model of affective computing analysis model. And finally, the study developed a safe inexpensive easy software of early risk prediction system of autism.

The amount of information available to the general public is enormous, and it is challenging to extract meaningful and reliable content from it. Nowadays, the large availability of news sources and their varying trustability are the biggest problems for selecting a proper source of information. This work describes an automated system that can extract such essential and trustworthy news and create automated news coverage on social media networks. It scans numerous Czech news providers, and if it finds any new emerging news story, the application publishes it on various social media accounts. This ensures that the whole provided news coverage is unbiased, fast, and doesn’t require any human supervision.

Oliver is an open-source MSLA 3D printer that uses light and special resin to craft complex three-dimensional objects. With a price point below 1000 USD and a wide variety of printing materials, Oliver can be used in a range of fields, from prototyping to jewelry and dental industries. The printer is accompanied by an extensive user manual describing both the construction and operation of the printer. The precision of the printer was measured and its function was verified by dozens of test prints.
In the text we provide a gentle introduction to algebraic number theory and show its applications in solving certain difficult diophantine equations. We begin with a quick summary of the theory of quadratic residues, before diving into a select few areas of algebraic number theory. Our article is accompanied by a worked problem and a list of other problems solved in our original thesis along with the respective main takeaways. All proofs are omitted for simplicity.

eucys2021.com/mathematics-01-2021

The project covers the topic of automatic sorting, and in order to showcase this in an useful real-world application we have chosen to direct our attention towards building a self-sorting recycling bin that can help solve the problem of waste-pollution. Here the idea is to use a Machine Learning algorithm analyzing sound in order to distinguish and thereby sort waste consisting of different materials. For now the project focuses on the three recyclables plastic, metal and glass since these materials contribute to a large part of the world’s waste. The sorting mechanism uses audio identification to distinguish the sounds emitted by the different materials when they are thrown into the recycling bin, and hereby the self-sorting recycling bin can identify and sort waste automatically.

eucys2021.com/engineering-04-2020

This project is a generic approach to image segmentation based on the perception of images as graphs. Image segmentation is all about discovering the essential parts of an image - areas of similar characteristics. Images consist of pixels and in this project their relations form a system of differential equations, which provides information to merge pixels into larger groups of pixels. Several iterations are performed to achieve a final segmentation of the image. This technique of merging groups of pixels makes it possible to achieve a fast algorithm with near-linear average complexity. Moreover, the technique is very general, and therefore gives the ability to universally segment images with any number of segments, and do it autonomously - meaning without user input.

eucys2021.com/computing-03-2020

Our project details the development of a sound recognition algorithm used for detecting errors in automated pipetting to insure continues quality control. The system was developed in cooperation with TechVolver Aps, where we tested the algorithm throughout the development process. By making sound signatures of a pipetting process, meaning a range of amplitude and frequency in which the pipetting normally occurs, we can determine whether a new pipetting is with or without error. We analyzed the construction of the pipette holder to insure that only the sound from the pipette would be recorded by the microphone attached to it. TechVolver estimates that the method has the potential to reduce errors by up to 80%, and reduce pipette inspection by up to 70%.

eucys2021.com/engineering-09-2021
“When the Well is Dry, we will know the Worth of Water”. Most of the world’s countries including Egypt suffers from water and petrol shortage, especially in the previous decades. With the current consumption rate, two-thirds of the world’s population may face water shortages by 2025. Also, every day more than 3.3 billion liters of treated water are lost through leaking pipes in England and Wales. Out of our responsibility towards the world in which we live, we had to come up with a solution that lowers the loss of water and petrol. We designed a system that can detect fluid leakage and deal with it fast to prevent the wasting of fluid by building wireless devices that connect together and with the cloud system to monitor and control the fluid.

eucys2021.com/environment-01-2020

The project is an AI model to detect the tiles’ cracks by analyzing the images based on CNN and VGG19. Using a 40000-image data set was divided into three sections: 60% for training, 20% for validation, and 20% for test. The images were selected randomly for the test to ensure the model’s accuracy. The results showed that this solution had great success because the accuracy, precision, and recall reached 96.8%, 98.24%, and 94.98%, respectively, meeting the chosen design requirements achieving the project’s target.

eucys2021.com/engineering-05-2021

Between 110 million and 190 million people suffer from physical disability according to WHO. Eye tracking systems for helping handicapped have limited self-reliance features, long delay in controlling, and high cost. This project tackles the problem of Lacking Community engagement of the physically disabled by enabling them to use computers without (Mouse-keyboard) by wearing a mask only by developing a novel Algorithm. A mask was designed by researchers has 3 colors placed on its surface that allow user to control computer's cursor by moving attached colors using his tongue through our developed software via camera. The project was tested in two phases: algorithmic and real-world viability. Algorithmically, the performance was measured by testing 1500 (open sources) videos full of colors.

eucys2021.com/computing-04-2021

Upper limb impairment and deterioration of motor function require rehabilitation by professional therapy to restore the limb function partially or entirely. Due to limitations in the number of therapists among other factors, much research has been conducted into robot-assisted rehabilitation of upper limb impairment. A new low cost, portable exoskeleton for hand impairment is presented in this project. This exoskeleton is a soft-actuated model that provides assessment with daily tasks such as grasping and reaching. It is constructed from 3D printed, easily-available, and low-cost components. An app is used to allow the exoskeleton to read and perform pre-determined movements. Simulation of the exoskeleton kinematics validated the design and control of the prototype.

eucys2021.com/medicine-04-2021
Metal-air battery

Metal-air batteries, such as Al-air, Zn-air, Mg-air are a novel green energy storage devices, which overcome the limitations of hydrogen technology and Li-ion batteries in replacing fossil fuels. Using mainly chronopotentiometry and impedance spectroscopy techniques in a three-electrode system, the emphasis was on testing 171 cathode prototypes to develop a state-of-art cathode. The developed cathodes were used in a full-sized battery cell which was assembled in a tic-tac case combined with different anodes and electrolytes. Measured voltages and currents were converted to powers and efficiencies. Cathodes developed demonstrated superior results compared to literature. Our batteries reached high power output of over 100 mW cm⁻² and coulombic efficiencies within 64% and 100%.

eucys2021.com/chemistry-02-2020

Characterization of the activities and biochemical parameters of maltase AG2 from the non-conventional yeast Blastobotrys adeninivorans

Non-conventional yeasts and their enzymes are scarcely studied but they could have unique characteristics with biotechnological applications which are uncommon for enzymes of bakers’ yeast. A-Glycosidases are enzymes which hydrolyze sugars, but some of them synthesize short saccharides. The aim of the study was to characterize the activities and biochemical parameters of A-glucosidase AG2 (BaAG2) from evolutionally old yeast Blastobotrys adeninivorans. Protein sequence of BaAG2 was analyzed and several experiments were carried out to determine its biotechnological potential. The results showed that BaAG2 is a highly active enzyme with a common buffer component as an inhibitor. Assay of products showed that BaAG2 synthesizes rare trisaccharide that could potentially promote humans’ health.

eucys2021.com/biology-07-2021

Immune response against cytomegalovirus and its association with inflammatory diseases in old individuals

Persistent cytomegalovirus (CMV) infection is one of the drivers of immunological ageing, which impairs the immune function of elderly people. In this study we show that higher anti-CMV antibody levels are associated with several chronic diseases in old individuals. We found that people diagnosed with either type 2 diabetes, chronic kidney disease or disorders of the thyroid gland had significantly higher CMV-specific antibody titres compared to healthy people. Females had higher anti-CMV antibody titres than males and higher antibody levels correlated positively with age. Our results show that age-related disorders are associated with CMV infection and confirm the age- and sex-associated differences of CMV-specific antibody levels demonstrated by previous studies.

eucys2021.com/medicine-04-2020

The capability of artificial intelligence to identify Estonian plants

The aim of this study was to evaluate the accuracy of artificial intelligence based plant image identification applications among the Estonian Flora. Automated identification is relatively new and has not been examined using an extensive dataset. Two applications, Pl@ntNet and Flora Incognita, were used to identify 1501 images from a national database (551 taxa) and 1000 observations from field conditions (281 taxa). The results displayed that the applications were more accurate in the field (success ca. 80% both), with the correct species suggested among top five close to 90% of the occasions. Accuracy varied in the database part. Images with flowers were identified better than others, both applications were quicker than manual identification. Flora Incognita was translated into Estonian.

eucys2021.com/computing-11-2021
Gender stereotypes in Estonian word embeddings

Word embeddings are an influential machine learning framework in natural language processing that represents each word in a large text body with a vector. Geometric relationships between the vector representations capture meaningful semantic relationships between the corresponding words. The research paper "Gender stereotypes in Estonian word embeddings" emulated experiments of earlier English literature on the subject, but in the context of Estonian language, positively showing, in particular, that word2vec word embeddings derived from the largest dataset of Estonian texts, the etTenTen corpus, strongly associate male first names with terms related to career and science, while correlating female names with arts and family.

eucys2021.com/social-sciences-01-2021

Sampling from a discrete probability distribution using a discrete uniform probability distribution

Define the simulation of a fair m-sided die with a fair n-sided die as a process of obtaining a random integer from interval \([1,m]\) using a fair n-sided die. Then one can simulate a 4-sided die with a 6-sided die as follows: Roll the 6-sided die. If the outcome is between 1 and 4 inclusive, select it as the result of the simulation. Otherwise roll the 6-sided die again. In a more general case the simulated die doesn’t have to be a fair one. In this work, I prove that a certain greedy algorithm minimizes the expected value of the required samples. It turns out, perhaps slightly surprisingly, that the greedy algorithm not only minimizes the expected value of the samples but is at least as good as any other algorithm in a certain sense explained in our main theorem.

eucys2021.com/mathematics-02-2020

A comparison of direct reversal and nucleotide excision repair in UVB-treated bacteria

DNA of living organisms are a sensitive target for the Ultraviolet radiation, and especially UVC and UVB brings significant damage to the DNA. Fortunately, living organisms have repairing mechanisms to maintain genetic diversity and be able to reproduce. This experiment compares the effectiveness of two of these repairing mechanisms of DNA, Direct Reversal repair and Nucleotide Excision repair. The findings of this research are relevant to the advantages and disadvantages of UV radiation water treatment technologies, sterilization of surgical instruments, and the possible improvement of them. Energy efficiency differences of the two repairing mechanisms was provided as one of the explanations for the results.

eucys2021.com/biology-04-2020

Strategies of the board game African Star

We studied the strategies of popular nordic board game African star with computer simulation. We digitized the game using Python coding language and built strategies that navigate the game board using graph theory path algorithms. We divided testing of the strategies into phases. We found out that Cairo is a bit better starting position than Tangier but one shouldn’t rush there. We also found that reacting to other players may not be beneficial. Our results are not written in stone because the strategies we used aren’t optimal.

eucys2021.com/computing-10-2021
Vibrato is a musical effect consisting of periodic changes in the amplitude and frequency of harmonics and commonly used to enhance sound. On the violin, vibrato can be of very different character depending on the desired effect. The purpose of this project was thus to investigate how vibrato and especially its rate and extent affect the amplitude and frequency of the harmonics of a violin note by recording and analysing notes played without and with vibrato and then modelling the amplitude and frequency of each harmonic with sinusoidal functions. The results show for example that the rate affects mainly the frequencies of the amplitude and frequency modulations while the extent determines the amplitude of the frequency modulation and thus the number of resonance frequencies excited.

eucys2021.com/physics-06-2021

You all know the current contactless that allows us to make a payment or to open doors by placing your smartphone on a terminal. Using it may be very difficult for a person with a disability such as a person who has an amputated hand. In order to help these people, we have created Intra Body Communication: the contactless of the future. With our technology, your body extends your smartphone. If you need to validate a ticket or pay for something, you can do it with any part of your body. No biometric data required! Just keep your smartphone in your pocket and place the part of your body of your choice on the terminal. Our technology takes care of the rest by transmitting information to your smartphone through your body. Naturally, our technology would be useful to everyone.

eucys2021.com/engineering-03-2021

Chemical experimentation on the scale of a one microliter drop imposes many challenges: What drop container could replace the beaker we use at school? How to design a suitable probe to analyze a drop? All these questions, have been the subject of our study for over two years. To answer them, with the advice of our partners, we have built and perfected a device. It currently can generate homogenized drops of reaction mixtures in a cell. A laser beam scans them. The images obtained are read by a photoreceptor. We analyze the evolution curves of the signal and we deduce the drop absorbance. The composition of these reactional millireactors evolves throughout the process. To analyze the content of a drop, we made a system allowing the passage to and from, before the laser beam, of a drops train.

eucys2021.com/chemistry-01-2021

We created the universal device for persons with disabilities to make services for people with visual impairment effortless, help them to be more independent. The issues with the perception of visual images will be alleviated by introduction of audio information. Medication selector, the interactive device can receive voice command and rotating sections turn to the position where the requested medication is placed. For those with speaking impairment, card system allows user to insert the card, encoded in Braille, into the card system to get desired medication. Also, device helps a person to take medications the amount of which is determined by the number of drops. Taking medication is forgettable for all age groups. Thus, we created an application that will remind users to take medication.

eucys2021.com/engineering-02-2021
During the COVID pandemic, it’s necessary to follow WHO recommendations, such as: wearing face mask, washing hands frequently. Yet, these norms are not enough, because the virus can invade our body in other ways. Medical gowns are made of polypropylene fiber fabric extracted from the fusion, on which virus lives for 8 hrs. Project goal is to modify a protective gown against virus. Modified disposable gowns will become reusable, which will be cheaper and it will be far effective. Virus will lose activity once it appears on the surface of the modified med. gown. Fabric surface is modified with antistatic substances. As a result, a small electric charge is distributed on its entire surface. Innovation is in coating the fabric with antistatic substances containing nanoparticles.

Fabric modification with an electrically conductive compound containing carbon nanoparticles to obtain a virus-protective system
GEORGIA | PHYSICS-02 | 2021
eucys2021.com/physics-02-2021

Photometric search for exomoons by using deep learning and convolutional neural networks
GERMANY | COMPUTING-06 | 2021
eucys2021.com/computing-06-2021

During the COVID pandemic, it’s necessary to follow WHO recommendations, such as: wearing face mask, washing hands frequently. Yet, these norms are not enough, because the virus can invade our body in other ways. Medical gowns are made of polypropylene fiber fabric extracted from the fusion, on which virus lives for 8 hrs. Project goal is to modify a protective gown against virus. Modified disposable gowns will become reusable, which will be cheaper and it will be far effective. Virus will lose activity once it appears on the surface of the modified med. gown. Fabric surface is modified with antistatic substances. As a result, a small electric charge is distributed on its entire surface. Innovation is in coating the fabric with antistatic substances containing nanoparticles.

Fabric modification with an electrically conductive compound containing carbon nanoparticles to obtain a virus-protective system
GEORGIA | PHYSICS-02 | 2021
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GERMANY | COMPUTING-06 | 2021
eucys2021.com/computing-06-2021

Enzymatic inactivation of the veterinary antibiotic Florfenicol
GERMANY | BIOLOGY-05 | 2021
eucys2021.com/biology-05-2021

Physical description and modelling of paper strip flights
GERMANY | PHYSICS-05 | 2021
eucys2021.com/physics-05-2021

Enzymatic inactivation of the veterinary antibiotic Florfenicol
GERMANY | BIOLOGY-05 | 2021
eucys2021.com/biology-05-2021

Physical description and modelling of paper strip flights
GERMANY | PHYSICS-05 | 2021
eucys2021.com/physics-05-2021

When a confetti cannon is fired, a turbulent spectacle follows: hundreds and hundreds of paper snippets swirl through the air in fantastic trajectories. It is this phenomenon that Leonard Münchenbach and Leo Neff devoted themselves to with scholarly rigour in their research project. They constructed a frame that made small strips of paper fall to the floor in the same way each time. A slow-motion camera was used to film the action and computer software helped analyse the footage. The young researchers investigated a wide variety of strip shapes - some long and narrow, others short and wide. Among other things, their findings enabled them to arrive at a formula that can be used to precisely calculate how fast paper strips of a certain shape and size rotate when they fall.

Physical description and modelling of paper strip flights
GERMANY | PHYSICS-05 | 2021
eucys2021.com/physics-05-2021

When a confetti cannon is fired, a turbulent spectacle follows: hundreds and hundreds of paper snippets swirl through the air in fantastic trajectories. It is this phenomenon that Leonard Münchenbach and Leo Neff devoted themselves to with scholarly rigour in their research project. They constructed a frame that made small strips of paper fall to the floor in the same way each time. A slow-motion camera was used to film the action and computer software helped analyse the footage. The young researchers investigated a wide variety of strip shapes - some long and narrow, others short and wide. Among other things, their findings enabled them to arrive at a formula that can be used to precisely calculate how fast paper strips of a certain shape and size rotate when they fall.

Physical description and modelling of paper strip flights
GERMANY | PHYSICS-05 | 2021
eucys2021.com/physics-05-2021
A rip current is a natural phenomenon that causes numerous fatal accidents all over the world. I detect and localize rip currents with a deep neural network called Faster R-CNN. I assembled a custom database of rip currents and used transfer learning, resulting in an accuracy of 85.19% (IoU threshold: 0.5) and an AP of 0.37. In addition, I developed an orientation-aware region proposal layer. Based on evaluation using the IoU measure, the findings revealed that the orientation-aware region proposal layer was 11.7% more accurate, allowing the algorithm to adapt to many positions and different perspectives. An automated rip current detection system is under development. This approach contributes to the early identification of the hazard, to preventing accidents and to protecting human lives.

eucys2021.com/computing-01-2020

Due to the constantly increasing demand for digital devices, smart writing tools based on different operating principles have also been developed. In the frame of Hungarian Contest for Young Scientist I also have developed a digital writing and drawing tool utilizing a silicon-based MEMS (microelectromechanical system) 3D force sensor. One can draw or write on arbitrary surface with this wireless smart device, visualizing a real-time image on the screen of either a laptop or a smartphone. Additionally, the thickness of the drawn line can be tuned by the pushing force as in the case of a real pen.

eucys2021.com/engineering-01-2021

My aim was to build a remote-controlled mars rover based on Opportunity with similar basic functions. The construction of the whole vehicle is unique, I designed all the components myself, both mechanically and electronically, with a few exceptions eg: engines, camera... I also manufactured the whole structure, for which I chose the 3D printing technology. And I made the circuit boards (PCBs) with the help of a milling machine. The use of these machines attracts the fact that the entire mars rover is available in the form of virtual drawings, 3D plans so that it can be reproduced by anyone with sufficient skill. This documentation, and/or the availability of a ready-made functional model, allows it to be used in education, resp. to generate and disseminate scientific interest.

eucys2021.com/engineering-01-2020

Epithelial-mesenchymal transition (EMT) contributes to the development of cancer metastases. Our research group built a new, multicellular network model of the process in order to find new possible drug targets for the abrogation of metastases. My aim was to find a possible drug-target for the treatment of hybrid EMT cells. This phenotype was built in the model and cell-cell simulations were run. A protein has been found, which made the cell lose its invasive properties after being inhibited. This means that a new, possible drug-target has been found for the treatment of cancer metastases.

eucys2021.com/medicine-01-2021
The J0640+3856 is a subdwarf red-dwarf eclipsing binary system which was discovered in 2015 at Piszkéstető Observatory. The discovered star has an orbital period of 0.187284394 days and the optical eclipse depth in excess of 6 magnitudes. The special feature of the described binary is that, it is the binary with the deepest eclipses compared to other binary systems. I studied this binary using 5 years of archival data in order to discover a third companion in the system. As the part of my project, additional measurements were taken for me at the Piszkéstető Observatory with the recently installed 0.8 m Ritchey-Chrétien telescope. As a result, I successfully determined a new, updated ephemeris, so the future times of minima for the following cycles can be predicted more accurately.

deep learning, while able to solve complex problems, is likewise capable of creating technologies that threaten privacy, democracy, and national security. One of these technologies is the ability to create images or videos that humans cannot distinguish from authentic media. Such generated media are termed ‘deepfakes’. While methods of automatic deepfake detection exist, current methods are unsuitable for deployment at scale, partly due to their inordinate computational cost. This paper performs a comprehensive analysis of recent deepfake detection methods and proposes multiple significant improvements, including a novel face detector. Together these culminate in an order of magnitude improvement of efficiency over the state-of-the-art.

Gender stereotyping negatively impacts on emotional development, mental health and career choices. In this project we carried out a statistical investigation into prevalence of gender bias in 376 pupils aged 5-7. We devised research activities to gauge their views on various aspects of gender stereotyping, such as: linking emotions/feelings to gender; rating the competency of males/females in STEM/Non STEM occupations; drawing male/female engineer. We can conclude that gender bias does exist in 5-7 year olds. Our results show that boys are more confident in male ability than girls are in female ability, and boys are less willing to recognise female ability. To help combat gender stereotyping, we have gathered resources to be used by teachers and parents that explicitly target gender bias.

Although much is known regarding stem cell (SC) self-renewal and differentiation, the specific mechanisms used for their elimination is still unclear. One key pro-apoptotic protein is ARTS. We showed that the absence of ARTS in mice protected intestinal stem cells from apoptosis (cellular suicide), which prevented radiation-induced cell death, as well as enhanced regeneration. We also identified a novel compound which has a significant potential for limiting apoptosis in the intestinal crypt both in healthy and diseased states, like Inflammatory Bowel Diseases. Collectively, our results offer the potential to dramatically advance our basic understanding of SC biology, elucidate novel functional pathways and advance novel SC-based approaches for regenerative medicine and targeted therapies.

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**In the footsteps of an invisible companion around an exotic eclipsing binary star system**

HUNGARY | PHYSICS-01 | 2021

Gábor Gergő Balázs 18 years
eucys2021.com/physics-01-2021

**Towards detecting state-of-the-art deepfakes**

IRELAND | COMPUTING-01 | 2021

Gregory Guy Tarr 18 years greg@inferex.com
eucys2021.com/computing-01-2021

**A statistical investigation into the prevalence of gender stereotyping in 5-7 year olds and the development of an initiative to combat gender bias**

IRELAND | SOCIAL-SCIENCES-01 | 2020

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Alan Thomas O’Sullivan 18 years alanousullivan27@gmail.com

eucys2021.com/social-sciences-01-2021

**The role of ARTS in stem cell apoptosis: identifying a novel compound for regenerative medicine and disease therapies**

ISRAEL | BIOLOGY-02 | 2020

Noa Prisalac 18 years noaprisalac24@gmail.com
eucys2021.com/biology-02-2020
As of 2050, the world as whole will consume 2-3 times the energy then the amount it consumes today. Current methods to produce energy, will not be able to answer this need in the future. Nuclear fusion may be the solution. Is a cylindrical capsule, that is considered less efficient than the common spherical one, with the addition of a magnetic field, could achieve similar or mitigating conditions for ignition. For the mechanisms that effects the total energy, an equation was developed that was modified for a cylindrical system. An achievable value for the magnetic field was found, that will satisfy the needed conditions.

