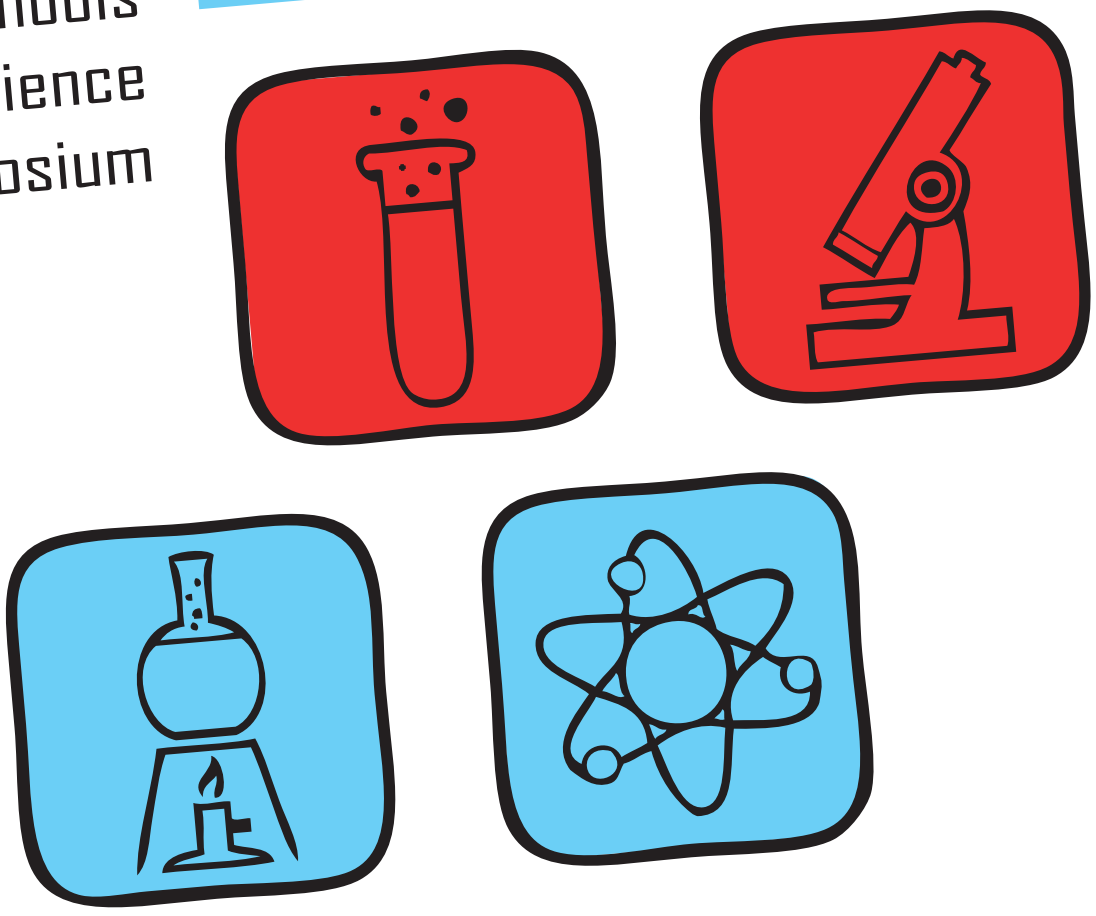
EUROPEAN SCHOOL LUXEMBOURG II - MAMER

15th ESSS

European
Schools
Science
Symposium



LUXEMBOURG

22TH - 25TH APRIL 2018

ESSS
LUXEMBOURG II
2018

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WELCOME NOTE

Very Welcome To The 15th European Schools Science Symposium at ES Luxembourg II

The European Schools are preparing our youth for a future with needs not possible to define with full accuracy. What we do know though is that science will take a great part in solving the challenges of the same future. I am sure that the creative and scientifically interested students from the European Schools will contribute to a sustainable development of the health and wellbeing of all as well as to create technical inventions that will meet demands in our future everyday life.

We at ES Luxembourg II feel privileged to be the European School who will host the 15th ESSS. We will use this opportunity to show for all school, Primary as well as Secondary, how exciting science is and what students from our schools can create when they combine knowledge, interest and ambition with personal creativity. Distinguished members of the Scientific community in Europe will through their evaluation of each presented work at the ESSS give these ambitious students a feedback highly valuable for future personal development of each student.

What we will be able to see at the ESSS is the result of a lot of hard work from students but we must not forget that behind each students there are great support from devoted teachers and from supporting parents.

I would like to say a special thank you to the teachers and other staff members who organized the ESSS, to the judges and also to the several organizations who financially as well as with human resources have made it possible for us to arrange the ESSS at ES Luxembourg II.

I wish you all very welcome to ES Lux II and the ESSS, and I do also, of course, wish all students participating great success.

Per FRITHIOFSON
Head Director
ES Luxembourg II

INSPECTOR NOTE

Chers élèves, chers jeunes scientifiques,
Chers participants aux Symposium des Sciences des Écoles européennes,

Cette 15ième édition du ***Symposium des Sciences des Écoles européennes*** pro-met d'être à nouveau un grand succès. Plus que 140 élèves et enseignants des écoles européennes vont se rassembler du 22 au 25 avril 2018 à l'EE Luxem-bourg II – Mamer/ Bertrange pour présenter leurs projets scientifiques. L'at-tractivité du symposium se fait aussi remarquer par la participation accrue des écoles européennes accré-ditées.

Vous tous, vous êtes la meilleure preuve que l'Europe sans frontières fonctionne. Il y a plus de soixante ans à Rome étaient jetées les bases de l'Europe telle que nous la connaissons aujourd'hui. L'Europe n'est pas un acquis, l'Europe n'est pas une évidence. L'Europe reste un choix, un choix nécessaire. Vous vivez l'identité européenne au quotidien.

Tout d'abord, je dois mon respect aux élèves qui se sont engagés, de manière exemplaire, bien avant d'arriver au Luxembourg. Mon respect parce que vous étiez prêts à fournir un travail supplémentaire, à vous investir, et ce, dans un domaine que d'aucuns ne portent pas dans leur cœur. Un mode d'analyse très précis, des réflexions logiques et un bon travail en équipe étaient indispensables pour arriver à un résultat convaincant.

Ce qui est merveilleux avec la science, c'est qu'elle fournit une source infinie de défis complexes, pouvant satisfaire tous les goûts et passions, et ça nous pousse à travailler dur pour comprendre notre monde. En tentant de faire des découvertes scientifiques, chaque problème est une opportunité, et plus le problème est difficile, plus l'impact de sa solution sera important.

Lors des qualifications au sein des différentes écoles, une approche stimulante des sciences a pu contri-buer à l'épanouissement d'une majorité d'élèves. Vous avez dû faire preuve de curiosité, de créativité, d'esprit d'initiative et d'un mode de travail rigoureux. Au sein de vos équipes il fallait être capable de résoudre de multiples problèmes, avoir l'esprit critique et pratiquer une bonne collaboration afin de faire aboutir vos idées.

J'aimerais aussi remercier les enseignants qui ont consacré leur temps libre afin de guider les élèves dans leurs démarches. Sans leur engagement de telles initiatives ne pourraient pas avoir lieu.

Un très grand merci à la direction de l'Ecole hôte, l'association des parents ainsi qu'à toute l'équipe orga-nisatrice (Igor Stefanic, Martine Thoma, Thomas Schmidt, Pascal Waechter, Marie Maquet, Lyubov Dombeva, Heike Boche, Vaishali Naik, Ioannis Volakakis, Angela Piccolomini, Christian Lesourd, Thomas Meunier, Elisabeth Patak, Paul Rhodes, Valentine Gillot, Véronique Labis, Horst Sommerer, Denis Dour, Frédéric Goosse, Stephen Haselock) pour leur travail insatiable tout au long des deux dernières années.