Current global trends show that food shortages are expected to occur throughout the world in 2050. Therefore, it is paramount to advance the aquaculture industries to modern technology standards. A key challenge in this field is the tiny size and large numbers of prawns, which are a crucial part of the food supply in Asia. This presents a major difficulty in growing prawns. We developed a system that included three algorithms to evaluate the number of prawns, utilizing artificial intelligence. Those algorithms were successful under lab and industrial conditions. The system increases efficiency in the aquaculture industry by enabling the farmer to feed, plan, and track the growth of the prawns. It provides a major step in creating a fully autonomous robotic system for handling prawn growth.

Although categorizing stimuli is a basic cognitive ability, the neural mechanisms of categorization and category learning are poorly understood. Here, we conducted a proof of concept experiment and were able to show that mice can learn categorization of auditory stimuli. This allows us to use mice as an animal model for future categorization studies. We further investigated connections in the mouse brain between the auditory cortex and frontal cortical areas, responsible for high-level integration and behavior. Seeking connections underlying categorization, we identified projections from the auditory cortex, and especially, temporal association area (TeA), to the orbito-frontal cortex. We propose that the TeA serves as a fundamental region in auditory category perception and learning.

Flame retardants (FRs) are often used in extinguishing forest fires. However, their ecological consequences are often overlooked. After use, FRs wash into nearby drainage basins. They contain biologically available nutrients to marine microbes and may disrupt the food web. FRs may affect relations between microbes and disrupt the system's balance due to different absorption rates between species. These effects are magnified in low nutrient environments, such as the Mediterranean. As part of this project, an experiment was conducted, simulating a marine FR pollution event. The results show that FRs may act as a fertilizer or be toxic, depending on its concentration. While FRs are necessary during emergencies, they affect the marine ecosystem and must be prevented from washing to the sea.
Our project aims to find new strategies for identifying chemical residues that are toxic to the environment and humans using Green Chemistry principles and Nanotechnologies. The Italian production of rice is about 1,500,000 tons/year, despite these numbers large quantities of rice are imported to meet national needs.

We developed a colorimetric sensor based on gold nanoparticles for the detection of bromide ions in rice samples. The nano-sensors obtained can be used to analyse both heavy metals such as chromium (with chromatic change in AuNPs from wine red to blue-violet) and Br- ions (with chromatic change from blue to red). Br- is a dangerous contaminant residue, which can result from the use of illegal material such as methyl bromide used as a fumigant in stored rice samples.

eucys2021.com/chemistry-02-2021

I present a new physical-mathematical method that describes the shape of a distorted interstellar bubble, namely the surface of a heliosphere deformed by the motion of the circumstellar gas. I created a straightforward but rigorous model, which has been tested on two real objects through a specifically developed algorithm that produces the outline of the bubble. Thus, I obtained a solid of revolution that allows the direct comparison between the mathematical model and the astronomical observations. The test-cases show a segment of the bubble’s surface, presenting a bright structure called bowshock, caused by the violent interaction between the stellar wind and the surrounding gas. The comparison has highlighted an excellent match between my theoretical model and the observable dynamics.

eucys2021.com/physics-03-2021

The purpose of this research is to use civil wastewaters entering the purification plant and those coming out of it after various treatments to build a galvanic battery and produce electric current. The water sent for purification contains molecules formed by elements such as carbon, nitrogen, sulfur and phosphorus in a predominantly “reduced” state and is scarce in oxygen concentration. The water that comes out of purification contains the same elements in a predominantly “oxidized” state and is rich in oxygen level. A prototype of this cell is assembled in order to analyze the generated potential difference and the involved chemical reactions.

eucys2021.com/environment-02-2021

As personal transport becomes more available, the task of regulating road traffic and traffic jams management is becoming increasingly important. The present work is focused on the part of the problem of road traffic regulation, which includes simulation modeling of traffic flow. The goal of the work is to study the application of simulation modeling in solving traffic regulation problems, considering a practical example. A model of the existing Riga city road junction was created, where traffic jams often occur, and traffic flow modeling was performed. Then changes were made to the model that could theoretically reduce traffic jams, and traffic IM was repeated. From the obtained results it was concluded that the proposed modifications can reduce traffic jams in the selected road junction.

eucys2021.com/computing-14-2021
Mosquito-borne diseases such as Tularaemia, Sindbis virus, Dengue fever, Zika virus, Yellow fever and Malaria are spread from endemic countries to other parts of the world and climate change might be one of the main causes of this phenomenon. Research highlights that climate change is not the only factor contributing to the spread of these diseases. The study analyzes the possibility of mosquito-borne disease spread in Liepaja and factors that might propagate it. The focus of this study is mosquitoes – vectors that transmit different pathogens to humans and animals. The empirical part of this study includes the collection of mosquito samples. One sample of mosquito (Coquillettidia richardi) was found to contain francisella tularensis highlighting multiple possible future threats.

Due to global warming, droughts cause great stress to plants, slow down their growth, reduce the supply of plant foods, increase the cost to the customer. Farmers use expensive biostimulants in order to save crops during droughts. So, I decided to look for an effective alternative – calcium compounds, which are widely used in agriculture to regulate soil acidity, and are known for their role in stress signaling. I studied effects of calcium chloride on adaptive responses of three economically important crops to drought stress. I found a significant decrease of proline levels in all calcium-treated plants when drought was simulated. For this reason, calcium chloride could be used in agriculture as a cheap and environmentally friendly alternative to biostimulants.

Now and especially in the near future, one of the most striking dangers to the world, which we have to overcome immediately, is environmental pollution. There are many sorts of contaminants, however, among them, pet excrements are highly harmful. I studied uncollected pet excrements in order to reveal a potential spread of deadly diseases that could escalate into an outbreak or epidemic. Although I studied a rather small area – covering one city in Lithuania, however, results could be easily extrapolated to many cities in other countries, where the number of pets (domestic and abandoned ones) is huge and still growing to this day.

3/4ths of all packaged foods contain added sugar, causing us to consume more sugar than required; the more we eat it, the more we tend to crave it, causing many to question sugar as an addiction. In this project, the effects of sugar on the brain and our hormones are explored, while also evaluating the extent that sugar can be seen as an addiction through a comparison to opioid addiction (as they have similar properties) examining a potential relationship between sugar and drug addiction. The findings of my research and literature reviews concluded that although there are several similarities between opioid and sugar addiction in their effects on the brain and symptoms created, implying a high likelihood of an existence of a sugar addiction like that of an opioid addiction.
Water quality in Luxembourg and its consequences on aquatic microorganisms
LUXEMBOURG | ENVIRONMENT-03 | 2020

Water samples from different rivers in Luxembourg showed the presence of different levels of concentrations of nitrites, nitrates, and phosphates. Their effects on aquatic microorganisms were assessed by storing the water under different conditions and being filled up with various amounts of manure. Effects of the manure on aquatic organisms were observed not only by calculating their abundance but also by identifying different species of microorganisms. Several species of aquatic microorganisms, bacterial and non-bacterial ones, were identified. The bigger the amount of manure in a water sample is, the bigger is the concentration of nitrates and, consequently, the lower the abundance of non-bacterial aquatic microorganisms. A growth in bacteria is observed.

eucys2021.com/environment-03-2020

Investigating the effect of alcohol on hepatocyte function
LUXEMBOURG | BIOLOGY-03 | 2021

How much alcohol is too much? Public health requires a guideline to incentivise responsible teenage vodka consumption and prevent irreversible liver damage. This study attempted to determine a safe concentration by immersing 1.0g pig liver pieces in a 37°C water bath with different vodka concentrations serially diluted. Vodka and hydrogen peroxide volume and mass of pig liver were controlled amongst other variables. Liver function was modelled through the level of inhibition of catalase in the breakdown reaction of hydrogen peroxide, measured by volume of oxygen produced. Results produced a bell curve pattern, with greatest oxygen production at 60% vodka concentration, suggesting some beneficial effects of alcohol at lower concentrations and advising consumption at this concentration.

eucys2021.com/biology-03-2021

Modelling treatment for ALS
LUXEMBOURG | MEDICINE-02 | 2020

Amyotrophic Lateral Sclerosis (ALS) is a fatal neurodegenerative disease characterized by motor neuron death in the brain and spinal cord. Though cell death in ALS is poorly understood, scientists believe that apoptosis and autophagy play a role. The MAP4K4 kinase regulates these and its inhibition has slowed ALS in ALS-derived induced pluripotent stem cells, iPSCs. This project examines the pathogenesis of ALS cell death, highlights that inhibiting the MAP4K4 kinase can rescue motor neurons, designs a method for this investigation in vivo, and examines the viability of the treatment.

eucys2021.com/medicine-02-2020

The impacts of antibiotic-clavulanate on the human microbiota
LUXEMBOURG | CHEMISTRY-03 | 2021

To maximise the efficiency of antibiotics, working against the proliferation of harmful bacteria, the chemical “clavulanic acid” has been introduced to the medical industry working alongside penicillin branches to prevent bacterial resistance. But, after research, it is evident that its impacts are detrimental to bacteria that present a mutualistic relationship with the human body, such as the ones in the gut microbiota, producing essential vitamins for the overall protection of the site and for the efficiency of our digestion. Given the acid and antibiotic combination is commonly prescribed and belongs to the WHO Essential Medicines List for children, there is an urgent need for further scientific research to prevent the growth of monopoly pharmaceutical companies at the cost of patients.

eucys2021.com/chemistry-03-2021
Increased urbanisation and population have led to higher medicine concentrations detected in water systems worldwide. This study investigates the effect of one of the most widely pollutant medicines (ibuprofen) on Chlorella pyrenoidosa as a model for other microalgae and higher plants. A colorimeter set to 440 nm was used to measure the effect of ibuprofen concentrations Chlorella growth over 11 days. Possible experimental error made it difficult to determine a trend over time, however, when comparing the concentrations to each other on the last day of testing it was found that the 0.4µg/L concentration had the most growth and the 0.0µg/L the least. This indicates that ibuprofen could cause eutrophication, however further investigation is necessary to adequately determine this risk.

eucys2021.com/environment-03-2021

This study explores the pattern behind Chinese women’s desire to “beautify” their facial features and what builds their standards of a “beautiful face”. By examining the evolution of manners toward commodified beauty, the overall progression of China on its way to modernization is unveiled. The essay follows a chronological order from the traditional beauty ideals in late-imperial China, which are derived from ancient times; and transit to the Maoist era when individualities are sacrificed for the state, followed by an introduction to cosmetic surgeries. This then leads to an analysis on the modern beauty ideals and market in China with theoretical underpinnings, where the extent of westernization is examined, assuming that the level of any constantly altering phenomenon is "measurable".

eucys2021.com/social-sciences-02-2021

Geopolymer concretes are a sustainable alternative to traditional concrete, characterised by their use of lower amounts of energy and raw materials, whilst having durable chemical and physical properties. Geopolymer concretes are produced through a geopolymerisation reaction, made by activating source materials such as fly ash with alkaline solutions. The investigation’s aim was to compare the durability of fly ash based geopolymer concrete, as the ratio between sodium silicate and sodium hydroxide in the alkaline activator solution is changed. The durability was determined through a sorptivity test. A negative relationship between the ratios and the sorptivity of the samples was observed. These findings can be used in industry to produce durable fly ash based geopolymer concrete.

eucys2021.com/chemistry-07-2021

Senescence is a state in which cells stop dividing but are metabolically active and release tumour-promoting factors. Chemotherapy can induce transient senescence of cancer cells, which may influence cancer relapse. Hence, eliminating senescent cancer cells with senolytics has potential in anticancer therapy. A process called autophagy may affect the action of senolytics. In my project, I observed that fisetin reduces the metabolic activity of colon cancer cells in two models of senescence induction. Fisetin caused changes of senescent morphology and decreased levels of senescence biomarkers. Results also show that it may affect autophagy in proliferating and senescent cells. These results suggest that fisetin may counteract senescence of cancer cells, but this requires further research.

eucys2021.com/biology-05-2020
Despite extensive research, we still don’t know everything about microplastic in the environment. That’s why, when I accidentally detected microplastic in bird pellet of protected species, I decided to begin researching this topic. The main purpose of this study was to recognize the contamination of small rivers in urbanized areas of my home city and check how the microplastics are capable to penetrate food networks. It turned out that I detected microplastic on all searched sites on chosen rivers, even those far from the city centre. Also, I detected microplastic in excrements and pellets of all investigated vertebrates. My research showed that the problem of microplastic in urban river systems is very serious especially given the possible consequences for nature protection.

eucys2021.com/environment-04-2020

Pell’s equation is a well-known Diophantine equation, which has been studied since ancient times -first by the Greek (the famous cattle problem of Archimedes) and Indian mathematicians (Bhaskara, Brahmagupta), and then in Europe (Brouncker, Euler, Fermat, Lagrange). Pell’s equation is related to many important problems in mathematics, and has applications mainly in algebraic number theory and theory of continued fractions. In my paper, I study the question of divisibility of the solutions of Pell’s equation by prime and non-prime numbers. To this aim, I use tools from algebra and number theory, such as quadratic residues and Dirichlet’s theorem on arithmetic progressions. As a result, for a given integer, I find equivalent conditions to be a divisor of such a solution.

eucys2021.com/mathematics-03-2020

Algorithmics is about solving problems formally. My algorithm belongs to text algorithms that relate to processing sequences of data. The problem itself is a variation of a classical problem in computer science called pattern matching. Its input data consists of two real number sequences - a pattern and a text, and the goal is to find contiguous parts of the text similar to the pattern. I decided to define similarity as maximum absolute error. This is a twist to the basic version where strict equality is required. It took me many weeks to find the core idea that made my method work. But it paid off - the algorithm is simple, effective and its code is short. It has applications in plagiarism detection, numerical data processing (for experiments or simulations), and musical analysis.

eucys2021.com/computing-12-2021
A seemingly simple question – “where lies the center of the triangle?” – turns out to lack an easy answer. Many different constructions emerged during centuries of mathematical discussion. Each of these points is somehow special, and none is a better fit for “the triangle center” than the others. There is even an “Encyclopedia of Triangle Centers” containing more than 40,000 different points – and my paper increased this number by another 35. I’ve started from the notion of isogonal conjugate – something already known in geometry. On this basis I’ve introduced the hodpiece of a point – the main construction of my article. The final and the most important result of my paper is that Bloom’s point (X40139) cannot be constructed using only a compass and straightedge.

eucys2021.com/mathematics-02-2021

People die prematurely every year due to air pollution, mostly due to car traffic. Green infrastructures can act as PM sinkers, through the deposition and removal of airborne pollutants. ATMOS aimed at quantifying PM retention by trees, developing a new methodology to calculate PM retention, based on volume function and assessing the economic value of the ecosystem service provide by ATMOS evergreen infrastructure.

eucys2021.com/environment-08-2021

Given the professional requirements of today’s society, workers of various professions, are exposed to high levels of harmful radiations, which increases the risk of contracting severe illnesses. To efficiently monitor the exposure to dangerous ionizing radiations, this project presents a system that analyzes in real-time the exposure to harmful radiation and alerts the user when the daily exposure limit is reached. It integrates a new Arduino-based detector fully developed for this purpose and communicates with a mobile application designed to analyse and record all working sessions. The result is a revolutionary prototype that introduces a new paradigm in the work safety conditions of these professionals, with the objective of reducing the associated health risks and save lives.

Development of an integrated ionizing radiation detection and alert system

eucys2021.com/engineering-08-2021

Our paper presents the study of cellular structures with the purpose of creating microactuators, some of which have applications in medicine. The microactuators were developed after studying various cellular structures ranging from the F1Fo ATP synthase to the sporangium of the Polypodium aureum fern. The geometrical parameters of the sporangium have been used along with additional data to develop diverse models of microactuators. Various materials were tested to serve as the base material for our actuators such as polyethylene, silicon dioxide, and chitosan. The mechanisms developed have various applications ranging from diagnostic tools to a possible treatment for paralysis.

Study of microbiological structures with the purpose of creating MEMS actuators with various applications in medicine

eucys2021.com/engineering-06-2020
**Strong electric field electroosmosis - physical principles and measurements in the strongly nonlinear regime**

Electroosmosis is the motion of an electrically neutral fluid under the influence of an electric field due to interface breaking of local electrical neutrality. We analyzed a simple system in which there are nonlinear effects present, related to the bulk electrolyte depletion caused by the accumulation of ions at the electrodes. The apparent electroosmotic velocity was measured and the zeta potential was evaluated for both a short time and a large time scale. Long time scale effects are significant, causing the zeta potential to vary. This can lead to electroosmosis in systems where it was not previously expected; for example, in the interstitial fluid near the tight junctions of the epidermis. In this context, micropumps with the purpose of drug delivery were quantitatively described.

eucys2021.com/chemistry-09-2021

**Demyelination: a research into the use of electrical models in studying demyelinating diseases**

The aim of our project is to analyze the use of equivalent electrical circuits in the modeling and study of demyelinating diseases. Within that scope, we have carried out a study into the anatomy and physiology of the nervous system, and more importantly, of the myelin sheath. Afterwards, a geometrical, a mathematical, and an electrical model have been used to better describe myelin. Following the implementation of the definition of demyelinating diseases in the thus created framework, we have conducted a couple of experiments highlighting the deformed signal characteristic to them.

eucys2021.com/medicine-06-2021

**InoShoes**

"InoShoes", the innovative shoe, was created to be comfortable and to provide useful information to the wearer, information that can be used to prevent the appearance and / or accentuation of certain foot disorders related to the walking process, respectively to communicate with the environment, external of the carrier. The shoe is equipped with a multitude of sensors placed in locations where the data collected reflects reality. The functions of the shoe include location through the phone’s GPS, transmission of SOS signals, pedometer, monitoring the pressure distribution, monitoring the frequency and characteristics of the steps.

eucys2021.com/engineering-11-2021

**Synthesis of helper lipid as a component of cationic liposomes for gene therapy**

Gene therapy is a promising approach to the treatment of hereditary and acquired diseases, which consists in the introduction of therapeutic nucleic acids into the cell for a targeted change in its functions. Cationic liposomes are able to protect such nucleic acids from biological factors, and to deliver them into target cells. An important component of cationic liposomes are helper lipids, which stabilize the structure of liposomes and control the release of genetic material. Currently used helper lipids may be destroyed in the bloodstream, therefore the problem of designing more stable analogues is actual task. As a result of the work, the new helper lipid which contains serine as a hydrophilic domain was synthesized and it will be used for the preparation of cationic liposomes.

eucys2021.com/chemistry-01-2020
Every day in Russia, about three hundred people get lost, and the percentage of the rescued is not so high. At the moment, special teams of the Ministry of emergency situations and volunteer formations are searching for people. Unmanned aerial vehicles are often involved in the rescue process, as this is a fairly promising area of technology development at the moment. The aim of the research is to develop a complex "Kestrel" with an unmanned aerial vehicle capable of recognizing human images during the flight and be able to be operated in the Arctic region. The objectives of the study are to develop and justify the applicability of such complex during rescue operations in the Arctic conditions and to work out specialized software for the payload.

eucys2021.com/engineering-03-2020

I made a model that is capable of one drop and in a few seconds to determine the quality of gasoline. The device measures and displays the obtained data of two main parameters - the octane number from 80 to 100 and the specific active electrical conductivity of gasoline. To increase the accuracy of the readings, a scheme has been developed to maintain a stable temperature of a drop of gasoline from 20.5 to 21°C. Correction of indications is provided depending on fluctuations in the active electrical conductivity of gasoline. Small size, low cost (not more than 800 ₽) in combination with a small error in the octane number (+/- 0.5) and ease of operation are the advantages inherent in my device.

eucys2021.com/physics-01-2020

We investigated the modifications of the pH of the cell culture medium in the environment of cancer cells with the aim of finding a new anti-cancer therapy. We tried to find out the ideal pH for performing anti-cancer therapy procedures and apply it to SKBR3 cells. From the observed results, we concluded that the ideal pH for our proposed therapy was 6. Then we focused on studying the effect of rottlerin on U-87MG cells. We investigated the effect of low extracellular pH on the efficacy of rottlerin treatment. Moreover, the combination of rottlerin and the change in extracellular pH resulted in a higher efficacy of the treatment effect. These results not only confirm the potential of rottlerin, but also prove the application of pH alteration method as a way to rationalise chemotherapy.

eucys2021.com/biology-01-2020

In this project, we have created a web search engine, Omnis, capable of question answering, which utilizes for this purpose artificial intelligence for reading comprehension and information extraction. The system obtains and processes data from unstructured texts, web documents, and various knowledge bases. Additionally, the engine is based on a modular architecture, which means that anyone can freely expand it by creating and deploying their modules.

eucys2021.com/computing-02-2021
Autism spectrum disorder (ASD) is a heterogeneous condition with no efficient treatment targeting its core symptoms available. This project aimed to investigate the dynamic changes in long-term effect of a subchronic intranasal oxytocin (0.8 IU/kg) treatment during the treatment period and after its termination in the Shank3 deficient mouse model of autism. Our results indicate prosocial and anxiolytic effects of oxytocin in both female and male Shank3(-/-) mice. Moreover, we found that termination of the subchronic treatment results in socially ambivalent behavior. Further interventional experiments are needed to fully elucidate the therapeutic potential of oxytocin in ASD.

eucys2021.com/medicine-03-2021

Biomechanics of the masticatory muscles in correlation with teeth have been researched. Specific measurement models and special measurement methods have been used to simplify the complexity of the human chewing process. Here the function of the masseter muscle and the lateral pterygoid muscle as the key muscles in human masticatory system has been evaluated. A three-dimensional scan of a realistic human jaw was used to develop a tool for the measurement of the maximum bite force on the front teeth. The determined forces acting in individual muscles during chewing were 341±71N and 149±64N. The results showed that the force and tension on the teeth varies according to their distribution and is highest on the front teeth with the smallest area of the dental crown.

eucys2021.com/physics-04-2020

Adolescents represent a considerable percentage of cannabis users, but the effect of smoking on their pulmonary function has not yet been investigated. Therefore, I decided to compare forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) of cannabis smokers with combined cannabis and tobacco smokers and control group of non-smokers, all participants being 18-year-old males. In previous studies, several mechanisms were proposed to explain inconsistent higher values of FVC and FEV1 in long-term cannabis smokers while smoking tobacco was repeatedly found to decrease both parameters. However, results of this study showed higher FEV1 in the group of cannabis smokers while differences in FVC were statistically insignificant, presumably due to lower exposure to substances.