Merci à tous les sponsors (CAS, Ecoles Européennes, APEEEL2, Ministère de l'Education nationale, de l'En-fance et de la Jeunesse, LIST) pour leur aide financière.

Continuez à travailler avec passion, et vous allez constater que beaucoup de filières vous ouvriront leurs portes. N'ayez pas peur d'approcher d'autres personnes, d'échanger vos idées et d'apprendre des autres. Entourez-vous de mentors plus âgés et plus expérimentés. Soutenez-vous réciproquement.

L'équipe qui remportera l'ESSS ira représenter les EE au prestigieux EUCYS (*European Union Contest for Young Scientists*), qui aura lieu du 14 au 19 septembre 2018 à Dublin (Irlande). Ce concours est la vitrine des meilleures performances scientifiques des élèves. Il s'agit d'une initiative de la Commission Euro-péenne lancée pour promouvoir la coopération et l'échange entre jeunes scientifiques. Profitez de cette occasion unique pour entrer en contact et vous échanger avec des jeunes du même âge, venus des quatre coins de l'Europe.

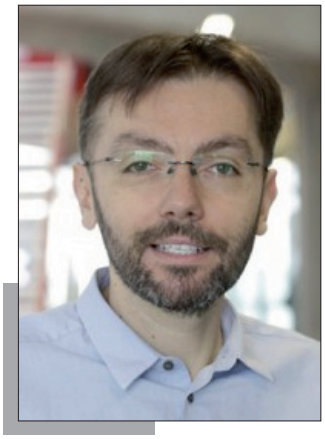
Or le but de l'ESSS n'est pas de pouvoir envoyer une minorité d'élèves à l'étranger mais d'éveiller l'intérêt pour les sciences chez une majorité de nos jeunes. Ce sont bel et bien de telles initiatives qui permettent de transmettre une image positive des sciences. L'enseignement scientifique doit rester une priorité dans notre système éducatif.

Pour le moment il me reste de féliciter tous les participants au symposium. Bravo pour votre engagement et vos travaux. Beaucoup de plaisirs avec les sciences et à l'année prochaine à l'école européenne de Mol !

Max WOLFF
Inspecteur des Écoles européennes

GUEST SPEAKERS

Boris LENHARD



Following a Diploma degree in Molecular Biology at the Faculty of Science, University of Zagreb, Croatia (1990-1994), Boris moved across town to do a PhD in Biochemistry (1995-1999) on the enzymatic mechanism and evolutionary adaptations of one of 6000 of yeast proteins. During his PhD he enjoyed computational sequence analysis enough to decide to switch fields to do it full time. He moved to Karolinska Institutet (Stockholm, Sweden) as a postdoctoral fellow in the group of Wyeth Wasserman, to work on bioinformatics of gene regulation and annotation. After two years as postdoc, he was offered a junior faculty position at Karolinska (2002-2005). In 2005 he moved to University of Bergen, Norway, where he built a group working on computational genomics of transcription and transcriptional regulation. He joined Imperial Col-lege London and MRC Clinical Sciences Centre in 2011 as Reader in Computational Biology. He is currently Professor of Computational Biology at Imperial College London, where he leads a group of 10 researchers at MRC London Institute of Medical Sciences.

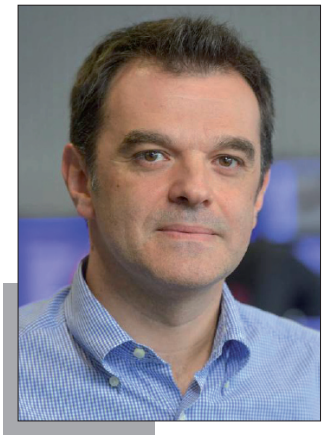
FISH-AND-CHIPS SCIENCE: STUDYING THE SECRETS OF LIFE USING SMALL FISH AND LARGE COMPUTERS

Experimental biology studies a variety of model organisms. Many discoveries on model organisms apply to human biology, too. The choice of model is a compromise between its ease of use in the laboratory and its relatedness to humans. Some of the choices include bacteria like E. coli, yeast, frogs, mice, and nonhuman primates. Bacteria and humans share the same genetic code and basic metabolic pathways, so they are good models for studying both. But, if we want to study how an embryo develops into adult, we need to study a multicellular animal - the closer to human the better.