Biomechanics of the masticatory muscles in correlation with teeth have been researched. Specific measurement models and special measurement methods have been used to simplify the complexity of the human chewing process. Here the function of the masseter muscle and the lateral pterygoid muscle as the key muscles in human masticatory system has been evaluated. A three-dimensional scan of a realistic human jaw was used to develop a tool for the measurement of the maximum bite force on the front teeth. The determined forces acting in individual muscles during chewing were 341±71N and 149±64N. The results showed that the force and tension on the teeth varies according to their distribution and is highest on the front teeth with the smallest area of the dental crown.

eucys2021.com/biology-03-2020

eucys2021.com/medicine-03-2020

eucys2021.com/physics-04-2020
Creating a biodegradable mask from lignin extracted from chestnut
SOUTH KOREA | CHEMISTRY-04 | 2021
We used hydrolyzed lignin extracted from the hard shell of chestnuts. We then combined lignin with polyvinyl alcohol (PVA) and utilized electrospinning to polymerize the solution and create a nanofiber matrix. Testing the matrix showed that the matrix could be used to create a recyclable, biodegradable facial mask. Observations under SEM allowed us to observe the nanostructure of the matrix, and test its potential as a filter. We then compared the Lignin mask with commercially available facial masks and tested the filtration efficiency and splash resistance. Further work is being done on methods to chemically treat the fabric to remove microdust and viruses, to show that the lignin mask is a commercially viable method of recycling old wood waste.
eucys2021.com/chemistry-04-2021

A study on removal of heavy metal and green algae in river using chestnut by-products
SOUTH KOREA | ENVIRONMENT-04 | 2021
This study aims to develop eco-friendly algae remover and heavy metal removal by utilizing the following two characteristics by-products of discarded chestnuts: (1) Polyphenols contained in chestnut by-products are effective in removing heavy metals. (2) The porous structure formed by carbonizing the outer shells of chestnuts may absorb algae. Using abandoning chestnut by-products can minimize the costs of raw material costs, enable mass collection, be relatively simple in making process, and be eco-friendly way to remove heavy metals. And it is expected to be fully utilized as a way to fundamentally solve the algae phenomenon that occurs on a large scale every summer as it is simple and does not cause secondary damage.
eucys2021.com/environment-04-2021

Transhumanism: will we still be human?
SPAIN | SOCIAL-SCIENCES-02 | 2020
This paper aims to highlight the general ignorance of transhumanism, as well as provide some key concepts to form an informed opinion about it. To this end, the fundamental aspects that concern it will be exposed and analysed and the repercussions that this philosophical approach may have in the fields closest to the human being, namely the social, ethical and anthropological fields, will be studied.
eucys2021.com/social-sciences-02-2020

Triops cancriformis. How to survive at climate change?
SPAIN | BIOLOGY-04 | 2021
This project is a study of the Triops cancriformis egg resistance to high temperatures and the analysis of its chemical composition by thermal analysis up to 1000°C and observation with scanning electron microscope. This would explain why it has survived the great extinctions of our planet and why it is considered a living fossil retaining the same appearance as more than 200 million years ago in the Triassic period.
eucys2021.com/biology-04-2021
The main focus is the mathematical formulation and implementation of a support vector machine (SVM) algorithm in D-Wave’s quantum annealer. The first step was to formulate the problem as a quadratic unconstrained binary optimization (QUBO) problem. With some adaptations, physical limitations of the quantum computer were overcome. Finally, I coded the algorithm and executed it in the quantum annealer, along with a local simulated annealing version, and its classification performance was compared against that of the classical algorithm. Through the proposal of a QUBO formulation of an SVM algorithm, it has been proven that it is possible to solve it in a quantum annealer and when executed with two datasets, excellent classifications were obtained, while not evidencing any quantum advantage.

eucys2021.com/computing-05-2021

How airplanes fly is one of the most important questions within the field of air- and spacecraft development. By studying how paper airplanes behave, one can develop knowledge on flight principles. The purpose of this scientific report was to gain a better understanding of how the design of a paper airplane affected the longest possible flight distance. The studies show that the models with a higher wing loading and thicker wings contributed to balancing the forces affecting the paper airplane, leading to the airplane being able to travel in a more stable trajectory in the same direction. The higher wing loading also resulted in less drag and a more even lift force. Lastly, the coanda effect depends on the angle of attack and thus also on how far the paper airplane can travel.

eucys2021.com/physics-08-2021

This study investigates the antibacterial effect of silver ions on Escherichia Coli and Bacillus Subtilis. It aims to clarify the correlation between the silver ion concentration and the antibacterial effect. The well diffusion method was used in the experiment, where five different concentrations of silver ions were examined (0, 1, 5, 20 and 50 mM). Every concentration was tested 12 times on each bacterial strain and the inhibition zone was measured after 24 h. The results generally showed that higher silver ion concentrations induced a higher antibacterial effect. Moreover, the effect on Bacillus Subtilis was greater than the effect on Escherichia Coli. A tendency of a plateau-effect could also be observed. However, a clear trend could not be established.

eucys2021.com/biology-08-2021

The French military radar GRAVES emits electromagnetic waves consistently at a frequency of 143.05MHz. These waves propagate in the air and are reflected by electrically conductive objects. If the object is moving, the frequency of the reflected wave will change. This effect is known as the Doppler shift. The reflected waves were received by an antenna positioned on the roof at the Gymnase de la rue des Alpes, in Biel, Switzerland. The signal was thereafter transmitted to a computer which displayed the Doppler shift graphically. Numerous concrete objects were identified in the study, from the meteorite swarm of the Perséids to the International Space Station (ISS).

eucys2021.com/engineering-05-2020
We are used to bubbles rising in liquids, however, when a column of liquid is oscillated vertically, it is not always the case. Experiments have been conducted to determine the critical conditions under which such a behavior occurs. In a second part of this paper, it is shown, that the experimental results are in good agreement with an equation of motion describing the air bubble's motion in a water column. Lastly, the behavior of bubbles in a vertically oscillating oil column was qualitatively explained, that is a new equation of motion was found and experiments have been conducted to verify its accuracy. After measuring the Reynolds Number of both flows, we can conclude, that due to the density and viscosity of the oil, different differential equations are needed.

eucys2021.com/physics-06-2020

In recent years, the occurrence of HABs - harmful algae blooms - in freshwater systems have become more frequent, as water temperatures are rising due to global warming. These blooms are formed by fast reproducing algae or cyanobacteria and can have serious consequences for aquatic organisms, as some bloom forming species produce toxins that inhibit the growth of other aquatic organisms. I asked myself if elevated temperatures would not only increase the growth rate but also lead to increased toxin production of the cyanobacterium Microcystis aeruginosa.

eucys2021.com/biology-09-2021

This paper proposes the comparison of two works of fiction, Homer’s Odyssey and the BBC’s Doctor Who, based on similarities in creation, structure, and content. A complex understanding of both works and their cultural significance is gained by methods of close readings and aspects of media archeology. The second oldest work of western fiction and the ongoing British science fiction series offer an astonishing array of comparability leading to significant insights. The ancient and the modern epics act as foils for each other, highlighting nuances whilst also driving home how many of the demands we have for popular fiction have not changed through the ages, simply because they fulfill basic human needs.

eucys2021.com/social-sciences-04-2020

When someone gets buried in an avalanche, the likelihood of survival drastically decreases with time. This project was created to reduce the time until the victim is rescued. The idea is to relocate the search from the ground, performed by humans, into the air by an autonomous drone. Such a drone should be tiny and portable, as mountaineers would always carry it with them when operating in avalanche endangered areas. In case of an accident, it can be sent out to search immediately. Attempting to bring this vision into reality, I built a functioning prototype, which is capable of detecting an avalanche transceiver and of communicating its location to a user. The findings of this experiment are highly valuable for further development of future systems.

eucys2021.com/engineering-10-2021
Most nations and their healthcare systems have been overwhelmed by the COVID-19 pandemic. Mass testing is central to rapid tracing and breaking the chain of community transmission. However, corona testing can be prohibitively expensive, especially for poorer nations. We develop and present testing protocols based on the group testing technique, in which several samples are pooled and evaluated as a group using a single test. We show that by cleverly choosing overlapping groups, one can dramatically reduce the number of required tests. For example, assuming an infection rate of 0.1%, the whole Swiss population, 8'570'000, could be tested using only 302'915 tests. Using these testing protocols, large populations can be mass tested while significantly decreasing the number of required tests.

eucys2021.com/mathematics-05-2021

Detection of Customer visits to Bank branches using RFID technology and open CV module for service improvement, security enhancement and customer loyalty services. Customers equipped with RFID stickers on the back of payment card, or savings book will be detected at their entrance and exit to the branch. However other customers non-equipped with RFID Tags could also be recognized thanks to open CV module. These identifications will be used for different purposes such as: 1) Human resources sizing for best customer services. 2) Informing the branch manager about the visit of a VIP customer for a better and followed welcome 3) Securing transactions against all fraud of customer identity theft in saving accounts. 4) Customer loyalty through reduction and free offers from partners

eucys2021.com/computing-07-2021

The wastewater containing Methylene Blue (MB), released by textile factories after dying Jean clothes, is significant pollution in the environment. We propose a photocatalytic protocol for MB treatment, as semiconductor photocatalysis uses sunlight to decompose organic pollutants (MB). We have used, for this, CZTS nanoparticles synthesized by the solvothermal method. The protocol shows that about 88% of MB was decreased in 260mn under visible light, efficiently. For industrialization, we propose a prototype of treating MB wastewater and obtaining a clean one automatically based on an automation system using PLC S7-1200 and a SIMATIC HMI for the supervision of this system.

eucys2021.com/chemistry-05-2021

World consumption of paper has grown 400% in the last 40 years. Now nearly 35% of the total trees cut around the world are used in paper industries, which is a disaster for nature. As wood contains 40-50% of cellulose, and sunflower seeds' shell contain 48% of this material as well, which is the main component of paper making, we found out that we can reduce the use of trees by replacing it by sunflowers seeds' shell. First we soaked sunflower’s seed shells in water for 6 hours to make it more easy to use . Second we boiled them and add them sodium carbonate for 30 minutes on high temperature. Then we kept pounding it to produce pulp. Finally we dried it on a hot surface.

eucys2021.com/materials-01-2021
A microfluidic pump (MFP) is designed in professional drawing program AutoCAD and produced by using 3D printer in this project. It is aimed to develop microfluidic pump which is cost-effective and has practical usage during the treatment processes of diseases such as cancer and diabetes. During the experiments we characterized our pump and examined that uniquely designed MFP has suitable flow properties as a pharmaceutical pump. Also it is anticipated to contribute to the economy with rapid manufacturing.

eucys2021.com/biology-06-2020

The energy consumption of the world is increasing day by day. As a result Greenhouse gases and aerosols are emitted into the atmosphere by burning fossil fuels. The emission of these gases can be easily reduced by using renewable energy sources. This project researches the usability of an amorphous carbon material called Diamond-like carbon (DLC) in solar cells. One of the most interesting property of DLC it’s chemical structure, DLC contains the chemical bonds of graphite (sp²) and diamond (sp³) at the same time. Thanks to this property very interesting phenomena called "Quantum Mechanical Tunneling" occurs, which makes DLC neither conductive like graphite nor insulator like diamond, and instead behaves like a semiconductor.

eucys2021.com/physics-05-2020

The crossing number $cr(G)$ of a graph $G$ is the least number of edge crossings of a plane drawing of $G$. Determining the exact crossing number of a graph is NP-Complete. In this project, we present a highly extensible algorithm for finding the crossing number of a graph. The algorithm works incrementally, by starting with an empty graph and adding vertices one by one in order to achieve the given graph. In every increment, we do a breadth-first search over the dual graph for each face. We go through a search tree of the possible increments to find the optimal embedding. Using an implementation of this algorithm, we can experimentally confirm Guy’s conjecture for small numbers of $n$. The crossing number problem has applications in incidence geometry and VLSI design.

eucys2021.com/computing-04-2020

Environmental pollutants carried by water and air are one of the most important problems that destroy resources today. Herein, a proof-of-concept of a new colorimetric-fluorescent environmental-medical sensor is demonstrated by testing two hypotheses: (1) by combining artificial receptors with microfluidics, sensors based on color changes for acrolein and formaldehyde molecules can be developed, and (2) using microfluidics designed with carbon quantum dots (NH₂-CQD) receptors, rapid gas-liquid diffusion can be detected instantaneously. For this purpose, imine synthesis, which enables the detection of aldehyde derivatives in liquid-gas phases, was carried out with NH₂-CQDs on a sensor. These novel receptors operating more economically, sustainably, and specific than conventional methods.

eucys2021.com/chemistry-08-2021
To improve the life expectancy and quality of a patient, early diagnosis, medical attention and accurate analysis are required. In this work, we propose a highly scalable system, with a focus on generalizability to other domains, that is capable of end-to-end cranial surgery planning, being the first study to define the surgery planning operation as an optimization problem and solving it via deep learning. The system distills the knowledge of the doctors and creates ensembles that will theoretically plan better cranial surgeries. To achieve this, four state-of-the art models: tumor classification, tumor segmentation, atlas-based segmentation, and tractography and a novel algorithm specifically designed to represent, calculate and minimize the risks involved therein are proposed.

eucys2021.com/computing-13-2021

To achieve this, four state-of-the art models: tumor classification, tumor segmentation, atlas-based segmentation, and tractography and a novel algorithm specifically designed to represent, calculate and minimize the risks involved therein are proposed.

eucys2021.com/computing-13-2021

The application allow you get a digital photo of a static object for amateur photography or technical documentation. The average user needs the process to be simple, to pull the device out of pocket, to press a few buttons and beautiful photos for the social network are ready. Failure is corrected just on the spot, quickly and easily – without Photoshop and working with the layer. Removing the moving of objects in the photo is not a new thing. Of course, there are programs and plug-ins for photo editors, and services, as well as regular Photoshop tools, but for Android such an additional axis does not exist.

eucys2021.com/computing-05-2020

This project is analyzed in three parts. In the first part, Covid-19 and winter diseases that show similar symptoms are distinguished by using fuzzy soft set matrices. In the second part, while calculating the Covid-19 follow-up treatment priority, a risk score algorithm is created with the help of six criteria: age, hypertension, cardiovascular disease, cancer, chronic kidney failure and diabetes. The severity of the disease in different individuals is compared. In the third part, Covid-19 vaccine planning is evaluated individually with a questionnaire study of 200 people and a literature review. 7 main criteria are determined as systemic disease, age, occupation, province and district, transportation preference, presence of a risk group in the immediate vicinity and Covid-19 history.

eucys2021.com/mathematics-03-2021

Magnetic springs have a lot of advantages in comparison with regular steel ones: they are more durable, they save almost all of their properties and serve well for dozens of years. That means that a replacement of mechanical springs and bearings with magnetic ones will lower the consumption sufficiently, due to the larger lifespan. Consequently, it acts very positively for ecology. So, the aim of the study is to investigate such springs and dependence of their properties on the magnets parameters. This concept of springs has a wide range of application. For example, they can improve magnetic shock absorbers features or they can be applied for the maglev trains. Also, a computer model, that helps to construct a spring with required properties was created and published.

eucys2021.com/physics-07-2020

Emirhan Kurtuluş
18 years

Deep learning based stereotactic cranial surgery planning
TURKEY | COMPUTING-13 | 2021

eucys2021.com/computing-13-2021

Zeynep Parla Parmaksiz
16 years

Mathematical decision algorithms in the diagnosis, treatment and vaccine priority of COVID-19
TURKEY | MATHEMATICS-03 | 2021

eucys2021.com/mathematics-03-2021

Iryna Bobkova
17 years

ANDROID-Application with the function of automatic removing of moving objects
UKRAINE | COMPUTING-05 | 2020

eucys2021.com/computing-05-2020

Yana Holovatska
17 years

Spring based on ring magnet
UKRAINE | PHYSICS-07 | 2020

eucys2021.com/physics-07-2020
Seymour’s Second Neighborhood Conjecture states that every simple digraph without loops or two-cycles contains a vertex whose second neighborhood is at least as large as its first. In this project we show that from existence of a counterexample to Second Neighborhood Conjecture it follows that there exist strongly-connected counterexamples with both low and high density (dense and sparse graph). We also show that if there is a counterexample to the conjecture, then it is possible to construct counterexample with any diameter not less than 3. Moreover, we prove that Second Neighborhood Conjecture and Vertex-Weighted Version of Second Neighborhood Conjecture are equivalent.

eucys2021.com/mathematics-04-2021

Optical inhomogeneity plays an essential role in the observation of various objects. For example, it underlies phenomena such as astronomical refraction and mirages occurrence. It is also used in optical devices: for instance, in the Luneburg lens, which is used in the radar reflector and microwave antenna. The research aim is to construct and examine the trajectory of light in an optically inhomogeneous medium using computer simulation. We derived the analytical formula of light trajectory in case of inhomogeneity along one coordinate, described the algorithm that constructs a trajectory of a beam in case of refractive index dependence on time and two coordinates, evaluated the accuracy of this algorithm and suggested methods of its efficiency maximization.

eucys2021.com/physics-07-2021
The Jury

The contest Jury is composed of 25 highly qualified scientists and engineers with worldwide reputations in their chosen field. The Jury carry out their duties at the contest as independent scientific experts and not as representatives of any institution, organisation or country. The European Commission appoints the Jury annually, basing its selection on the scientific and technological needs of the contest. They are selected both from academia and industry. The Commission ensures an appropriate geographical and gender balance. Jury members normally remain on the jury for up to 5 years. In exceptional circumstances the EC reserves the right to appoint Jury members for more than 5 terms.

The role of the Jury at EUCYS is of the utmost importance. The Jury follow the Jury Rules and Guidelines established by the EC. The Jury assess and score the competing projects based on the written descriptions submitted by the projects and through interviews with the Contestants carried out during the Contest. Based on their assessment of the projects and on lengthy discussions with other jury members, the Jury draw up the lists of winners of the core prizes and the special prizes. The decision of the Jury is final.

This year the Commission is delighted to point out that two members of the jury are previous winners of the contest. They are selected both from academia and industry. The Commission ensures an appropriate geographical and gender balance. Jury members normally remain on the jury for up to 5 years. In exceptional circumstances the EC reserves the right to appoint Jury members for more than 5 terms.

The decision of the Jury is final.

Since the European Commission took over the running of the European Union Contest for Young Scientists in 1989, the position of President of the Jury has been held by

President of the Jury

Attila Borics
Hungarian Academy of Sciences, Hungary

Members of the Jury

Sir Peter Swinnerton-Dyer

Professor Galo Ramirez
Universidad Autonoma de Madrid, 1992-1994

Professor Gisela Anton
Universitat Nurnberg, 1995-1996

Professor Pedro Guerreiro
Universidade Nova de Lisboa, 1998-1999

Professor Pauline Slosse
Universite Libre de Bruxelles, 2000-2002

Dr. Ulf Merbold
ESA/ESTEC Noordwijk, 2003-2005

Professor Jane Grimson
Trinity College Dublin, 2006 and 2008

Professor Hansen Vagn Lundsgaard
Technical University of Denmark, 2007

Professor Chris Phillips
Imperial College, London, United Kingdom, 2009

Professor Hagit Messer-Yaron
The Open University of Israel, Israel, 2010

Professor Maria Ana Viana-Baptista
Lisbon Engineering Institute, 2011-2012

Dr. Henrik Aronsson
University of Gothenburg, 2013-2014

Dr. Lina Tomasek
Astronomical Observatory of Padua, 2015-2016

Dr. Attila Borics
Hungarian Academy of Sciences, 2017, 2019-2021

Professor Tony Fagan
University College Dublin, 2018
MEMBERS OF THE JURY

Franco Algieri is Associate Professor of Interna onal Rela ons and Head of the Interna onal Rela ons Department at Webster Vienna Private University. Prior to that he was Director of Research at the Austrian Institute for European and Security Policy (AIES) and Senior Research Fellow at the Center for Applied Policy Research (C.A.P.), Ludwig Maximilians University Munich. He was lecturing Poli cal Science at the Ins tut für Poli cal Sciences, Eberhard Karls University Tübingen and at the Geschwister Scho ß Ins tut, Ludwig Maximilians University Munich. He was appointed Guest Professor at the School of Interna onal Studies and Senior Fellow at the Centre for European Studies, both at the Renmin University of China, Beijing. Franco Algieri studied Poli cal Science and Sinology in Freiburg, Tübingen and Taipei, and European Studies in Bruges. He received his doctorate and M.A. both from the Eberhard Karls University Tübingen, and a Diploma of Advanced European Studies from the College of Europe Bruges. His research focus covers European and Asian security issues, the European integra on process and EU-Asia rela ons, with special emphasis on EU-China rela ons.

Tony Fagan
UNIVERSITY COLLEGE DUBLIN, IRELAND

Professor Anthony (Tony) Fagan received his PhD in Electronic Engineering from University College Dublin (UCD) in 1978. He then spent two years working on advance modem design at Marconi Research laboratories in England. On his return to UCD in 1980 he established the DSP research group there. Through this group he has helped establish a strong signal processing industry in Ireland with many companies being founded by his research graduates, especially in the area of physical-layer communications design. Well over 100 research graduates have been produced by his group. Co-operation with industry has been a distinguishing feature of his academic career with much of his funding coming directly from these contacts. In 2016 he was awarded the Parsons medal for his work with industry. He retired from full-time academic life in 2017 but continues his love of engineering by acting as consultant to various advanced communication systems design companies.

Mella Frewen
FOOD DRINK EUROPE, BELGIUM

Mella Frewen is Director General of FoodDrinkEurope, representing Europe’s largest manufacturing industry. She has a wide experience of relations with international institutions, with the Institutions of the European Union, and trade associations across the food chain. Ms. Frewen represents the food industry in numerous high-level Advisory and Steering Committees of the EU Commission and is Vice President of the FAO/OECD Advisory Group for Responsible Business Conduct along Agricultural Supply Chains. She is also involved in several food industry-related Boards.

She has worked in the Agri-food sector in Europe for more than 30 years. She has a Master of Science degree from the National University of Ireland and worked a post-graduate course at the University of Brussels (ULB). She also holds a Harvard certificate on Agribusiness and an INSEAD certificate on International Operations Management.

Attila Borics
HUNGARIAN ACADEMY OF SCIENCES

Dr. Attila Borics graduated as a chemist and a chemistry teacher from the University of Szeged in 2001, then received his PhD degree in 2005 from Creighton University (USA) for his contribution to the field of chiroptical spectroscopy and conformational analysis of peptides. Currently he is working in the Biological Research Centre of the Eötvös Loránd Research Network in Szeged (Hungary) as a senior research associate and teaching structural biology and bioinformatics at the University of Szeged. His research focuses on biomolecular structure, more specifically protein and peptide structure and interactions, conformational analysis and structure-activity studies. This includes the investigation of the three dimensional structural determinants of the biological activity of various biological compounds and drug candidates, explanation of the mechanism of action of enzymes and receptors on a structural basis and the location of interaction sites of proteins.

Dr. Victoria Bloodworth studied Aeronautical Engineering at Imperial College London, UK, earning her PhD in 2008, specialising in carbon fibre composite structures. She then spent the next eight years working at Aerotrope, a small and radical engineering consultancy based in Brighton, UK. During this time, she was part of the design team with a diverse project portfolio, providing design engineering for wind turbines, large scale artworks and zero carbon vehicles, which includes the current world speed sailing record holder Vestas Sailrocket 2. In 2017, she moved to Denmark to join the world’s largest wind turbine manufacturer, Siemens Gamesa Renewable Energy, Blade Design department where she is now at the forefront of making the next generation of wind turbine blades a reality. A British national, currently residing in Denmark, she spent her childhood years in Singapore before moving to the UK for higher education and work.

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Victoria Bloodworth
SIEMENS GAMESA RENEWABLE ENERG, DENMARK

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**THE JURY**

**Estelle Mossou**  
**EUROPEAN SOUTHERN OBSERVATORY**  
**MUNICH, GERMANY**

Physicist by training, I carried out my PhD on the structural characterization of biomedically and biotechnologically relevant filamentous systems, followed by a postdoctoral position at the Institut Laue Langevin (Grenoble, France) on method developments aimed at combining X-ray and neutron techniques for biological systems in terms of crystallography and fibre diffraction. I then carried on as instrument scientist responsible of a monochromatic single crystal neutron diffractometer. I am now part of the macromolecular crystallography group at the European Synchrotron Radiation Facility (ESRF) in Grenoble, working as support for user experiments on the state-of-the-art structural biology beamlines as well as developing pipelines for room-temperature data collection with microfluidic crystallization chips.

**Mariya Lyubenova**  
**EUROPEAN SOUTHERN OBSERVATORY**  
**MUNICH, GERMANY**

Mariya Lyubenova holds a doctorate in astronomy from the Ludwig-Maximilians-Universitaet after pursuing 3 years of research at the European Southern Observatory (ESO) in Munich, Germany. In her work she observes and uses the motions and chemical properties of stars in galaxies as fossil records to unravel the build-up and evolution of galaxies. Well before she started her university studies in her home country Bulgaria, she was already an active astronomy club member and editor of an astronomy magazine and a newspaper. After the completion of her PhD in 2009, Mariya took a leading role in publishing the book “An Expanded View of the Universe — Science with the European Extremely Large Telescope” where the key science cases for the ELT are summarised. Next, she worked for several years at the Max Planck Institute for Astronomy in Heidelberg, Germany, in parallel as a researcher and an equal opportunity officer. In addition, she became a parent of a daughter who (at her current stage of research) is equally passionate about the fossil record of past times, but with emphasis on dinosaurs and all the like. Then, Mariya spent 3 years as a researcher at the Kapteyn Astronomical Institute of the University of Groningen, the Netherlands. In May 2017 Mariya moved back to ESO, this time as a member of the astronomers’ faculty. There she spends half of her time on research and the other half on supporting the Education and Public Outreach Department with her scientific expertise. Saying briefly, I am a mathematician. Both teacher and researcher. My work fascinates me. I take pleasure in teaching of mathematics, applied mathematics and biomechanics at our technical university. I supervise final theses of students, as well. Naturally, I always use math, mostly applied math, in my research. The most of my investigations are interdisciplinary, tied up with disciplines as biomechanics, biomathematics, medicine, rheology, material science, building physics, etc. Recently I deal with data mining, optimization and uncertainty modelling and its utilization in image processing. I like sports, classical music and beautiful nature.

**Mária Minárová**  
**SLOVAK UNIVERSITY OF TECHNOLOGY**  
**BRATISLAVA, SLOVAKIA**

**Milena Horvat**  
**JOZEF STEFAN INSTITUTE**  
**SLOVENIA**

Hans Langeveld is a tropical agronomist with a wide experience in quantifying land use practices in agriculture and food production around the globe. He focuses on sustainable food production, food and forest residue valorization, biogas, and development of biobased production chains. Hans has been an enthusiastic member of the jury since 2016. His main interest is in helping students to identify the object(s) of their passion and setting out a route to develop their skills and interest in the subject.

**Morten Lennholm**  
**EUROFUSION (JET)**  
**CULHAM SCIENCE CENTRE**  
**UNITED KINGDOM**

Morten Lennholm has worked in the field of Nuclear Fusion Research for the last 34 years. From a microwave and control engineering education, he developed his knowledge of plasma physics and much of his work has involved a combination of engineering and plasma physics. He has published in journals such as ‘Physical Review Letters’ and ‘Nuclear Fusion’ on the control of fusion plasma, plus in ‘Nature Communications’ to describe the potential for control of certain plasma instabilities through ‘phase space engineering’. He received his PhD degree from Eindhoven University of Technology in 2014 for his work on ‘Real Time Control of the Sawtooth Instability in Fusion Plasmas with Large Fast Ion Populations’. Based at the Culham laboratories in Abingdon, England, Morten conducts, manages and coordinates work involved in the operation of the JET Tokamak (Joint European Torus), including engineering and physics studies associated with this project. His main areas of interest include: radio frequency heating employed in Tokamak fusion experiments; plus, plasma control systems, which allow the control of a number of plasma parameters including the location of the plasma itself inside the Tokamak vacuum vessel.

**Hans Langeveld**  
**BIOMASS RESEARCH**  
**THE NETHERLANDS**

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**Prof. Dr. Milena Horvat**  
**JOZEF STEFAN INSTITUTE**  
**SLOVENIA**

Prof. Dr. Milena Horvat is the head of the Department of Environmental Sciences www.environment.si (since 1997) at the Jožef Stefan Institute and the dean of the Jožef Stefan International Postgraduate School - www.mps.si (since 2016). Her main expertise is in the field of mercury research, which is interdisciplinary and covers the fields of analytical chemistry, human health, polluted areas, the marine environment, and clean technologies and sensor development. She is the author and co-author of over 300 articles in SCI journals and 24 book chapters. She has organized several international conferences and workshops and has been the guest editor of 16 special issues of journals, including environmental health perspectives, environmental research, analytical and bioanalytical chemistry, marine chemistry ...). She received the national Ambassador for Science Award in 2002, the national Zois Award for Research Excellence on 2014, and the international Life of Achievement Award at ICMGP in 2019. She has been a supervisor of 18 Doctoral Dissertations and several master’s and diploma theses.

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Margus Niitsoo was a competitor at EUCYS 2005 where he learned that the ability to communicate his findings is at least as important a skill as actually doing research. While studying for his degrees in mathematics and computer science in University of Tartu, he actively sought ways to also improve his skills in communication, becoming a teaching assistant in university, joining a science popularization initiative and also taking as many psychology courses as he could fit into his timetable among his own courses. However, his love of mathematics did not fade, and despite the new interests, he still managed to finish his BSc and MSc together in just 3 years instead of the usual 5, which was followed by another 3 years of PhD studies in theoretical cryptography. This briefly made him famous, as he was the youngest person to get a PhD in Estonia at just 24 years of age. Obsessed with teaching and finding ways to improve it, he was then offered the job of curriculum manager which allowed him to work not only on his own teaching but also to find better ways of organizing the curriculum and finding means to support both students and lecturers in their pursuits. He thoroughly enjoyed the work, but felt that he needed to see the world outside the academia as well and so headed for the industry. Currently, Margus is the CTO of a small music education startup that is developing a tool for automatic assessment and feedback of musical performance, which again allows him to combine his twin passions of teaching and computer science.

Maria Ángeles Moro is Full Professor at the Spanish Centre for Cardiovascular Research [CNIC] since November 2019, where she leads the Neurovascular Pathophysiology Group. Prof. Moro also co-leads the Neurovascular Research Unit, with sites at Universidad Complutense de Madrid (UCM, where she is Full Professor of Pharmacology) and at the Health Research Institute of “12 de Octubre” University Hospital. Prof. Moro’s group studies key questions in stroke and vascular cognitive impairment by applying different models and novel technologies, with the final aim to translate findings to patients. Her laboratory has established relevant paradigms of ischemic and hemorrhagic stroke and of the different nosological entities that account for cognitive decline driven by cardiovascular risk factors.

She participates in several consortia such as the Spanish Neurovascular Network (INVICTUS) and the Leuca Foundation Grants "Stroke-Impact" and "Circadian Effects in Stroke".

She has published extensively in the area of neuroscience and neurological sciences, especially in the neurovascular research field. Her scientific production includes more than 170 indexed papers with more than 10000 citations and an “h-index” of 60/70 (WOS/Google Scholar).

Mira Van Thielen has a degree in pharmaceutical as well as medical sciences. At the age of 16 years she won several (inter)national prizes with her medical project. The same time she was one of the founders of the educative youth organisation at the public observatory MIRA (Belgium).

Nowadays, she is working as a staff member at the department of Anaesthesiology in Leuven University Hospital (Belgium). Her research interests are devoted to a combination of physics and medical sciences. Besides, she is a board member of ‘Jeugd, Cultuur & Wetenschap’, a scientific youth organisation in Belgium.

Luisa Pereira has a degree in Biology and a PhD in Human Population Genetics. She is a senior researcher and group leader at I3S-IPATIMUP (Institute of Research and Innovation in Health, University of Porto-Institute of Molecular Pathology and Immunology of the University of Porto), being interested in using genetics to infer the past and evolution of human populations and to evaluate susceptibility of human populations to complex diseases. She is co-author of 138 peer-reviewed papers in international journals and a book on popular science. She has been engaged in presenting her work to the general public, including young students in high schools, and regularly collaborates with local media.

Zuzanna Szymańska, Ph.D. graduated in mathematics and computer science from the Faculty of Mathematics, Informatics and Mechanics University of Warsaw. In 2010, at the Polish Academy of Sciences, she obtained her PhD degree with distinction in biology with a specialization in biophysics. Currently, she is an Assistant Professor at the Institute of Mathematics of the Polish Academy of Sciences and the Interdisciplinary Centre for Mathematical and Computational Modelling (ICM) at the University of Warsaw. Her main area of research involves developing multi-scale mathematical models in biology and medicine, particularly for processes such as the growth and spread of cancer or wound healing.

Luísa Pereira has a degree in Biology and a PhD in Human Population Genetics. She is a senior researcher and group leader at I3S-IPATIMUP (Institute of Research and Innovation in Health, University of Porto-Institute of Molecular Pathology and Immunology of the University of Porto), being interested in using genetics to infer the past and evolution of human populations and to evaluate susceptibility of human populations to complex diseases. She is co-author of 138 peer-reviewed papers in international journals and a book on popular science. She has been engaged in presenting her work to the general public, including young students in high schools, and regularly collaborates with local media.
Dr. Anna Zajakina is the head of the Cancer Gene Therapy group at Latvian Biomedical Research and Study Centre. She has completed her PhD in 2005 at University of Latvia, Molecular Virology and Biochemistry Division. She raised her expertise at University of Rostock (Germany), Uppsala University (Sweden) and University of Bordeaux (France). Dr. Zajakina is the author of more than 40 papers and conference presentations related to cancer research, molecular biology and virology issues. The main research interests involve the development of novel clinically translatable methods for cancer treatment based on gene therapy vectors and immuno therapy. Currently, main research projects are focused on delivery of therapeutic genes by viral vectors into tumours for smart regulation of tumor microenvironment in combination of polyfunctional magnetic nanoparticles. Being a national coordinator of European Biotechnology Thematic Network Association, Dr. Zajakina is actively taking part in organization and hosting of international workshops, seminars and conferences, working in cooperation with students and researchers representing various organizations and universities.

Prof. Milan Macek serves as the chairman of the largest academic medical/molecular genomics institution in the country, which comprises a research/diagnostics reproductive genetics centre. He was a president of the European Society of Human Genetics (ESHG), board member of the European Society for Human Reproduction and Embryology (ESHRE) and board member of the European Cystic Fibrosis Society (ECFS). His institute is a “clearing center” for dissemination of knowledge in genomics gathered within various international European projects, such as CF Thematic Network, EuroGentest, EuroCareCF, Tecgene, RD-Connect and Solve-RD to Central and Eastern Europe in the fields of rare disease genomics and reproductive genetics. Prof. Macek done his first postdoctoral research at the Institute of Human Genetics in Berlin (Germany) and continued as a postdoctoral fellow at the McKusick-Nathans Institute of Genetic Medicine - Johns Hopkins University in Baltimore (USA). During that time, he was also a fellow at Harvard School of Medicine in Boston. Prof. Macek is also the former chief advisor of the Czech EU Council Presidency under which the "EU Council recommendation on an action in the field of rare diseases" was adopted in June 2009. He is the acting president of the Czech Society of Medical Genetics, a past member of the European Union Committee of Experts on Rare Diseases (EUCERD) and current member of the EU - European Board of Member States on Rare Diseases. He also serves as external expert and project monitor for the European Commission within Marie Curie Actions.

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Christian Bressler has been developing the field of ultrafast x-ray science over the past 20 years at several synchrotron and free electron laser facilities. He received his PhD from the Free University of Berlin, and spent his postdoctoral period at SRI International in Menlo Park, California. He relocated to Switzerland, where he became 2002 assistant professor for physics at the university of Lausanne and at the Ecole Polytechnique Fédérale de Lausanne (EPFL). In 2009 he moved to Hamburg as Leading Scientist and designed, implemented and inaugurated the Femtosecond X-Ray Experiments Instrument at European XFEL, while pursuing a rigorous research programme in structural dynamics research. This was accompanied by several research campaigns with his group at several FEL and SR facilities leading to an improved instrument design. He has served on several national and international advisory boards, and connected to the scientific community via more than 180 invited presentations and more than 80 publications. His current research interests include structural dynamics of functional molecular materials with an emphasis on understanding their emergent behavior and the influence of solvent molecules surrounding reacting molecules during the ongoing ultrafast reaction.

Evelyn Cottereau has an engineering degree from the Ecole Supérieure de Physique et Chimie Industrielles of Paris (France) and received a M.S. degree from Berkeley (USA).

Her work focused on ion implantation and transport of radioactive beams, designing, building and operating scientific apparatus.

She designed and operated the on line radioactive isotope separator PARRNe at the ALTO facility at Institut de Physique Nucléaire at Orsay. She also set up and operated a national facility based on a 3 MV electrostatic tandem along with sample preparation mainly for radio carbon dating in different fields of application (climate studies, archaeology...). She was in charge of the Andromede facility for surface analysis designed around a 4 MV single ended electrostatic accelerator to accelerate cluster beams.
Lidija Matija is a professor at the University of Belgrade Faculty of Mechanical Engineering where she received her PhD in Control Engineering in 1997. She has been working in the Institute for Chemical Power Sources, Belgrade, in the field of fullerenes based materials, its production and application for battery production. In 2002 she has changed her field of research and moved to the Institute of Technical Sciences, of SASA where she investigated fullerene and carbon based materials for biomedical applications. In 2005, professor Lidija Matija moved back to the University of Belgrade Faculty of Mechanical Engineering within the department for control engineering and became the Chair of NanoLaboratory. In the period from 2008 - 2010 she was appointed as Seconded National expert (SNE) in European Commission, DG RTD where she worked as scientific officer. She is a founder of the department for Biomedical engineering at the University of Belgrade Faculty of Mechanical engineering. Her main fields of research are: Control Systems, Early Detection of Skin Cancer and Melanoma, Intelligent Materials, Fullerenes and Carbon Nanotubes, STM/AFM, Nanotechnology, Nanomedicine. Professor Matija's fields of teaching are: Control Systems, Biomedical Engineering, Nanotechnology, Nanomedicine. She was several times awarded in her country for her research achievements in the field of nanotechnology and she was the coordinator of several national research projects of which more than half had industry involvement.

Professor Karin Tonderski received her B.Sc. in Biology and Chemistry from Uppsala University. She completed a Ph.D. studying nutrient recycling in constructed wetlands, and currently works as a lecturer and researcher at the multidisciplinary department of Management and Engineering, Linköping University, Sweden. Her research is focused on applied aspects of nitrogen and phosphorus cycling and recovery, and implications for water management issues. Examples are management of biofertilizers from biogas systems, nutrient cycling in urban agriculture and use of constructed wetlands for greywater treatment in informal urban settlements. She has worked with several research and educational projects in East and South Africa, and Vietnam, with focus on low-cost sanitation and nutrient cycling. Her scientific work has resulted in > 60 peer reviewed publications and around 35 reports and chapters in international books.

Peter Celec is the head of the Institute of Molecular Biomedicine at the Comenius University in Bratislava, Slovakia. He studied medicine, molecular biology and national economy, has PhD in normal and pathological physiology, as well as DSc in molecular biology. His research focuses on extracellular DNA as a biomarker but also on its role in the pathogenesis of inflammatory diseases. Research stays in Germany (Göttingen, Aachen) and USA (Boston) enabled several important and fruitful international collaborations for his interdisciplinary research team. With an h-index of 30 Dr. Celec is one of the most successful researchers in biomedical sciences in Slovakia. His professional motto is: Science must be fun! So, he is proud of the Ig Nobel prize for the research on salivary DNA exchange during kissing.

Professor in Plant Molecular Biology, at the University of Gothenburg, Sweden. He pursued his PhD degree in Plant Physiology at the University of Gothenburg, and graduated in 2001. He spent the following year and a half as a postdoctoral student at Leicester University, United Kingdom. The next year he spent at Gotland University and Skövde University, Sweden as senior lecturer. He then returned to the University of Gothenburg in 2004. His current research is dedicated to molecular breeding of salt tolerant wheat where the aim is to develop new varieties in a faster and more precise way than before. These varieties can be used for cultivation on salt-contaminated unusable land in e.g. Bangladesh, to increase food production. He has expertise from working with chlorophyll and photosynthesis, protein import complex and protein transport, and lipid and vesicle transport. Moreover, he has published solely bioinformatics papers. He is the founder and owner of two SMEs within the plant biotech area. Currently he is the Head of the Department of the Biological and Environmental Sciences at the University of Gothenburg.
the Prizes
The Prizes

The participants compete for a number of core prizes on the basis of a written description of their work, their exhibited material and the interviews with the Contest Jury. In addition to this, a limited number of special donated prizes are awarded by the Jury, to offer some winners the opportunity to benefit from the specific experiences linked to these prizes. It is up to the Jury to decide whether a prize-winner can receive both a core prize and a special donated prize.

**Core Prizes**

The Core Prizes are the principal prizes awarded at the contest. These are cash prizes. In the case of a team winning such a prize, the amount is shared equally between the members of the team.

In each of the Core Prizes categories, 2 prizes will be awarded to 2020 projects, and 4 prizes to 2021 projects.

There are three categories of Core Prizes:
- **First Prizes** worth € 7,000 each;
- **Second Prizes** worth € 5,000 each;
- **Third Prizes** worth € 3,500 each.

**Honorary Prizes associated with the First Prizes**

There is one Honorary Prize associated with the first prizes.

**Special Donated Prizes**

The Special Donated Prizes are offered to contestants who, according to the EUCYS Jury, would benefit from the specific experience that these prizes offer. They are mostly study visits to leading scientific organisations:

**EIROforum** members each kindly award individual prizes as follows:
- European Organization for Nuclear Research (CERN) – offers a project prize (for up to 3 people) of a week’s visit to its Geneva site;
- EUROfusion – offers one project a one week stay (for up to 3 people) at a EUROfusion member research facility;
- The European Molecular Biology Laboratory (EMBL) – offers a project prize (for up to 3 people) of a week’s placement at its premises in Heidelberg;
- The European Space Agency (ESA) – offers a single prize winner the opportunity to spend a week at ESA’s main technical centre, ESTEC, in The Netherlands;
- European Southern Observatory (ESO) – offers a project prize (for up to 3 people) of a visit of up to one week to the ESO headquarters in Germany;
- European Synchrotron Radiation Facility (ESRF) – operator of the world’s most powerful synchrotron radiation source, offers up to 2 people (3 if the ESRF prize is combined with that of the ILL) of a winning project a one week visit to its site in Grenoble;
- The Institut Laue-Langevin (ILL) – operator of the world’s most intense neutron source, offers up to 2 people (3 if the ESRF prize is combined with that of the ILL) of a winning project a one week visit to its site in Grenoble;

**The Joint Research Centre**

Kindly offers a two day stay at its Ispra site in Italy for 3 projects (up to nine students).

**PRACE super computing**

Kindly offers a trip to one of its supercomputing facilities in Europe.

**Bulgarian National Seminar on Coding Theory “Professor Stefan Dodunekov”**

One EUCYS project will be invited to participate in the next edition of NWCT (Q4 2021, Bulgaria).

**International Swiss Talent Forum**

Two students will be invited to attend ISTF with their individual projects.

**Expo-sciences Luxembourg**

Two students will be invited to attend Expo-sciences Luxembourg with their individual projects.

**EuChemS**

The European Chemical Society is pleased to offer a prize of €1000 to the best Chemistry project.