Zebrafish is a small fish found in the rivers and lakes of south Asia. It has become a favourite model to study vertebrate embryonic development. Its embryo is transparent and develops outside of the body, so it can be easily manipulated and studied under microscope. It takes only a day to grow from fertilised egg to an enbryo with eyes, brain and muscles. The embryo then takes two months to grow into an adult that can produce next generation of embryos.

Comparison of human and zebrafish genomes can tell us which parts of the genome are the most important. These parts include both the genes and the bits that turn genes on and off, and they are under strong evolutionary pressure not to change. I will show how we compare genomes using computer algorithms and computer graphics. This is how we have discovered that thousands of parts of genome are almost identical between human and fish. These parts control when and where genes switch on and off during embryo development. It was a big surprise to us that these control parts were much more similar than the genes themselves. We still do not know how they manage to stay so similar for hundreds of millions of years: it is one of the unsolved mysteries of genome biology ■

Andrea ACCOMAZZO



Andrea Accomazzo is born 27 Jul 1970 in Domodossola (Italy). After having completed high school at Liceo Scientifico Rosmini, he was admitted in August 1989 to the Italian Air Force Academy in Pozzuoli (Neaples) as a cadet pilot in the Corso Leone IV. He completed the first 2 years of training as a military pilot, to then complete his master graduation in aer-ospace engineering at the Politecnico di Milano 1995 with a master thesis on the trajectory control for the Vega launch vehicle.

He worked from 1995 till 1999 at BPD Difese e Spazio, then Fiat Avio, in the Colleferro (Rome) and Turin establishments, where he followed the project of the GNC system of the Vega launch vehicle and the descent system of the Philae lander of the Rosetta mission. In 1999 he joined the European Space Agency (ESA) at the European Space Operations Centre (ESOC) in Darmstadt (Germany) as Spacecraft Operations Engineer for the Rosetta mission, role that he kept till launch in March 2004. In 2003 he was assigned as Spacecraft Operations Manager for the Venus Express mission, role that he kept during launch in November 2005 and orbit insertion at Venus in April 2006. He returned to the Rosetta mission as Spacecraft Operations Manager in 2006. In this role he was responsible for the preparation and execution of all flight activities of the mission during the interplanetary cruise, hibernation, and comet proximity operations.

Since April 2013 he is head of the Solar and Planetary Missions Division in the Mission Operations Department, and as such Flight Director of all ESA interplanetary missions; in particular he has been the Flight Director for the Rosetta mission in its most critical phase after the arrival at comet Chur-yumov-Gerasimenko and during the landing of the Philae probe on the surface of the comet in No-vember 2014.

After this event he has focused more on missions in development phase like Exomars Orbiter and Rover (arrived at Mars in 2016 and to be launched in 2020 respectively), Bepi Colombo (launch towards Mercury in 2018 and arrival in 2025), Solar Orbiter (launch towards the Sun in 2020 and start of routine operations in 2021) and Juice (launch towards Jupiter and its moons in 2022/2024 and arrival in 2030/2034)

THE ROSETTA MISSION

The Rosetta mission was conceived in the middle of the eighties and provided its scientific results only thirty years later, finally giving the scientists the chance to understand this mysterious world. This talk will guide us through this unique mission as seen from the people that flew it to its target. We will see why scientists are so interested in such an object, how we could even think of reaching such a target, and how we could fly in such a peculiar environment. The mission design, the space-craft development, the operations team build-up and training were all elements of a huge project that involved hundreds of people and managed to reach a spectacular success.