**FoodDrinkEurope**

Will offer a prize to the best food related project.

**PEPSICO**

Will offer personal computers to the best food technology project.

**WOLFRAM**

Are pleased to offer all contestants submitting projects in Mathematics a free one year licence to Mathematica and WolframAlphaPro.

**The European Commission is very grateful to the organisations that offer these special prizes to the contestants.**
The Special Donated Prizes of EIROforum are offered to contestants who, according to the EUCYS Jury, would benefit from the specific experience that these prizes offer. They consist of (up to) one-week visits to renowned scientific organisations, where the prize-winners would have unique opportunities to get acquainted with world-class facilities, experiments and cutting-edge instrumentation:

EIROforum members www.eiroforum.org each kindly award individual prizes as follows:

- European Organization for Nuclear Research (CERN) – offers a project prize (for up to 3 people) of a week’s visit to its Geneva site;
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EIROforum is a partnership of Europe's eight largest intergovernmental research organisations. As world leaders within their respective fields of science, the member organisations of EIROforum constitute the vanguard of European science. Operating some of the largest research infrastructures in Europe, devoted to the exploration of fundamental quests of mankind such as the origin and the evolution of matter, biological life and structure of our Universe, they enable European scientists to engage in truly cutting-edge research, and be on the forefront on a global scale.

In support of the EUCYS initiative, EIROforum members are pleased to offer (up to) one-week visits/placements to their organisations.

To ensure optimum value of the experience to the prize winners, these will be offered on the basis of the relevance of the activities of the organisation to the field of interest of the nominated student. For safety and sometimes security reasons, age restrictions may apply.

EIROforum also sends experienced scientists to give a key note address to the contestants. As a curtesy to EIROforum, those students who would like to be considered for the EIROforum prizes, and their National Organisers, should endeavour to attend the EIROforum lecture during the contest.
**THE PRIZES**

**EUROPEAN SOUTHERN OBSERVATORY (ESO)**
www.eso.org

The European Southern Observatory (ESO), Garching, near Munich, Germany, and Chile. ESO is the foremost intergovernmental astronomy organisation in Europe and the world’s most productive ground-based astronomical observatory by far. ESO is supported by 15 countries, and carries out an ambitious programme focused on the design, construction and operation of powerful ground-based observing facilities enabling astronomers to make important scientific discoveries. ESO also plays a leading role in promoting and organising cooperation in astronomical research. ESO operates three unique world-class observing sites in Chile – La Silla, Paranal and Chajnantor – and is presently constructing a 39-metre diameter European Extremely Large optical/near-infrared Telescope, the E-ELT, which will become “the world’s biggest eye on the sky”.

ESO offers a prize of a visit of up to one week to its headquarters in Garching, for up to three students. Minimum age: 18 years at the time of taking up the prize.

**EUROPEAN SYNCHROTRON RADIATION FACILITY (ESRF)**
www.esrf.eu

The European Synchrotron Radiation Facility (ESRF) Grenoble, France, is supported and shared by 22 countries. The ESRF is the most powerful synchrotron radiation source in the world: it is a stadium-sized machine producing many beams of bright X-ray light. These are guided through a set of lenses and instruments called beamlines where the X-rays illuminate and interact with samples of material being studied. Here, at more than 40 specialized experimental stations, physicists work side by side with chemists and materials scientists. Biologists, medical doctors, geophysicists and archaeologists have become regular users. Companies also send researchers, notably in the fields of pharmaceuticals, cosmetics, petrochemicals and microelectronics. Each year approximately 7,000 researchers travel to Grenoble where they work in a first-class scientific environment to conduct exciting experiments at the cutting edge of modern science.

ESRF will award the prize of a one week visit to the EPN Science Campus in Grenoble, for the leader(s) (maximum 2, or 3 if combined with the ILL prize) of a project in a topic related to the structural and dynamical study of condensed matter, materials and living matter using synchrotron radiation X-rays to achieve sub-nanometric resolution in both fundamental and applied research. This could be in the fields of biology, chemistry, cultural heritage, engineering, environmental sciences, materials research, medicine or physics. The visit may be undertaken in parallel with that of the winner(s) of the ILL prize. Minimum age: 18 years at the time of taking up the prize.

**EUROPEAN MOLECULAR BIOLOGY LABORATORY (EMBL)**
www.embl.org

The European Molecular Biology Laboratory (EMBL) is Europe’s flagship laboratory for the life sciences. Established in 1974 as an intergovernmental organisation, EMBL is supported by over 20 member states. EMBL performs fundamental research in molecular biology, studying the story of life. The institute offers services to the scientific community; trains the next generation of scientists and strives to integrate the life sciences across Europe. EMBL is international, innovative and interdisciplinary. Its more than 1,600 staff, from over 80 countries, operate across six sites in Barcelona (Spain), Grenoble (France), Hamburg (Germany), Heidelberg (Germany), Hinxton (UK) and Rome (Italy). EMBL scientists work in independent groups and conduct research and offer services in all areas of molecular biology. EMBL research drives the development of new technology and methods in the life sciences. The institute works to transfer this knowledge for the benefit of society.

EMBL offers a prize of a week’s visit to its Heidelberg headquarters for up to three students involved in the selected project. Eligible topics should be in the field of molecular biology. Minimum age: 18 years.

**EUROPEAN SPACE AGENCY (ESA)**
www.esa.int

The European Space Agency (ESA) Paris, France. ESA is Europe’s gateway to space. Its mission is to shape the development of Europe’s space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world. It is an international organisation with 22 member states, and by coordinating the financial and intellectual resources of its members, it can undertake space programmes and activities far beyond the scope of any single European country. Its programmes and missions cover astronomy, planetary, solar, and fundamental physics, human spaceflight and robotic exploration, Earth observation, launches, navigation, telecommunications and applications, and space engineering research and development.

ESA offers a single prize winner the opportunity to spend a week at ESA’s main technical centre, ESTEC, in The Netherlands. The winner must be at least 18 and already studying at university, preferably science or engineering at the time of taking up the prize.

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ESA offers a single prize winner the opportunity to spend a week at ESA’s main technical centre, ESTEC, in The Netherlands. The winner must be at least 18 and already studying at university, preferably science or engineering at the time of taking up the prize.
The Institut Laue-Langevin (ILL), Grenoble, France, operates the most intense neutron source in the world. It is used to examine conventional and newly created materials. The research at ILL includes the analysis of the structure of new materials for future electronic tools, the measurement of stresses in mechanical materials, and examination of the behaviour of complex molecular assemblies, particularly in a biological environment. The ILL also tackles questions relating to the fundamental properties of matter. Recent research includes the world's first magnetic soap, great developments on gamma-ray optics and potential Alzheimer treatments.

ILL will award a prize of a one week visit to the EPN Science Campus in Grenoble, for the leader(s) (maximum 2, or 3 if combined with the ESRF prize) of a project in a topic related to a scientific or engineering field of relevance to ILL. The visit could include witnessing technical developments being made in connection with the neutron beams, such as detectors and optical devices, or taking part in an experimental session. Areas covered include: neutron research and technology in the disciplines of chemistry, nuclear physics, chemistry, biology, crystallography and magnetics.

The visit may be undertaken in parallel with that of the winner(s) of the ESRF prize. Students must be at least 18 at the time of taking up the prize.

The European XFEL (XFEL.EU), Schenefeld Hamburg metropole, Germany. European XFEL is an X-ray laser based on a linear accelerator with unique characteristics. Its operation started in September 2017. The facility opened up new research opportunities for a whole range of scientific fields, such as medicine, pharmacy, biology, chemistry, physics, materials science, and nanotechnology.

European XFEL will award a one-week placement at its site in Schenefeld for one person presenting a project in biology, chemistry, engineering, materials research, or physics. The visit will provide insights into the process of operating a new, cutting edge international research facility. Students must be at least 18 at the time of taking up the prize.

The EIROforum organisations constitute true success stories for Europe. In particular, they:

- were created by their member states as part of a long-term strategy for the future of European research;
- attract some of the best scientists and researchers from across the world, thanks to their scientific excellence and cutting-edge facilities;
- have implemented the European Research Area (ERA) concept and contribute significantly to structuring European research in their specific scientific fields;
- link European scientific communities with the rest of the world;
- develop new technologies, instrumentation and electronic infrastructures and support innovation and technology transfer for the benefit of society at large.

The EIROforum organisations have world-class research infrastructures. Notably, they:

- operate major research infrastructures – unique in Europe and in some cases in the world;
- are funded by their member states, with a combined annual budget for science of around 2 400 million Euros;
- are crucial to the competitiveness of European research, providing up-to-date and continually improved facilities for European scientists;
- serve more than 25 000 scientists every year (in astronomy, particle physics, fusion, space sciences, condensed matter physics, chemistry, and the life sciences);
- are active in international, often global, research for the benefit of Europe;
- possess unique experience in building and operating research infrastructures of great value for the further development of the European Research Area.

EIROforum is also committed to promoting and supporting innovative science education in Europe, as demonstrated by its science education activities.

SCIENCE IN SCHOOL

Published and funded as a cooperative venture by the eight European research organizations of EIROforum, Science in School aims to support teachers in the delivery of their STEM curricula, by connecting them to inspiring, cutting-edge science and technology, in order to foster positive attitudes towards the science that shapes their lives, and attract students to careers in these fields.

The programme supports science teaching both across Europe and across disciplines: highlighting the best in teaching and cutting-edge research. It covers not only biology, physics and chemistry, but also earth sciences, engineering and health, focusing on interdisciplinary work.

The contents include teaching materials and projects in science education, up-to-date information on cutting-edge science, interviews with inspiring scientists and teachers, reviews of books and other resources, and many other useful resources for science teachers. The main language of publication is English, and the journal aims to provide translations when possible in other European languages.

Science in School originated as a quarterly print journal. Following a 2019 review, EIROforum decided to move to an online-only model to better reflect changing digital competencies and encourage wider take-up.
THE PRIZES

THE JOINT RESEARCH CENTRE (JRC)
THE JOINT RESEARCH CENTRE (JRC) kindly offers a two day stay at its Ispra site in Italy for 3 projects (up to nine students).

The Joint Research Centre (JRC) is the European Commission’s science and knowledge service. It performs direct scientific research and provides evidence-based and independent scientific advice to European policy makers helping them to make informed decisions. EU policies that address global and societal challenges – such as financial stability, climate change, food security, water availability or the ageing society – need to be based more and more on a solid scientific understanding. In close cooperation with international partners, the JRC elaborates models and scenarios to assess policy options while stimulating innovation through developing new methods, tools and standards.

The work of the JRC has a direct impact on the lives of European citizens. It promotes a healthy and safe environment; secure energy supplies, sustainable mobility and consumer safety, and helps improve preparedness and response to natural and man-made disasters.

Serving society, stimulating innovation, supporting legislation

The JRC’s headquarters are in Brussels and its seven scientific directorates, which host specialist and unique laboratories, are located on sites in Belgium, Germany, Italy, the Netherlands and Spain.

The JRC award will allow the participants from three successful projects to spend two days at its facilities, shadowing scientists from all over Europe according to the interests of the prize winners.

THE PRACE EUCYS AWARD

The Partnership for Advanced Computing in Europe (PRACE) donates the "PRACE Travel Award Voucher for the Best Computational Project”. The EUCYS’s Scientific Committee will select the winner out of the contestants.

The voucher has a maximum value of € 2000, to cover the following elements:

- Travel, accommodation, meals and transport of the awardee with an accompanying person, if the awardee is not yet of legal age at the time of travelling 1.
- Visit of a PRACE HPC centre in the winner’s home country provided that the home country is a PRACE Member 2.
- The PRACE Travel Award Voucher is valid until May 2022. The Voucher is not transferable to another person.
- Costs claimed on the Travel Award Voucher need to be justified by original receipts.

PRACE contact is Silke Lang, Communications officer: s.lang@staff.prace-ri.eu.

1 The organization of the travel, accommodation, meals and transport will be organized by the PRACE HPC center.
2 Subject to the respective and current Corona regulations of the winner’s home country when the visit is planned.

BULGARIAN NATIONAL SEMINAR ON CODING THEORY “PROFESSOR STEFAN DODUNEKOV” PRIZE

The annual National Seminar on Coding Theory (NWCT), named after Stefan Dodunekov (1945-2012) is an annual research event, held since the 1980s. Prof. Dodunekov, the founder of the Bulgarian school of coding theory, was a world-renowned scholar in the area of algebraic and combinatorial theory of error-correcting codes and its applications for data protection and information security. The seminar brings together experienced researchers and young people – university and PhD students, assistant professors, specialists from coding theory and cryptography. Special sessions are devoted to novel ideas in the field, innovative applications of algebraic and geometric coding theory and research achievements of young scientists.

One EUCYS project will be invited to participate in the next edition of NWCT (Q4 2021, Bulgaria).

INTERNATIONAL SWISS TALENT FORUM

Two students will be invited to attend ISTF with their individual projects.

EXPO-SCIENCES LUXEMBOURG

Two students are invited to attend Expo-sciences Luxembourg with their individual projects.

WOLFRAM PRIZES

WOLFRAM Research is donating a one-year Mathematica Student Edition license plus a free one-year subscription to WolframAlpha Pro for all contestants submitting projects in the field of mathematics, physics and computer science.

The PRACE EUCYS Award is given to the best computational project. The winners will receive a travel prize to visit one of the Prace super computing facilities in Europe with all the costs related to the trip covered.
Bioeconomy Prizes

The EUCYS Bioeconomy Bio-based Industries Prize

About the bioeconomy

The bioeconomy is made up of those parts of the economy that use renewable biological resources from land and sea like crops, forests, fish, animals and micro-organisms to produce food, materials and energy.

The bioeconomy is an essential alternative to our current fossil-based economy. It can replace our current fossil fuel-based economy which is dependent on the planet’s limited supply of non-renewable resources, such as petroleum and coal. It’s hailed as the next wave in our economic development and should provide major opportunities for innovation, jobs and growth to help re-industrialize Europe.

In fact, the bioeconomy is already a reality. Biomass like plant material, municipal and livestock waste is converted into electricity, fuels, plastics and the basic building blocks for chemical processes. Many materials made from petrochemicals can be replaced with materials made from biomass. Sometimes, small changes to naturally occurring substances can produce useful alternatives to commonly used products such as packing or trash bags.

Using biochemicals instead of chemicals derived from petroleum can reduce pollution, increase efficiency, and limit the use of hazardous materials and chemicals in the manufacture process. Enzymes from plants and microorganisms, as well as bacteria and other microbes, can be used in industrial chemical reactions to make a number of everyday products. Enzymes help bring about and speed up chemical reactions. Enzymes are in laundry detergent to improve stain removal. They convert cellulose to sugar, bleach paper and curdle milk for cheese and yogurt.

Cups, forks, spoons, knives, plates, food storage containers, T-shirts and pillows can be made from biomass including waste and residues. These products can be made so that they are biodegradable and compostable. It is hoped that the production and use of these bio-products and materials will reduce the amount of biodegradable waste and materials going to landfills.

About the Bio-based Industries Joint Undertaking (BBI JU)

The Bio-based Industries Joint Undertaking (BBI JU) is a partnership between the European Commission and the Bio-based Industries Consortium (BIC) set up in 2014 to fund research and innovation to help to develop the bio-based economy in Europe. BBI JU’s funding is meant to encourage further investment by the private sector through industry. It works by setting up multi-partner projects who work together to solve the scientific, logistic and infrastructural challenges facing the bio-based industry in Europe. Research can be in a lab or in a combination of lab, pilot plant or biorefinery.

The BBI JU programme offers enormous opportunities to tackle some major societal, environmental and economic challenges, including climate change, energy and food security and resource efficiency.

The bioeconomy EUCYS prize will be awarded by the judges to the project which they feel best uses biotechnology for the production and the conversion of biomass into non-food value-added products.

The winning project should reflect three key principals of the bio-based economy in using raw material of a biological origin, for example whole or parts of plants, trees, algae, marine organisms, micro-organisms, animal in a way which is:

- sustainable
- renewable
- innovative

The winning project will also meet a fourth criteria based on the effectiveness of its overall communicability to the scientific community and the general public. The winning project should promote scientific studies, while raising environmental awareness, and promote the bioeconomy.

The prize will be awarded by BBI JU who will provide a paid 4 to 5-day trip to Brussels for the winning project including travel to/from, accommodation and daily allowance in Brussels and participating in a tailor-made experience related to the science behind the BBI JU programme.

The prize awarded will comprise:

- a visit and introduction to the Bio-based Industries Joint Undertaking office;
- a visit to some of the key public institutions shaping European bio-based policy, including the European Parliament’s visitor centre and a look behind the scenes at the European Commission’s Directorate-General for Research and Innovation, as well as meetings with key EU officials;
- Two one-day visits to bio-based biorefineries and laboratory facilities selected from the following based in:
  - Bio Base Europe Pilot Plant, DSM labs (tbc) and Biotech Campus (tbc) in Gent, Belgium (subject to confirmation)
  - Biotech Pilot Plant in Delft, The Netherlands (subject to confirmation)
- the possibility to visit local tourist sites in the relevant locations, where the itinerary permits.

During each one-day excursion, a range of age-appropriate supervised activities will be organised, along with an opportunity to meet and talk to the scientists working there about their research and a career in science. There may also be an opportunity to visit a few tourist attractions during the stay.

The prize will be awarded to the winning project (up to a maximum of three participants) and one teacher/lecturer (who has made a significant & demonstrable contribution to the winning project), to be nominated by winners to accompany them. Where no teacher/lecturer is nominated, an accompanying responsible adult must be nominated by the winning project. The winning person or persons will remain under the responsibility & supervision of this person during their travel, activities and visits.

Special conditions

Minimum age of all project participants is 16 years at date of judges’ final decision.

Eligible countries

EU Member States, Associated Countries

Insurance cover

The winner(s) must ensure they have suitable travel, medical and accident insurances and will be asked to provide evidence prior to the visit.

Prize to be taken by

BBI JU will offer a maximum of three possible dates for the winning project to participate in the award. These will be provided according to availability of the winning project in conjunction with the availability of the organisations concerned in making the award.

1 The bio-based product must be wholly or partly derived from biomass and can be an intermediate, material, semi-finished or final product. Bio-based products include bio-chemicals, bio-plastics, pharmaceuticals, paper and paper products, textiles, 2nd generation biofuels and bioenergy and bio-based ingredients used in everyday products.

2 Travel and accommodation will be provided on the same basis as for attending competition exhibition.

3 Subject to the approval of their educational institution.
The EUCYS Bioeconomy Food Industry Prizes

PepsiCo is once again delighted to support EUCYS. Owing to the continuing COVID 19 situation across Europe, PEPSICO has decided to offer a personal laptop to each member of the winning team. PepsiCo are pleased to be associated with EUCYS again this year.

Host country prizes

AWARD FROM THE MINISTRY OF UNIVERSITIES

The Ministry of Universities is pleased to present two special awards to the best multidisciplinary project, one for 2020 and another for 2021 projects.

THE IBERDROLA PRIZE

IBERDROLA, THE UTILITY OF THE FUTURE

With a history of over 170 years, today Iberdrola is a global energy leader, the number-one producer of wind power and one of the world’s biggest electricity utilities by market capitalisation. The group supplies energy to almost 100 million people in dozens of countries and has more than 600,000 shareholders and a workforce comprising more than 38,000 employees.

Iberdrola is leading the transition towards a sustainable energy model through investments in renewable energy, smart grids, large-scale energy storage, and digital transformation, offering the most advanced products and services to our customers.

Iberdrola wishes to promote and encourage the work of future research leaders. For this reason it sponsors The Iberdrola Prize. The winning team will be given 3,000 € with the aim of developing the scientific training of its participants.

The prize will consider Projects from the fields of Engineering and the Environment in both the 2020 and 2021 editions.

EuChemS is pleased to present a prize of 1,000 € for the best chemistry entry in the EU Young Scientists Contest. For more information on EuChemS please see: www.euchems.eu

The European Chemical Society (EuChemS) brings together over 40 chemical societies which together represent more than 160,000 chemists in academia, industry, government and professional organisations in over 30 countries across Europe.

Founded in 1970, EuChemS aims to provide a single voice on key science and policy issues, based on expert scientific knowledge and to promote chemistry as a provider of solutions in a changing world. EuChemS Professional Networks cover all areas of chemistry, enable networks between European scientists to thrive, and provide expert advice to EuChemS’ policy positions. EuChemS organises the biennial EuChemS Chemistry Congress open to all, and has an event recognition scheme in place to promote chemistry-related events across Europe.

Euchems wish to support EUCYS. For more information see: www.euchems.eu

FoodDrinkEurope, on behalf of Europe’s Food and Drink Industry, is very pleased to award the winner/each member of the winning team with a check for 2,000 €, to help the young scientists in their research pursuits and provide support for their future academic or professional plans.

THE EUROPEAN FOOD AND DRINK INDUSTRY PRIZE, AWARDED BY FoodDrinkEurope

EuChemS

THE EUCHEMS PRIZE

www.euchems.eu

EUCHEMS

European Chemical Society

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THE EUROPEAN FOOD AND DRINK INDUSTRY PRIZE

www.fooddrink.eu

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THE FOOD AND DRINK INDUSTRY

PRIZE, AWARDED BY FoodDrinkEurope
The award will consist of a one-week stay for each of the teams at the Salamanca Cancer Research Center of the University of Salamanca. Minimum age: 18 years at the time of the visit.

The award will consist of a one-week stay for each of the teams at the Institute for Agribiotechnology Research Group of the University of Salamanca. Minimum age: 18 years at the time of the visit.

The Bioinformatics, Intelligent Systems, and Educational Technology (BISITE) Research Group is formed by a group of researchers whose principal interest is the development and application of intelligent computer systems to different types of problems: AI, ML, Deep Learning, Emotional Systems, Fintech, Blockchain, IoT, Industry 4.0, Smart Cities, Smart Grids, Intelligent Textiles, and Cybersecurity.

The EUCYS BISITE-USAL awards are given to the best projects addressing computer-related topics (one for both 2020 and 2021).

The Institute of Functional Biology and Genomics (IBFG) is a joint research center between the Consejo Superior de Investigaciones Científicas (CSIC) and the University of Salamanca (USAL). The Institute’s main research interest is understanding the molecular mechanisms that regulate cell growth and division, cell morphogenesis, and the replication and expression of the genome.

The IBFG was created in 1970 under the name of the Institute of Microbial Biochemistry (IMB) by Professor Julio R. Villanueva. The IMB was one of the first joint research Institutes between the CSIC and a Spanish University. The IMB was closely linked to the Department of Microbiology of the School of Biology, in the Science building. In 1993, the IMB moved to the Departmental building on the Miguel de Unamuno Campus.

EUCYS CIALE+IBFG-USAL awards are given to the best projects addressing issues related to biodiversity, agriculture, the environment, or water (one for both 2020 and 2021).

INSTITUTE FOR NEUROSCIENCES OF CASTILLA Y LEÓN

www.cicancer.org/about-cic

The objective of the Cancer Research Center (CIC), which was created in 1995 to promote the Institute of Molecular and Cellular Biology of Cancer (IBMCC) and is under the patronage of the Cancer Research Foundation of the University of Salamanca (FICUS), is to integrate competitive and excellent research on cancer at its basic, clinical, and applied or translational levels. This is achieved with the support of the Junta de Castilla y León, the Higher Council for Scientific Research and the Carlos III National Institute of Health.

The EUCYS CIC-USAL awards are given to the best projects addressing medical issues (one for both 2020 and 2021).

The award will consist of a one-week stay for each of the teams at The Institute for Neurosciences of Castilla y León of the University of Salamanca. Minimum age: 18 years at the time of the visit.

The award will consist of a one-week stay for each of the teams at the Institute for Neurosciences of Castilla y León of the University of Salamanca. Minimum age: 18 years at the time of the visit.

The Institute for Agribiotechnology Research (CIALE) was founded in 2000 with a commitment to unite, support, and promote the research and training activities carried out in different areas related to Agriculture at the University of Salamanca. The aims of the CIALE focus on agricultural research and development in areas such as biodiversity, genetic improvement, plant production, plant health, and water resources among others. The work carried out is multidisciplinary and encompasses a wide range of projects involving both basic and applied research.

INSTITUTE OF NEUROSCIENCES OF CASTILLA Y LEÓN

https://institutoneurociencias.org

The Institute of Neurosciences of Castilla y León (INCYL) is working on a large number of research projects, using the most advanced methodology to understand the structure, organization and functioning of the nervous system, the mind, behaviour, and ways of becoming ill. Its laboratories investigate diseases and treatments in aspects as relevant as sensory pathology and prevalent neurological and mental diseases such as Alzheimer’s disease, epilepsy, schizophrenia, pain, multiple sclerosis, Parkinson’s, etc.

The EUCYS INCYL-USAL awards are given to the best projects addressing topics related to medicine (one for both 2020 and 2021).
National Organisers

The National Organisers are responsible for selecting projects, submitting applications, and for all communication with the Commission. All contestants will be accompanied in the EU Contest by their National Organiser, or by an adult escort appointed by the National Organiser. The National Organiser, as the principal contact in all participating countries, will assure liaison between the contestants and the EU Contest in all matters concerning the Contest. National Organisers and/or escort(s), together with their contestants, constitute their respective country’s official delegation and are the only parties that can enjoy access to all public and private events associated with the Contest. National Organisers assume responsibility for the wellbeing and behaviour of their party. They: ensure that the latter travels with adequate health, accident and travel insurance to cover them for both travel and the duration of the Contest; to handle linguistic or other problems which may arise during the Contest or in relation to associated activities, and to ensure that they have their own measures in place to assure their behaviour remains beyond reproach.

eucys2021.com/national-organisers

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Winners 1989-2019
Brussels 1989

**FIRST PRIZES**
- Mogens Markussen, Denmark: Eyewriter, an eye operated control unit.
- Stephan Schlitter, Germany: Conducting polymers in batteries.
- Grace O’Connor, Sinead Finn, Ireland: A crop fractionation industry.
- Lina Tomasella, Italy: Toxicity of colour dyes used as tracers.
- Nicola Kirk, United Kingdom: Walking aid for a disabled person.
- Jean-Pierre Wyss, Matthias Zimmermann, Elmar Artho, Switzerland: Recognition of handwritten signs.

**SECOND PRIZES**
- Serge van der Velde, Olivier Camberlin, Belgium: Computer-guided solar furnace.
- Charles Courtin, Pierre Betsch, Hugues Nodet, France: A Doppler rocket.
- Menno Bolt, Eric Toonen, Pascal Steevmans, Netherlands: Wind energy project.
- Mark Mathieson, United Kingdom: Voice intensity feedback for speech handicapped.
- Anouk Thommen, Switzerland: Comparative study of two composts.

**THIRD PRIZES**
- Samuel Delaere, Belgium: Electromagnetic radiation.
- Dimitri Hautot, Belgium: Studies on the Kelvin generator.
- Stephan Rantved, Søren Chyltoft, Denmark: LISSI, an I.C. Test Computer.
- Matthias Büger, Germany: Asymptotic theory of mean values.
- Walter Georg Veeck, Jens Schneider, Germany: Construction of a diffusion cloud chamber.
- Dimitri Theocharidis, Paul Magoulas, Greece: New Dimension 2000, an automation system with computer.

Copenhagen 1990

**FIRST PRIZES**
- Paul Vauterin, Bruno Callens, Belgium: Automated meteor observation station.
- Wolfram Schulze, Germany: The effect of assimilatory starch for the growth of Arabidopsis.
- Annagh Dalton (née Minchin), Ireland: Caloporus Peregrina, an immigrant alga to Europe.
- Donatella Manganelli, Italy: Silence, micro-organisms at work.

**SECOND PRIZES**
- Morten Larsen, Denmark: Hand reader.
- Jan Lichtenberg, Germany: Unilyser, a universal computer system for chemical analysis.
- Paul Ribeiro, Portugal: Diving patterns of the bottlenose dolphin.
- Reinhard Herzog, Austria: An electronic plotter.
- Stein Ringnes, Ingvart Apeland, Jarand Felland, Norway: Solar energy project.

Zurich 1991

**FIRST PRIZES**
- Barry O’Doherty, Daniel Dundas, Ireland: The dynamics of a two-well potential oscillator.
- Paul Hoffmann, Luxembourg: Computer-assisted text conversion to Braille.
- Angus Filsie, United Kingdom: Clearway: a mucus extractor.
- Christian Tost, Sabine Zangl, Austria: Catalytic converter restoration.

**SECOND PRIZES**
- Torkild Jensen, Norway: Earthquakes as a self-organised critical process.
- Hans Jacob Feder, Norway: Biodet in Oslofjord.
- Stefano Scheller, Germany: Computer-aided holography for optical and acoustical reconstruction.
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<td>Use of bigos in a photosynthetic culture</td>
<td>Flood prevention in the river Otra in Southern Norway</td>
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<td>Henk Hoekstra, Christian Kok</td>
<td>Panagiotis Theofanidis, Nick K. Tsagourias</td>
<td>Daniel Morton, Tim Mullis</td>
<td>Nuno Alves da Silva, Hugo Macedo</td>
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<tr>
<td>NETHERLANDS</td>
<td>GREECE</td>
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<tr>
<td>Oscillating systems of chemical reactions</td>
<td>Research and development of a traffic light system</td>
<td>A palletizer improvement</td>
<td>Image processing using a neural network</td>
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<tr>
<td>Edwin Thaller, Friedrich Pfluegelemeier</td>
<td>Luis Bellot Rubio, Antonio Román Reche, Gustavo Román Reche</td>
<td>Peter Seidel</td>
<td>Stefan Serefoglou</td>
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<td>AUSTRIA</td>
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<tr>
<td>Intelligent testing probe</td>
<td>Analysis of visual observations of the comet Levy</td>
<td>Ball lightning, an investigation</td>
<td>Bio-indicators</td>
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<td>Christof Teuscher, Flavio Stragiotti</td>
<td>Jochen Erhard, Christoph Herbst</td>
<td>Jürgen Scherschmidt</td>
<td>Computer-controlled waste-water purification</td>
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<td>SWITZERLAND</td>
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<tr>
<td>Atoless II: development of a wind measuring computer system</td>
<td>Electronically regenerated of FeC12/FeC13 compounds in metal etching processes with an environmental and economic focus</td>
<td>Using computers in physics experiments</td>
<td>THIRD PRIZES</td>
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<tr>
<td>Hendrik Küpper, Frithjof Küpper, Martin Spiller</td>
<td>SECOND PRIZES</td>
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<td>THIRD PRIZES</td>
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<tr>
<td>GERMANY</td>
<td>Henrik Mouritsen</td>
<td>Jan-Cristoph Puchta</td>
<td>Amina Azami, Chemseddine Bega</td>
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<td>Environmental relevance of heavy metal substituted chlorophylls</td>
<td>DENMARK</td>
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<td>Oliver Trapp</td>
<td>Akiological expedition to the rainforests of the Philippines</td>
<td>The ecology of the common buzzard and goshawk</td>
<td>Bio-indicators</td>
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<tr>
<td>GERMANY</td>
<td>Lars Knudsen, Peter Andersen</td>
<td>Elke Lau</td>
<td>Kai Eberspächer, Dominik Zayer, Andreas Gorbach</td>
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<td>Study on the effect of a chelator on yeast</td>
<td>DENMARK</td>
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<td>Anders Skov</td>
<td>Druppy, the computer controlled intravenous drip feed</td>
<td>Internal addresses in the Mandelbrot set</td>
<td>Computer-controlled waste-water purification</td>
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<td>Albert Barmettler, Günther Ederer</td>
<td>Jane Feehan</td>
<td>Padelis Ermillios</td>
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<td>The Calluna Case-Carrier</td>
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<td>Christian Krause</td>
<td>Vagelis Papadopoulos</td>
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<td>Green toad (Bufo Viridis) in the great belt</td>
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<td>Jean Byrne, Elizabeth Dowling</td>
<td>The minimum overlap problem of Paul Erdös</td>
<td>Telephone break-in security</td>
<td>Extension of the integral calculus</td>
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<td>Rodger Toner, Donal Keane</td>
<td>Henrik Ström</td>
<td>Guillermo Guerrero Guerro, Javier Villegas, Javier Rodríguez</td>
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<td>Population dynamics of a thistle predator: Toreilla Serrotulae</td>
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<td>Dominik Zeiter, Ewald Amherd, Reinhard Fubber</td>
<td>Mate selection by a mate crustacean</td>
<td>An anti-boot virus program</td>
<td>Beech recovery using solar energy</td>
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<td>SWITZERLAND</td>
<td>Maria Salany González, Antoni Camprubi</td>
<td>Samuel Schaer</td>
<td>Eduardo Molin González, Ruth Morena, José Manuel Brel</td>
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<td>Graphital plants varieties of trees</td>
<td>I Cano, Fidel Costa Rodriguez</td>
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<td>Water rocket</td>
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<td>The geological mapping of a Neolithic mine</td>
<td>Séverine Meyniex, Catherine Khamphan, Marie Montanard</td>
<td>France</td>
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<td>Peat bogs fossils: unmasking the past</td>
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Newcastle
Upon-Tyne 1995

FIRST PRIZES

Sven Siegle
GERMANY
Natural pulping or paper from straw

Brian Fitzpatrick, Shane Markey
IRELAND
Plants can tell us when they need a drink of water

Christopher Mead, Matthew Taylor
UNITED KINGDOM
Radio waves from comet Shoemaker-Levy 9

SECOND PRIZES

Tycho van Meeuwen
NETHERLANDS
The witty wise writing writer

Nina Fraefel
SWITZERLAND
The force of a set and the Euler characteristic

SECOND PRIZES

Emil Laslo
HUNGARY
From Salix Alba to modern medicine

Johanna Larnhed
SWEDEN
Antifouling

SECOND PRIZES

Marcin Kowalczyk, Marcin Sawicki
POLAND
Plants can tell us when they need a drink of water

Andreas Derr
GERMANY
A virus recognition programme to prevent computer infection

THIRD PRIZES

Robert Varga
HUNGARY
Computerised navigation

Oved Elfvin
FINLAND
Biohumus production by the red Californian worm

Gergely Eberhardt
HUNGARY
Delayed failure in ultra-high strength steels

THIRD PRIZES

Andreas Derr
GERMANY
A car hand brake: a potential life saver?

Annikka Nystrom
SWEDEN
From Salix Alba to modern medicine

Caroline Turner
UNITED KINGDOM
A time interval analyser

THIRD PRIZES

Nicolas Rebierre, Olivier Rebierre,
Olivier Pesle
FRANCE
Real speed

Patrick Neuberg
LUXEMBOURG
Improved cell sectioning

Nicole Gozer
NETHERLANDS
Teenage restlessness in a Dutch town

Jorgen Carlung
NORWAY
Examining voting patterns

Martin Franz Waldmann, Johannes Lackner, Jörg Schmidhuber
AUSTRIA
Solar energy to ecological fuel

Jürgen Hintermayer, Attilla Agoston
AUSTRIA
Brain waves and artificial intelligence

Michael Schachinger, Thomas Wetzlberger, Jürgen Zauner
AUSTRIA
Telephoning via computer networks

Ana Simeoes das Neves
PORTUGAL
The pharmacology of medicinal plants

Kaarlo Vaïsanen
FINLAND
Production of fullerenes by Draetshmer-Huffman’s method

Magnus Viström, Pontus Forslund, Robert Haglund
SWEDEN
A car hand brake: a potential life saver?
**Radosław Skibiński**
POLAND
The Cenozoic fish: discovery and reconstruction

**Thomas Bürg**
SWITZERLAND
An intelligent six-legged walking machine

**Justin Marston**
UNITED KINGDOM
The dripping tap as a model chaotic system

---

**Gábor Ivánka**
HUNGARY
MATKA: the game to solve your mathematical problems

**Erik van Alphen, Tom van Diessen**
NETHERLANDS
Less waste with bricks

**Anni Könönen**
FINLAND
Human impact on forest vegetation

**Daniel Atwood, Andrew Teesdale**
UNITED KINGDOM
How eucalyptus resins can prevent seeds from germination

---

**Montserrat Coll Lladó, Mariona Picart Merino**
SPAIN
Commercially viable sardine anchovy fish production

**Raphael Hurley**
IRELAND
The mathematics of monopoly

**Grzegorz Kapustka, Michael Kapustka**
POLAND
Some properties of polygons

**Maxim Sergeev**
RUSSIA
A new method to process some production waste

---

**Grzegorz Niedzwiedzki**
POLAND
New finds of dinosaur tracks in the Holy Cross Mountains

**Vaclav Rehák**
CZECH REPUBLIC
Prisoners dilemma: modelling of social phenomena using cellular automata

**Jasmin Roya Djamantadi**
GERMANY
Cytotoxicity of different mistletoe preparations on leukemic cells

---

**Álvaro Luis Maroto Conde**
SPAIN
Paravisin 3.0: window access for visually impaired

**Thierry Caramigeas, Vivien Moliton, Michael Pressigout**
FRANCE
A microwaves controlled household management system

---

**Erik Erikson**
DENMARK
KOMBI-2: a novel approach soil preparation and sowing

**Juliane Richter**
GERMANY
The phenomenon of fluctuation in concentration

---

**Florent Durrey**
FRANCE
Globular clusters around the Milky Way

**Gabor Guta**
HUNGARY
Simulator with ultra low noise

**Yevgen Nazarenko**
UKRAINE
The processing of aluminous manufacture after-product
Vienna 2002

FIRST PRIZES

Pawel Piotrowski
GERMANY
Special wings and ground effect for efficient transportation

Martin Etzrodt, Martin von der Helm
GERMANY
The slime mold phasysan as a model organism for biotechnology

Lauri Kauppila
FINLAND
Comparing the Oxidiser/Fuel ratio and heat released from Rocket Fuel Combustion

SECOND PRIZES

Vincent Bougeau, Solene Broner
FRANCE
Are there germs in the highest layers of the atmosphere?

Arnhild Jacobsen
NORWAY
The Physics of a rolling soda can

David Sahrla
SLOVENIA
Chemiluminescence

THIRD PRIZES

Maarten Vanhove
BELGIUM
Morphological diversity of cladoceran resting eggs in shallow lakes

Piotr Garbacz
POLAND
Influence of direction and intensity of gravity on plant growth

Ozgur Paksoy, Aslihan Akin Nuriiye
TURKEY
A general approach to the proof of inequalities

Budapest 2003

FIRST PRIZES

Jana Ivanidze
GERMANY
pH sensitive GFP mutant

SECOND PRIZES

Uwe Treske
GERMANY
Low-cost scanning tunneling microscope

Gábor Németh
HUNGARY
Efficiency enhancement of plasma loudspeakers

THIRD PRIZES

David Sehna
CZECH REPUBLIC
Math studio - a computer algebra system

László Nagy
HUNGARY
Phytoecology and environment protection of the central Hungarian plain

Johannes Keller
SWITZERLAND
The influence of the quill shape on the harpsichord sound

Travel award to the Noble Prize Ceremony

Jasmin Roya Djannatian
GERMANY
Cytotoxicity of different mistletoe preparations on leukemia cells

Anastasiya Efimenko
UNITED KINGDOM
My challenge to children’s mortality

Bergen 2001

FIRST PRIZES

Thomas Aumeyr, Thomas Morocutti
AUSTRIA
CURE - Controlled Ultraviolet Radiation Equipment

Sebastian Abel
GERMANY
Cloud

James Lee Mitchell
UNITED KINGDOM
Characteristics of Ascle drug resistance in candida tropicales

SECOND PRIZES

Bálint Pato
HUNGARY
Stress proteins as constituents of the Microtubular Lattice

Zbigniew Lech Pianowski
POLAND
New liquid crystal for holography

Marcin Wojnarski
POLAND
Neural network for solving classification problems

THIRD PRIZES

Jimi Lee Truelsen
DENMARK
A new cryptographic algorithm

Shane Browne, Michael O’Toole,
Peter Taylor
IRELAND
Symmetrical shapes formed by polgons

Richard Hulme, Yan Pugh-Jones
UNITED KINGDOM
Analysing the flight of Brazilian humming birds

Moscow 2005

FIRST PRIZES

Igor Gotlibovitch, Renate Landig
PHYSICS | GERMANY
Conners in water - unexpected symmetry breaking in fluid dynamics

Javier Lopez Martinez Fortun, Eliecer Perez Robaina, Carlos Machado Carvajal
BIOLOGY | SPAIN
Sonchus leptacaulis: a new species consolidation in Gran Canaria

SECOND PRIZES

Silvana Konermann
MEDICINE | SWITZERLAND
Development of a system for the local prevention of catheter associated urinary tract infection

THIRD PRIZES

Ocan Sankur
COMPUTER | TURKEY
N-gram based language classification

Artur Lewandowski
BIOLOGY | POLAND
Ants learning process

Laurynas Pliuskys
ENVIRONMENT | LITHUANIA
Hydrochemical analysis of the lakes of Trakai

Vienna 2004

FIRST PRIZES

Martin Knobel, Gerhard Schony,
Florian Grossbacher
ENGINEERING | AUSTRIA
Breakthroughs in the manufacturing of condenser microphones

Charlotte Stranvist
CHEMISTRY | DENMARK
Improving the method of synthesizing antidepressants

SECOND PRIZES

Ozgur Paksoy, Aslihan Akin Nuriiye
TURKEY
A general approach to the proof of inequalities

Jana Ivanidze
GERMANY
pH sensitive GFP mutant

SECOND PRIZES

Marcel Kolodziecyk
MATHEMATICS | POLAND
A counterfeit coin problem

Roland Bauerschmidt
COMPUTER | GERMANY
Internet access for guests

SECOND PRIZES

Jana Ivanidze
GERMANY
pH sensitive GFP mutant

SECOND PRIZES

Mehmet Halit Calayir, Mehmet Cakan
PHYSICS | TURKEY
Construction of a seismograph

Third PRIZES

Charlotte Stranvist
CHEMISTRY | DENMARK
Improving the method of synthesizing antidepressants

SECOND PRIZES

Zdenek Janovosky
ENVIRONMENT | CZECH REPUBLIC
Vegetation dynamics of the small forest and open landscape ponds and its historical causes
THIRD PRIZES

Georgi Dyankov
PHYSICS | BULGARIA
A method of measurement of refractive indices, birefringence and thickness of a thin anisotropic layer

Aisling Judge
BIOLOGY | IRELAND
The development and evaluation of a biological food spoilage indicator

Florian Schnös
ENGINEERING | GERMANY
SmartCam – Development of a universal 3D-Camera

Valencia 2007
FIRST PRIZES

Florian Ostermaier, Henrike Wilms
PHYSICS | GERMANY
Flashing Water Drops

Márton Spohn
CHEMISTRY | HUNGARY
Examination of Plants’ Self-Defence Against Pests

Abdusalam Abubakar
MATHEMATICS | IRELAND
An Extension of Wiener’s Attack on RSA Encryption

SECOND PRIZES

Martina Hafner
ENVIRONMENT | AUSTRIA
Energy from maize straw

Anne-Laure Delaye, Aude Latrive,
Astrid Verpeaux
PHYSICS | FRANCE
Can we walk on water?

Yael Amarilyo
BIOLOGY | ISRAEL
Molecular Identification and Characterization of Phytoplasma Bacteria in Grapesines – Another Milestone Saving the Wine Industry

THIRD PRIZES

Julian Glechner, Werner Pollihammer,
David Stockinger
ENGINEERING | AUSTRIA
Latent heat storage system (Salt crystal as a new energy storage technology)

Eva Černohorská
MATHEMATICS | CZECH REPUBLIC
Generalization of method of tiling in triangular and hexagonal grid

Copenhagen 2008
FIRST PRIZES

Magdalena Bojarska
MATHEMATICS | POLAND
Hamiltonian cycles in generalized Halin graphs, Martin Tkáč
ENGINEERING | SLOVAK REPUBLIC
Tilting of bulk materials based on gravitation principle in cargo railway transport

Elisabeth Muller
EARTH SCIENCE | UNITED KINGDOM
From Microcosm to Magma Oceans: A Lunar Meteorite Perspective

SECOND PRIZES

Michael Mikát
BIOLOGY | CZECH REPUBLIC
Ecology and Ethology of family Lestidae (Insecta: Odonata)

Fabian Gafner
PHYSICS | SWITZERLAND
Dikranos – the airplane with reverse gear

SECOND PRIZES

Émer Jones
ENGINEERING | IRELAND
Research and Development of Emergency Sandbag Shelters

Sara Vima Grau
EARTH SCIENCE | SPAIN
From mineral to Romanesque altarpiece: Identification of mineral pigments and reproduction of a Catalan Romanesque altarpiece

Lisbon 2010
FIRST PRIZES

Miroslav Rapcak
PHYSICS | CZECH REPUBLIC
Complete Phase Diagram Of CO2 Nanoclusters

Paris 2009
FIRST PRIZES

Liam McCarthy, John D. O’Callaghan
BIOLOGY | IRELAND
The Development of a Convenient Test Method for Somatic Cell Count and its Importance in Milk Production

Fabian Gafner
PHYSICS | SWITZERLAND
Dikranos – the airplane with reverse gear

SECOND PRIZES

Philip Cardona
ENGINEERING | MALTA
Cappuccino Logo Printer

Omri Lesser
PHYSICS | ISRAEL
The Complex Potential and its Application to the Planning of Dams

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From mineral to Romanesque altarpiece: Identification of mineral pigments and reproduction of a Catalan Romanesque altarpiece

THIRD PRIZES

Áron Hunyadi
ENGINEERING | HUNGARY
Radial velocity measurement of spectroscopic binaries

Stefan Strobel
COMPUTING | GERMANY
Development of a near-infrared vein imaging system

Omri Lesser
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THIRD PRIZES

Miroslav Rapcak
PHYSICS | CZECH REPUBLIC
Complete Phase Diagram Of CO2 Nanoclusters

Stockholm 2006
FIRST PRIZES

Michael Kaiser, Johannes Kienl
ENGINEERING | AUSTRIA
Development of a completely new electro-thermo-mechanical De-Icing system for aircraft

Johannes Burkart, Alexander Joos
PHYSICS | GERMANY
Flight curves of table tennis balls

Tomasz Widowik
CHEMISTRY | POLAND
Synthesis of a potential (beta)-blocker

SECOND PRIZES

Thomas Gigl
EARTH SCIENCE | GERMANY
Radial velocity measurement of spectroscopic binaries

Michael Marcinkowski
MATHEMATICS | POLAND
On a geometric transformation relating the Euler and Nagel lines

Zoltan Tarjanyi, Csaba Vass
BIOLOGY | HUNGARY
New diagnostic method to define the errors of the apoptosis program

THIRD PRIZES

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BIOLOGY | HUNGARY
New diagnostic method to define the errors of the apoptosis program

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Zoltan Tarjanyi, Csaba Vass
BIOLOGY | HUNGARY
New diagnostic method to define the errors of the apoptosis program
WINNERS 1989-2019

**EUCYS 2011 SALAMANCA**

**First Prizes**

**Helsinki 2011**
- **Alexander Amini**
  - **Computing** | **Ireland**
  - Tennis Sensor Data Analysis: An Automated System for Macro Motion Refinement
- **Pius Markus Theiler**
  - **Engineering** | **Switzerland**
  - Nature On Your Screen - Computer Based Modeling And Local Area Network In The Education Of Ecology

**Second Prizes**

- **Justyna Slowiak**
  - **Biology** | **Poland**
  - Biodiversity, Paleoecology And Taxonomical Position Of Vertebrates In The Middle Triassic Sea Ecosystem In Silesia (sw Poland)
- **Povilas Kavaliauskas**
  - **Medicine** | **Lithuania**
  - The Role of Houseflies (Musca domestica) in Spreading Antibiotic Resistant Bacteria

**Third Prizes**

- **Simone Schudt**
  - **Engineering** | **Germany**
  - Aircraft Of The Future - A Practise based School Project
- **Luca Banzereus, Michael Schmitz**
  - **Physics** | **Germany**
  - Production And Characterization Of Graphene Devices

**Warsaw 2014**

**First Prizes**

- **Luboš Vozdecký**
  - **Physics** | **Czech Republic**
  - Rolling Friction
- **Petar Milkov Gaydarov**
  - **Mathematics** | **Bulgaria**
  - Contributions to cyclic graph theory

**Second Prizes**

- **Aleš Zupančič**
  - **Biology** | **Slovenia**
  - Self-cleaning fabrics based on nanocovers
- **Petr Milikov Gaydarov**
  - **Mathematics** | **Bulgaria**
  - Hamming Distance of Polynomials over GF(2)

**Prague 2013**

**First Prizes**

- **Mark James Kelly, Eric Doyle**
  - **Physics** | **Ireland**
  - Music A'Clock
- **Clara Judge, Emer Hickey**
  - **Biology** | **Ireland**
  - Contributions to cyclic graph theory

**Second Prizes**

- **Jakub Nagrodzki**
  - **Chemistry** | **Poland**
  - Development of molecular patches therapy: trimethylguanosine cap analogues synthesis
- **Sophie Healy-Thow**
  - **Biology** | **Ireland**
  - A statistical investigation of the effects of diazotroph bacteria on plant germination

**Third Prizes**

- **Till Muser**
  - **Mathematics** | **Poland**
  - A natural characterization of semilattices of rectangular bands and groups of exponent two
- **Balázs Zsombori**
  - **Computing** | **Hungary**
  - Giving Everyone a Voice

**Bratislava 2012**

**First Prizes**

- **Mark James Kelly, Eric Doyle**
  - **Physics** | **Ireland**
  - Music A’Clock
- **Clara Judge, Emer Hickey**
  - **Biology** | **Ireland**
  - Contributions to cyclic graph theory

**Second Prizes**

- **Perttu Pöllönen**
  - **Social Sciences** | **Finland**
  - FreeGeo - the world’s first dynamic Android mathematics system app
- **Claire Emslie**
  - **Biology** | **Ireland**
  - A statistical investigation of the effects of diazotroph bacteria on plant germination

**Third Prizes**

- **Jasmin Allenspach**
  - **Mathematics** | **Switzerland**
  - Modern Mathematics in Islamic Mosaics
- **Nevzet Khasanov**
  - **Physics** | **Switzerland**
  - Information technology for a feedback control

**Prague 2013**

**First Prizes**

- **Mark James Kelly, Eric Doyle**
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  - Music A’Clock
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- **Paul Clarke**
  - **Mathematics** | **Ireland**
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- **Aleš Zupančič**
  - **Chemistry** | **Slovenia**
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**Warsaw 2014**

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  - Rolling Friction
- **Petar Milkov Gaydarov**
  - **Mathematics** | **Bulgaria**
  - Contributions to cyclic graph theory
**WINNERS 1989-2019**

**THIRD PRIZES**

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<th>Milan 2015</th>
<th>Brussels 2016</th>
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| Philipp Mandler, Anselm Bernhard Peter Dewald, Robin Braun | Timothy Matthew Logan
**ENGINEERING | GERMANY**
Hexapod - Construction and Programming of a six-legged exploration robot | To Graze or Not to Graze? **Anselm von Wangenheim**
**PHYSICS | GERMANY**
Monopod - Physics at the tipping point |
| Matas Navickas
**BIOLOGY | LITHUANIA**
Flowering Apple Tree “Malus baccata x Malus pumila” in vitro | **SECOND PRIZES**
| Sanath Kumar Devalapurkar
**MATHEMATICS | UNITED STATES**
On the Stability and Algebraicity of Algebraic K-theory | Ane Kristine Espeseth, Torstein Vik
**MATHEMATICS | NORWAY**
Motivic Symbols and Classical Multiplicative Functions |
| Michal Baczyk, Paweł Piotr Czyż
**PHYSICS | POLAND**
The studies of behaviour of single and coupled on-off type oscillators on the example of bottle oscillators | **SECOND PRIZES**
| Lukas Stockner
**COMPUTING | GERMANY**
Statistical modeling of volumescattered light | Tassilo Constantin Schwarz
**COMPUTING | GERMANY**
Drone detection system: Detection, tracking and classification of potentially dangerous flight objects for multicopter defence |
| Polina Vladislavovna Ledkova
**ENVIRONMENT | RUSSIA**
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 | Anette Kumar, Anamta Kumar
**MEDICINE | UNITED KINGDOM**
Polymeric nanomaterial modified by hydroxyapatite and stem cells |
| Dominika Katarzyna Bakalarz, Joanna Michalina Jurek
**MEDICINE | POLAND**
Origami Biobandage - mathematically described multipotential bioimplant based on polymeric nanomaterial modified by hydroxyapatite and stem cells | **THIRD PRIZES**
| Thomas Heger
**MEDICINE | CZECH REPUBLIC**
Biological activity of essential oils and extracts from narrow-leaved lavender (Lavandula angustifolia) M(III) | Tomáš Heger
**MEDICINE | CZECH REPUBLIC**
Biological activity of essential oils and extracts from narrow-leaved lavender (Lavandula angustifolia) M(III) |
| Annette Kumar, Anamta Kumar | Valerio Pagliarino
**MATHEMATICS | NORWAY**
Motivic Symbols and Classical Multiplicative Functions | **THIRD PRIZES**
| Junji Soo, Yongchan Hong
**ENVIRONMENT | SOUTH KOREA**
Agricultural application of halobacteria and their compatible solutes in enhancing plant salinity endurance | Tomáš Heger
**MEDICINE | CZECH REPUBLIC**
Biological activity of essential oils and extracts from narrow-leaved lavender (Lavandula angustifolia) M(III) |
| **SECOND PRIZES**
| Michael Bayhammer, Florian Thaller
**MEDICINE | AUSTRIA**
Tendon Tissue Engineering - Development of a Novel Tissue Biomaterial for Cushing Tendons | Ane Kristine Espeseth, Torstein Vik
**MATHEMATICS | NORWAY**
Motivic Symbols and Classical Multiplicative Functions |
| Polina Vladislavovna Ledkova
**ENVIRONMENT | RUSSIA**
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 | Tassilo Constantin Schwarz
**COMPUTING | GERMANY**
Drone detection system: Detection, tracking and classification of potentially dangerous flight objects for multicopter defence |
| Dominika Katarzyna Bakalarz, Joanna Michalina Jurek
**MEDICINE | POLAND**
Origami Biobandage - mathematically described multipotential bioimplant based on polymeric nanomaterial modified by hydroxyapatite and stem cells |
| **THIRD PRIZES**
| Damien Andreas Höllerer, Péter Udvardi
**ENGINEERING | AUSTRIA**
Development of a 3D Printer Prototype for Biomedical Applications | Timothee Baudenaud, Florent Alexis
**ENGINEERING | FRANCE**
Design of a magnetic system to guide drones in the presence of obstacles |
| Uladzislau Hadalau
**ENGINEERING | BELARUS**
Hybrid propulsion system for multirotor vehicles |
| Ivo Zell
**PHYSICS | GERMANY**
A wing is enough: An improved flying wing based on a bell-shaped lift distribution | Special prizes
**THE EUROPEAN SPACE AGENCY (ESA)**
Kristijan Kongas
**ENGINEERING | ESTONIA**
Simulation of the collision of binary white dwarfs using a cubic grid - stability analysis by variation of diffusivity constant and resolution |
| **WINNERS 1989-2019**

**THE EUROPEAN LABORATORY FOR PARTICLE PHYSICS (CERN)**
Uladzislau Hadalau
**ENGINEERING | BELARUS**
Hybrid propulsion system for multirotor vehicles |
| Jaime Redondo Yuste
**PHYSICS | SPAIN**
A study of the interaction between a magnetic field and electrolytic ions |
| Eliska Bršlíková
**ENVIRONMENT | CZECH REPUBLIC**
Subvolcanic intrusions in South Bohemia |
| **THE EUROPEAN MOLECULAR BIOLOGY LABORATORY (EMBL)**
Rūta Prakapaičiūtė
**MEDICINE | LITHUANIA**
Antimicrobial bacteriophage dressing in chronic wound treatment |
| **THE EUROPEAN SOUTHERN OBSERVATORY (ESO)**
Tassilo Constantin Schwarz
**COMPUTING | GERMANY**
Drone detection system: Detection, tracking and classification of potentially dangerous flight objects for multicopter defence |
| **THE INSTITUTE LAUELANGEVIN (ILL)**
Balduin Detting
**ENGINEERING | SWITZERLAND**
Development of a 3D Printer Prototype for Biomedical Applications |
| **THE EUROPEAN X-RAY FREEELECTRON LASER FACILITY (XFEL)**
Peter Udvardi
**PHYSICS | HUNGARY**
Micromechanical structure for sensing of low frequency sounds and vibrations |
| **THE JOINT RESEARCH CENTRE (JRC)**
Daniel Andreas Höllerer, Jonathan Reisinger
**ENGINEERING | AUSTRIA**
Slackline Tensioning System |
| **THE EUROPEAN SOUTHERN OBSERVATORY (ESO)**
Tassilo Constantin Schwarz
**COMPUTING | GERMANY**
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| **THE JOINT RESEARCH CENTRE (JRC)**
Daniel Andreas Höllerer, Jonathan Reisinger
**ENGINEERING | AUSTRIA**
Slackline Tensioning System |
Sponsors’ prizes
THE INTEL ISEF 2016 PRIZES
Amalya Ben Asher, Yuval Feldman, Tal Cohen
MEDICINE | ISRAEL
Aggregated Oxy-Infusion System
Naama Schor
SOCIAL SCIENCES | ISRAEL
The morality of larks and owls: relationship between the biological clock and morality in decision making
Zane Greta Grants, Daniela Gods-Romanovska
ENGINEERING | LATVIA
The textile-based tensesireisitive sensors’ operatio and their usage in the innovative technologies
EUCHEMS
Christian Schär, Paul Ratke, Friedrich Wanierke
CHEMISTRY | GERMANY
Alpha-aluminium oxide based genosomes: Development of a chemical synthesis process prompted by current mining conditions
BBI
Modestas Gudauskas
BIOLOGY | LITHUANIA
Acetobacter spp. bacteria producing biopolymers simultaneously
FOODDRINKEUROPE
Daniel Vaslica Copil, Sofia Onorato
BIOLOGY | ITALY
Natural antimicrobial extracted from medicinal plants
DUPONT
Mari Louise Fufezan, Diana Bura
ENVIRONMENT | IRELAND
An Investigation into the Effects of Enzymes used in Animal Feed Additives on the Lifespan of Caenorhabditis Elegans
FERRERO
Adam Andor Urmos
CHEMISTRY | EUROPEANSCHOOLS
Multifunctional application of natural sensor arrays
NESTLE
Ana Milovanović, Ana Halužan Vasle
BIOLOGY | SLOVENIA
Designing Synthetic Gene Regulatory Networks
INNOVATION IN FOOD AND AGRICULTURE
Ivan Hristov Ivanov, Vasilen Rosenov Tsvetkov
ENGINEERING | BULGARIA
Intelligent Planting

Winnners 1989-2019

SALVETTI FOUNDATION
Ethan Lee Dunbar-Baker, Po Yin Chau, Ragan Colin Michael McGilp
ENGINEERING | UNITED KINGDOM
David’s Wheels: a disability accessible and driveable hot rod for social and physical mobility

PRACE
Eero Valkama, Iiro Kumpulainen
COMPUTING | FINLAND
Digitalization of Chess Games using Computer Vision

TALLINN 2017

FIRST PRIZES

Karina Movesjan
BIOLOGY | CZECH REPUBLIC
The role of RAD51 mutations in cancer development

Adam Jan Alexander Ohnesorge
SOCIAL SCIENCES | SWITZERLAND
Taxonomic diversity of the Myldle Ordovician – early Silurian echinoderms from Siljansringen, Sweden

Danish Mahmood
ENGINEERING | CANADA
W.N.I.T.S. (Wireless Interconnected Non-Invasive Triage System)

SECOND PRIZES

Kamil Humánski
ENVIRONMENT | POLAND
Taxonomic diversity of the Middle Ordovician – early Silurian echinoderms from Siljansringen, Sweden

Yana Zhabur
ENGINEERING | UKRAINE
Enhancement of technical capabilities of delta robot

Colette Benko
MEDICINE | CANADA
Novel Paediatri Cancer Therapy: Targetting Epigenetics to Induce Differentiation

THIRD PRIZES

Florian Cásar, Michael Plainer
MATHEMATICS | AUSTRIA
Sigma – Learning how computers learn

Chavdar Tsvetanov Lalov
BIOLOGY | BULGARIA
The structure of self-avoiding walks and the connective constant

Arne Jakob Geipel, Matthias Paul Grützner, Julian Egbert
PHYSICS | GERMANY
Liquid stream hits rough surfaces – showing an extraordinary and stable wave pattern

Honorary awards

STOCKHOLM INTERNATIONAL YOUTH SCIENCE SEMINAR 2017
Kamil Humánski
ENVIRONMENT | POLAND
Taxonomic diversity of the Middle Ordovician – early Silurian echinoderms from Siljansringen, Sweden

Yana Zhabur
ENGINEERING | UKRAINE
Enhancement of technical capabilities of delta robot

LONDON INTERNATIONAL YOUTH SCIENCE FORUM 2018
Karina Movesjan
BIOLOGY | CZECH REPUBLIC
The role of RAD51 mutations in cancer development

Adam Jan Alexander Ohnesorge
SOCIAL SCIENCES | SWITZERLAND
The forgotten prisoners – Civilian prisoners of the Great War in Corsica

Chavdar Tsvetanov Lalov
MATHEMATICS | BULGARIA
The structure of self-avoiding walks and the connective constant

Special donated prizes by The Eiroforum

THE EUROPEAN LABORATORY FOR PARTICLE PHYSICS (CERN)
Florian Cásar, Michael Plainer
MATHEMATICS | AUSTRIA
Sigma – Learning how computers learn

EUROFUSION (JET)
Arne Jakob Geipel, Matthias Paul Grützner, Julian Egbert
PHYSICS | GERMANY
Liquid stream hits rough surfaces – showing an extraordinary and stable wave pattern

THE EUROPEAN MOLECULAR BIOLOGY LABORATORY (EMBL)
Nina Chiara Kathe
MEDIcINE | SWITZERLAND
Small non-coding RNA induced gene silencing of tetracycline resistance gene in E. coli

THE EUROPEAN SOUTHERN OBSERVATORY (ESO)
Can Pak
PHYSICS | TURKEY
Measuring the surface vibration frequency with laser diode

THE EUROPEAN SPACE AGENCY (ESA)
Dávid Puskás
MATERIALS | HUNGARY
3D printed Moonbase

THE EUROPEAN SYNCHROTRON RADIATION FACILITY (ESRF)
Johannes Nicolas Waller, Philipp Nikolai Kessler
CHEMISTRY | GERMANY
Fehling’s solution - Do we need a new interpretation?
Bioeconomy prizes

BBI JU
Gal Levy
ENVIRONMENT | ISRAEL
Production of biofuels from organic wastes in the "black-soldier" fly larvae
EUROPEAN FOOD AND DRINK INDUSTRY
Matas Aluižkevičius
ENGINEERING | LITHUANIA
Honeybee Colony Sounds Reveal Secrets of Life in Hives
DANONE
Kendra Zhang
ENVIRONMENT | USA
A paper-based microbial fuel cell for self-powered glucose monitoring in saliva
DSM
Camilla Hurst
MATHEMATICS | EUROPEAN SCHOOLS
The role of materials and surfaces in the transmission of bacteria in public places
PEPSICO
Ayumi Rie Mayer, Olivia Linnea Ryaard-Halsted
ENVIRONMENT | DENMARK
Sound Politics
EUROPEAN ASSOCIATION FOR CHEMICAL AND MOLECULAR SCIENCES (EUCHEMS)
Songrui Zhao
CHEMISTRY | CHINA
A Research on Synthesis, Characterization and CO2 Absorptive Character of Pyridinium-based Ionic Liquids
SWISS INTERNATIONAL TALENT FORUM
Alexandr Jankov
MATHEMATICS | CZECH REPUBLIC
The Basel problem

WOLFRAM RESEARCH
Andrej Shvedau, Nikolay Sheshko
MATHEMATICS | BELARUS
Any Heron Set can be Embedded in Z2
Andrej Shvedau, Nikolay Sheshko
MATHEMATICS | BELARUS
The Basel problem
Alekandra Jakovleva, Edvards Janis Reckiciks
MATHEMATICS | LATVIA
Magic Polyiamonds
Alena Igrekova Teslikina
MATHEMATICS | RUSSIA
Centered figurate numbers
Tija Božič, Mija Torkar, Sara Maruž
MATHEMATICS | SLOVENIA
Origamatics: Mathematical exploration of the equilateral triangle through paper folding
Adam Piotr Klukowski
MATHEMATICS | POLAND
The floor-polynomials
Gustav Møller Grimberg
MATHEMATICS | DENMARK
Use of comparative entropy analyses for dating and quantifying historical divergences between languages
Florian Cásar, Michael Plainer
MATHEMATICS | AUSTRIA
Sigma – Learning how computers learn
Barry Phillip Ovitt
MATHEMATICS | FINLAND
An Application of Queuing Theory On Relief Systems
Chadra Tsvetanov Lalov
MATHEMATICS | BULGARIA
The structure of self-avoiding walks and the connective constant

Special donated prizes

SALVETTI FOUNDATION
Philipp Sinnewe
ENGINEERING | GERMANY
A more energy efficient aerospace engine
PRACE
Adomas Paulauskas
COMPUTING | LITHUANIA
Virtual Reality Games for Rehabilitation

Host country awards

THE TALLINN CITY GOVERNMENT
Luis Miguel Afonso Pinto, Beatriz Sampaio Bastião, Olavo Filipe Estima Saraiva
ENGINEERING | PORTUGAL
EasyPark
Ministry of Education and Research
Gustav Møller Grimberg
MATHEMATICS | DENMARK
EasyPark: Use of comparative entropy analyses for dating and quantifying historical divergences between languages

Dublin 2018

FIRST PRIZES
Adrian Fleck, Anna Amelie Fleck
MATERIALS | GERMANY
FleckProtec – Body Protec on Made From Starch
Nicolas Fedrigo
MEDICINE | CANADA
Improving Spinal Fusions: Redesigning the Pedicle Probe to Prevent Vertebral Breaches
Brendon Matusch
ENGINEERING | CANADA
Development of a Level 2 Autonomous Vehicle Using Convolutional Neural Networks and Reinforcement Learning

SECOND PRIZES
Alexandru Liviu Bratosin, Petru Molla, Miheea Vlad Bojian
BIOLOGY | FRANCE
DNAdrive
Karl Hendrik Tamkivi
BIOLOGY | ESTONIA
Positioning of bat maternity roosts in relation to surrounding landscape complex in Western Saaremaa
Francisco Miguel Araújo
MATHEMATICS | PORTUGAL
Commutativity theorems for groups and semigroups

Special donated prizes

JRC-JOINT RESEARCH CENTRE
3 prizes: two-day stays at the JRC's Institutes in Ispra, Italy
Alekandr Kostadinov Shopov, Atanas Konstantinov Stefanov
PHYSICS | BULGARIA
Digital image denosing based on sphereconstrained total variation optimization with an additional noise component
Sijia Zhang
SOCIAL SCIENCES | CHINA
Innovation into the Verbal Conflict Problem in Middle School Students’ Families

Kyuee Jo, Chaeyoung Lee
COMPUTING | SOUTH KOREA
Building a robust classifier on model for speech-based Parkinson's Disease diagnosis

Honorary awards

STOCKHOLM INTERNATIONAL YOUTH SCIENCE SEMINAR 2018
Adrian Fleck
MATERIALS | GERMANY
FleckProtec – Body Protec on Made From Starch
Francisco Miguel Araújo
MATHEMATICS | PORTUGAL
Commutativity theorems for groups and semigroups

LONDON INTERNATIONAL YOUTH SCIENCE FORUM 2019
Anna Amelie Fleck
MATERIALS | GERMANY
FleckProtec – Body Protec on Made From Starch
Karl Hendrik Tamkivi
BIOLOGY | ESTONIA
Positioning of bat maternity roosts in relation to surrounding landscape complex in Western Saaremaa

INTEL ISEF 2019 Prizes

3 prizes: two-day stays at the JRC’s Institutes in Ispra, Italy
Stefan Gruber-Hofer, Johannes Ortner, Michael Eder
ENGINEERING
Development of a sampler for solid recycled materials

SOCIAL SCIENCES | CHINA
Investigation into the Verbal Conflict Problem in Middle School Students’ Families

IVAYLO MALINOV ZHELEV
COMPUTING | BULGARIA
A more energy-efficient aeroplane engine

LISA BATTISTINI, THOMAS BOISSIN, STEFAN GRUBER-HOFER, JOHANNES ORTNER, MICHAEL EDER
ENGINEERING
Development of a sampler for solid recycled materials
Special donated prizes by The Eiroforum

EIROFORUM PRIZES
CERN - THE EUROPEAN LABORATORY FOR PARTICLE PHYSICS
One week stay in Geneva, Switzerland
Kasper Fredenslund
PHYSICS | DENMARK
Creating playlists with artificial intelligence

CERN - THE EUROPEAN LABORATORY FOR NUCLEAR PHYSICS
One week stay in Geneva, Switzerland
Ginés Marín Martínez
SOCIAL SCIENCES | SPAIN
Collaborative economy suspended. The Legal challenge of Uber and BlaBlaCar. Job Precarity? Unfair Competition?

Tobia Simon Ochsner
COMPUTING | SWITZERLAND

Bioeconomy prizes

BBJ BU
Study trip to Belgium
Gabija Imbrasaitė
MATERIALS | LITHUANIA
Biodegradable film for preservation of meat and fish products

THE EUROPEAN FOOD AND DRINK INDUSTRY
Ioanna Karaiskaki, Anna Maria Agathokleous, Pavlos Makrides
ENVIRONMENT | CYPRUS
Plastics in the marine environment of Cyprus: monitoring and potential bioremediation strategies

CASIGIL
Visit to its state of the art R&D centre at Vilvoorde, Belgium
CARGILL
THE EUROPEAN FOOD AND DRINK INDUSTRY

Sofia 2019
WINNERS 1989-2019

FIRST PRIZES
Leo Li Takemaru, Poojan Pandya
BIOLOGY | USA
Investigating the Role of the Novel ESCRT-III Recruiter CCDC11 in HIV Budding: Identifying a Potential Target for Antiviral Therapy

Adam Kelly
COMPUTING | IRELAND
Optimised Simulation of General Quantum Circuits

Alex Korocenev, Felix Sewing
ENGINEERING | GERMANY
Hoverboard – a Magnetically Levitated Vehicle

Magnus Quaade Oddershede
ENGINEERING | DENMARK
The wingtip’s influence on the efficiency of airplane wings

SECOND PRIZES
Saba Gogichaishvili, Nia Gogokhia
CHEMISTRY | GEORGIA
Novel Biodegradable Polymer for Pharmaceutical Applications

Olli Järvinen
MATHEMATICS | FINLAND
On the Common Prime Divisors of Polynomials

Josehun Lee
PHYSICS | SOUTH KOREA
Introduction of a Novel Diodicity Evaluation Criteria and 1-D Approximate Model for Multistaged NMP (No-Moving-Parts) Check Valves and Methods for Valve Stage Optimization

Claudia Lidia Pubill Quintillà
SOCIAL SCIENCES | SPAIN
With Death at His Heels. Chronicle of an Escape and Two Wars

THIRD PRIZES
Antoni Ignacy Lis – Poland
CHEMISTRY | POLAND
Novaprotective in antimycotic therapy

Noah Scheiring, Andreas Ladner, Tobias Schauer
ENGINEERING | SWITZERLAND
Diffuse, PVO

Océane Zofia Adrienne Patiny
ENGINEERING | FRANCE
Remote Controlled Cylinder
Aliaksandr Piachonkin  
MATHEMATICS | BELARUS  
On the number of points on an algebraic curve in a ring of residues

Honorary awards

LONDON INTERNATIONAL YOUTH SCIENCE FORUM (LIYSF)  
All-expenses-paid trip to London to attend the London International Youth Science Forum (LIYSF)

Adam Kelly  
COMPUTING | IRELAND  
Optimised Simulation of General Quantum Circuits

Magnus Quaade Odershede  
ENGINEERING | DENMARK  
The wntgtp’s influence on the efficiency of airplane wings

Olli Järvineni  
MATHEMATICS | FINLAND  
On the Common Prime Divisors of Polynomials

STOCKHOLM INTERNATIONAL YOUTH SCIENCE SEMINAR (SIYS)  
All-expenses-paid trip to Stockholm to attend the Stockholm International Youth Science Seminar (SIYS) and the Nobel Prize Ceremony

Alex Korocencev, Felix Sewing  
ENGINEERING | GERMANY  
Hoverboard – a Magnetically Levitated Vehicle

Special awards

THE EUROPEAN MOLECULAR BIOLOGY LABORATORY (EMBL)  
A week’s placement at EMBL premises in Heidelberg, Germany

Mattias Akke, Elsa Axby  
CHEMISTRY | SWEDEN  
Catching the Bad Guys: Capturing Oligomers of the Amyloid-β Peptide

EUROPEAN SOUTHERN OBSERVATORY (ESO)  
A visit to ESO facilities in Chile including trips to the Paranal Observatory and ESO’s Scientific Centre in Santiago, Chile

Ségalène Mosser, Louis Richard, Hugo Montan  
PHYSICS | FRANCE  
Advanced ARAGO, a “gravitational wave” detector

THE INSTITUT LAUE-LANGEVIN (ILL)  
One week visit to their Grenoble site

Nadia Brzostowicz  
PHYSICS | SPAIN  
Acoustic levitation. Building and analyzing two different acoustic levitators based on piezoelectric transducers, and exploring its current and possible future applications using simple physical and chemical experiments

EUROPEAN X-RAY FREE-ELECTRON LASER FACILITY GMBH (XFEL.EU)  
One week placement at their site near Hamburg, Germany

Roman Rouba  
PHYSICS | BELARUS  
Investigation of the Prance Rupert’s drop properties

Sponsor’s awards

EUROPEAN ASSOCIATION FOR CHEMICAL AND MOLECULAR BIO SCIENCES (EUCHEMS)  
A prize of €1,000

Zeyad Bady  
CHEMISTRY | EGYPT  
High particular matter filtration efficiency Nano-fibrous membrane

EUCYS BIOECONOMY BIO-BASED INDUSTRIES  
A paid 5-day trip to Brussels for the winning project including travel, accommodation and daily allowance in Brussels and participating in a tailor-made experience related to the science behind the BBB32 programme

Ronja Holopainen  
MATERIALS | FINLAND  
EcoHe: a reusable, ecological and affordable menstrual hygiene product for developing regions

EUROPEAN FOOD AND DRINK INDUSTRY  
A check for 2,000 euros

Emma Nielsen  
ENVIRONMENT | DENMARK  
MOOSIC: a mean for productivity optimisation

UNILEVER  
A two-day mini-internship, he will get to experience how products from brands like Knorr, Hellmann’s, and Lipton are being developed

Mihlós Zsógő  
ENGINEERING | HUNGARY  
Moth.NET

PEPSICO  
A day at their Beaumont Park R&D centre in the UK, following a range of different activities with our R&D team

Hannah Schatz, Yasemin Gedik  
ENVIRONMENT | AUSTRIA  
Microplastic on our doorstep

EXPO-SCIENCES LUXEMBOURG  
Present his project alongside our national participants

Zvezdin Besarabov  
COMPUTING | BULGARIA  
Distributed creation of Machine learning agents for Blockchain analysis

INTERNATIONAL SWISS TALENT FORUM (ISTF)  
Participate at The International Swiss Talent Forum – February 5th – 8th 2020

Elisa Seppetti  
SOCIAL SCIENCES | ITALY  
OnMind: an IoT wearable biofeedback system for the treatment of psychosomatic disorders

JOINT RESEARCH CENTRE (JRC)  
A two day stay at its Lapa site in Italy

Maria Bouso Posada, Xana Rego Fernández, Ana Rubal Sánchez  
BIOLOGY | SPAIN  
O la đa mía. Distribution, ethology and phenology of the Iberian wolf

Jannik Wyss  
BIOLOGY | SWITZERLAND  
Gene regulation during development: The roles of the genes xbp1, creb3l1 and creb3l2 in axial mesoderm differentiation

Andrey Gizdov  
MEDICINE | BULGARIA  
The effect of the E12 antibody on multiple sclerosis

Moth.NET  
The effect of the E12 antibody on multiple sclerosis

EcoMe: a reusable, ecological and affordable Nano-fibrous membrane  
High particulate matter filtration efficiency

Catching the Bad Guys: Capturing Oligomers of the Amyloid-β Peptide  
Nanotechnology in radiographs

Music Splash  
Prevention of Cheating in eSports

Constantin Schott  
MATHEMATICS | GERMANY  
Neural Network application to key-point-detection in radiographs

BULGARIAN SUMMER RESEARCH SCHOOL  
Participate in the Summer Research School of the Bulgarian High School Students Institute of Mathematics and Informatics

Aila Sellar, Brendan Miralles, Grace Lord  
COMPUTING | UNITED KINGDOM  
Music Splash

Alexander Alexandrovich Sokko  
ENGINEERING | RUSSIA  
Next generation of solid-fuel rocket engines

Nadia Brzostowicz  
CHEMISTRY | EGYPT  
Investigation of the Prance Rupert’s drop properties

Participate in the Summer Research School of the Bulgarian High School Students Institute of Mathematics and Informatics

Host country awards

INTERNATIONAL STUDENTS OF HISTORY ASSOCIATION (ISHA)  
Participate in a relevant conference and present their results

Claudia Lidia Pubili Quintilla  
SOCIAL SCIENCES | SPAIN  
With Death at His Heels. Chronicle of an Escape and Two Wars
European Union Initiatives for Research and Youth
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Nurturing a new generation of highly qualified scientists is essential to ensure knowledge and growth, and to stimulate sustainable competitiveness and welfare in Europe.

For more than two decades, the European Union, via its Framework Programmes for research and technological development, has had a policy of supporting science and technology aimed essentially at fostering European research activities with those carried out at the level of the Member States. The Framework Programmes have played a lead role in multidisciplinary research and cooperative activities in Europe and beyond.

At present, Horizon 2020 which is the biggest Research and Innovation programme ever, has a budget of nearly €80 billion available to research during the period 2014 – 2020. The EU Framework Programme for Research and Innovation will be complemented further by the existence of the European Research Area. These measures endeavour to break down barriers to create a genuine single market for knowledge, research and innovation. The European Union also recognises the need to start the process of integration at grass roots level. The Commission is actively promoting European cooperation in the fields of science education, training and careers, as well as in trying to stimulate young people's interest in science outside formal education.

In addition to the EU Contest for Young Scientists, the Directorate- General for Research has introduced several other initiatives to encourage young people to consider careers in science.

Marie Curie actions

The Marie Curie Actions provide research training, career development and mobility schemes allowing researchers to be truly mobile both internationally and between commercial and non-commercial sectors. There are opportunities for researchers at any career stage and of any nationality.

In particular, the Initial Training Networks (ITN) offer early-stage researchers the opportunity to broaden their scientific and generic skills, including those related to technology transfer and entrepreneurship, to join established research teams and enhance their career prospects in both public and private sectors, thereby making research careers more attractive to young people. This is being achieved through a transnational networking mechanism, aimed at structuring the existing high quality initial research training capacity throughout EU Member States and Associated Countries. Calls for ITN proposals are announced on the Research & Innovation Participant Portal.


Furthermore, the Marie Curie Intra-European Fellowships (IEF) are open to researchers holding a doctoral degree or with at least four years’ research experience. The purpose is to give them the financial means to undertake advanced training through research or to acquire complementary skills at a European organisation most suited to their professional needs. These fellowships are to encourage young researchers to spend time outside their own country to acquire new research skills or experience working in other sectors.

More information about Marie Curie Actions can be found at: [http://ec.europa.eu/research/mariecurieactions](http://ec.europa.eu/research/mariecurieactions)

EURAXESS

Researchers in Motion

The European Commission has launched a user-friendly web portal for researchers called “EURAXESS - Researchers in Motion” with the aim of improving career development and mobility of researchers. The objective of the portal is to provide a single access point to information and support services which help researchers and their families when moving to and pursuing careers in another country.

EURAXESS hosts the following four initiatives:

- EURAXESS Jobs (formerly European Researcher’s Mobility Portal) is a recruitment tool with constantly updated job vacancies for researchers throughout Europe;
- EURAXESS Services (formerly ERA-MORE Network) is a network created to assist researchers and their families in organizing their stay in another country;
- EURAXESS Rights (European Charter for Researchers & Code of Conduct for the Recruitment of Researchers) sets out the rights and obligations of researchers and their employers;
- EURAXESS Links (formerly ERA-Link) is a networking tool for European researchers working in the US or Japan.

EURAXESS portal address: [http://ec.europa.eu/euraxess](http://ec.europa.eu/euraxess)
ERC Starting Grants

The European Research Council (ERC) is a special funding component of Horizon 2020 which promotes investigator-driven frontier research. Its main aim is to stimulate scientific excellence in Europe by supporting and encouraging the very best, truly creative scientists, scholars and engineers to go beyond established frontiers of knowledge and the boundaries of disciplines. ERC grants are awarded through open competition to projects in any field of research.

The ERC has launched a Starting Independent Researcher Grant scheme [ERC Starting Grants] with the objective to support excellent researchers with leadership potential, located in or moving to the EU and Associated Countries, who are about to establish their first research team or to start conducting an independent research programme.

The calls for proposals are published annually. Full information, including the Guide for Applicants, can be found at: http://erc.europa.eu

Other initiatives for students and young people

In a more general sense, the European Commission provides information, training, non-formal education and mobility opportunities for young people through a variety of programmes and activities. The European Youth Portal was developed as a direct result of the European Commission’s 2001 White Paper ‘A new impetus for European Youth’, and is a means of giving access to information specifically targeted at young people who are living, learning and working in Europe.

The portal is a gateway to European and national information on 33 countries in 27 languages. It allows young people to have their views heard through online discussion forums, and their questions answered through the Eurodesk Network.

The web address of the Portal is: http://europa.eu/youth

The original Youth in Action was a 2007-2013 EU Programme for young people aged 15-28 (in some cases 13-30). It aimed to inspire a sense of active citizenship, solidarity and tolerance among young Europeans and to involve them in shaping the Union’s future. It promoted mobility within and beyond the EU borders, non-formal learning and intercultural dialogue, and encouraged the inclusion of all young people, regardless of their educational, social and cultural background.

The activities of the Youth in Action programme will continue under the new Erasmus+ programme, scheduled to last from 2014-2020.

Moreover, the European Commission has integrated its various educational and training initiatives under a single umbrella entitled the Lifelong Learning Programme. The programme enables individuals at all stages of their lives to pursue stimulating learning opportunities across Europe. There are four sub-programmes focusing on different stages of education and training and continuing previous programmes:

- Comenius for schools
- Erasmus for higher education
- Leonardo da Vinci for vocational education and training
- Grundtvig for adult education.

A cross cutting programme aims to ensure that they achieve the best results possible via four key activities: policy co-operation, languages, information and communication technologies, and effective dissemination and exploitation of project results. In addition, the Jean Monnet Programme aims for a geographical reach beyond Europe’s borders by stimulating teaching, reflection and debate on the European integration process at higher education institutions worldwide.

Traineeships in the European Institutions

In-service trainings are organised each year to provide young university graduates with a unique first-hand practical experience and knowledge of the day-to-day work in the EU Institutions. The European Parliament, the Council, the Commission, Court of Justice, the Social and Economic Committee, the Committee of the Regions and the European Ombudsman offer such traineeships, each lasting from 3 to 5 months. The trainings also aim to provide an understanding of the objectives and goals of the EU integration processes and policies. It is an opportunity to work in a multicultural and multilingual environment, contributing to the development of mutual understanding, trust and tolerance.

Details for each institution can be found at: http://europa.eu/epso/discover/useful_links

General information about the EU

European integration has delivered half a century of stability, peace and economic prosperity. It has helped to raise standards of living, built an internal market, launched the euro and strengthened the Union’s voice in the world.

The process started shortly after the devastation of World War II, and was launched on 18 April 1951 with the signing of the Paris Treaty which established the European Coal and Steel Community (ECSC) involving six countries: Belgium, France, Germany, Italy, Luxembourg and the Netherlands. On 25 March 1957, the Treaty of Rome was signed to establish the European Economic Community (EEC) in order to promote the free movement of people, goods and services, and capital. A major revision of the Treaty of Rome was signed on 17 February 2003 in Maastricht, which would lead to the strengthening of the economic and monetary ties between the members and define what we now call today the European Union.

Over the years membership grew. In 1973, Denmark, Ireland and the United Kingdom joined. Greece followed in 1981, and Spain and Portugal, in 1986. In 1995, Austria, Finland and Sweden brought the membership up to 15 Member States. The entry of eight central and eastern European countries together with Cyprus and Malta into the European Union on 1 May 2004 was a historic achievement, ending centuries of East-West division. More recently, the number of members has grown to 28 with the entry of Bulgaria and Romania in 2007 and of Croatia in 2013.

The European Union is based on the rules of law and democracy. It is neither a new State replacing existing ones nor is it comparable to other international organizations. Its Member States delegate sovereignty to common institutions representing the interests of the Union as a whole on questions of joint interest. All decisions and procedures are derived from the basic treaties ratified by the Member States.

The principal objectives of the Union are:

- Establish European citizenship
- Ensure freedom, security and justice
- Promote economic and social progress
- Assert Europe’s role in the world

To know more about the EU, please visit the EUROPA portal at: http://europa.eu

For Schools

The European Commission supports formal and informal science education in schools as well as science centres and museums, through the Science in Society programme. Several projects have been supported via EU funding in this area through collaborative and coordination and support actions. During the last few years, special attention has been paid with respect to research on the use and development of formative and summative assessment methodologies and their role in teaching STEM, including Inquiry Based Science.
Education techniques, and disseminating results to the society as a whole. The overall aim is to raise the interest of both youth and young people in science and mathematics. Projects such as S-TEAM, FIBONACCI, PRIMAS, ESTABLISH, SAILS, INQUIRE, KidsINNscience, contribute to this purpose.

As part of the dissemination strategy and with the aim to improve, through the results and materials produced by the projects, the European Commission launched SCIENTIX - the Community for Science Education in Europe (www.scientix.eu). SCIENTIX is a web-based community for Science Education targeted not only to teachers and researchers, but also to policy makers, parents and anyone interested in science education. It has been created to provide a user-friendly information platform to encourage dialogue and facilitate sharing of progress, know-how and best practices in science education across EU Member States and Associated Countries.

The European Commission also supports research projects on science education as well as initiatives for reinforcing the link between science education and S&T careers in the private sector through reinforcing the partnership between industry and education.

Providing members of the European educational community, current and future scientists, researchers and innovators with the necessary knowledge and tools, as well as skills and qualifications is a main priority of the European Commission. This shall contribute to having science literate and responsible citizens and stimulating young people to embark on research careers. Science education is the vehicle to meet current and future societal challenges.
In 2022, Leiden will be the European City of Science. A year in which Leiden is the stage for European knowledge and a year in which Leiden will show that she is a true City of Science. Leiden has been a university city since 1575 and while the University of Salamanca is almost twice as old and one of the oldest universities of Europe, Leiden houses the oldest university of the Netherlands: Leiden University. With numerous university buildings 'scattered' across the historic city centre at walking distance, a high number of (international) students and many scientific discoveries attributed to it, the city affirms its status as ‘City of Discoveries’. The unique combination and carrying the title of European City of Science 2022, provides the perfect opportunity to host EUCYS2022.

One of the main goals of Leiden2022 is to put young scientists in the spotlight and involve them in the City of Science year. Because young scientists are the future, Leiden2022 will innovate EUCYS and highlight careers of young talented scientists in and outside the academic context. Moreover, to make EUCYS2022 as attractive and unique as possible, Leiden2022 will organise EUCYS2022 during the ArtScienceWeek. This interdisciplinary week combines art and science and provides the best opportunity for young scientists to explore the European capital of science. With inspiring theatrical and cinematic experiences, workshops, and events such as the Night of Discoveries and the Brave New World Conference, the young scientists can explore and celebrate the entanglement of science and art and watch as the city of Leiden transforms into a world of discovery.

As the European City of Science in 2022, apart from inviting over EUCYS, Leiden2022 will also host Europe’s largest interdisciplinary science convention, EuroScience Open Forum (ESOF). Moreover, Leiden2022 will organise the first everyearlong City of Science Event, with all 365 days revolving around science, knowledge, arts, and expertise.

Have you become intrigued, interested, and curious about the next EUCYS edition and want to stay up to date? Follow Leiden2022 on twitter and linkedin (leiden2022) or Instagram (2022leiden). Or check the website leiden2022.nl