The talk will satisfy technical curiosities and give an in-sight on how engineers can actually master these challenges. Finally, some of the scientific results will be presented ■

JUDGING PANEL

Christelle BAHLAWANE

The Integrated BioBank of Luxembourg (IBBL) is a "bank" that collects, stores, processes and distributes biological samples (such as tissue, blood, urine stool…) and the data associated with those samples (such as clinical information about the participant). IBBL supports research to improve the prevention, diagnosis and treatment of a wide range of illnesses (such as cancer, diabetes, cardiovascular disease and neurodegeneration) as well as to promote health in Luxembourg and abroad.

As a project manager at the IBBL, Christelle Bahlawane is in charge of the implementation of new projects including new collections of biological samples from participants according to the needs of the scientists. They ensure that the samples are collected following good clinical practices and are used for high quality research projects.

Mrs Bahlawane is a link between the researchers, the medical doctors and the different authorities which deliver the authorisation required to collect and use biological samples.

Her work on an everyday basis requires a lot of reading and writing skills, the ability to listen to and to understand the needs and the projects of the researchers and a lot of flexibility to adapt to the continuously changes inherent to scientific project ■

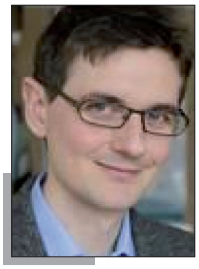
Naoufal BAHLAWANE

Naoufal Bahlawane is a Lead Research and Technology Associate at the Luxembourg Institute of Science and Technology (LIST), a research and technology organization (RTO) which the mission is to promote the economic growth and diversification through innovation.

Naoufal Bahlawane has graduated in Physicochemical Analysis and received a PhD in Materials Engineering from Claude Bernard University, Lyon, France. He was awarded the JISTEC and AvH fellowships to perform research at Kyushu National Industrial Research Institute in Japan and at Bielefeld University, Germany. As a research group leader at Bielefeld University, where he obtained a habilitation and Venia Legendi in Physical Chemistry, Naoufal Bahlawane has investigated aspects related to the chemistry of thin films deposition and the interplay between the materials' structure-properties and surface reactivity. He is involved in teaching physical chemistry since 2001 in Bielefeld University (Germany) and now in Luxembourg University.

His current research activities rely on surface chemistry for the design of functional and smart coatings with tunable physicochemical properties to address specific needs as those associated with optics, thermal management and energy storage ■

Prof. Stéphane BORDAS



Born in Paris, France in 1975, Stéphane joined in 1999 a joint graduate programme of the French Institute of Technology (Ecole Speciale des Travaux Publics) and the American Northwestern University. In 2003, he graduated in Theoretical and Applied Mechanics with a Ph.D. from Northwestern University under the guidance of Professor Brian Moran. Between 2003 and 2006, he was at the Laboratory of Structural and Continuum Mechanics at the Swiss Federal Institute of Technology in Lausanne, Switzerland, working under the support of Professor Thomas Zimmermann. In 2006, he became permanent lecturer at Glasgow University Civil Engineering Department. Stéphane joined the Mechanics team at Cardiff University on 1st September 2009, as a Professor in Computational Mechanics and directed the institute of Mechanics and Advanced Materials from October 2010 to November 2013. On November 1st, 2013, he joined the University of Luxembourg as a Professor in Computational Mechanics. He is the Editor of the series « Advances in Applied Mechanics » since 2013. His areas of expertise are: computational mechanics with an emphasis on moving discontinuities (mechanics of fracture, biofilm growth, etc.),

Method development (enriched/extended finite elements, meshfree methods, smooth strain finite elements), Evolving discontinuities, Academic research/ industrial applications. Stéphane has also been awarded an ERC Starting Independent Research Grant (RealTcut), (where Pierre Kerfriden is main collaborator) to address the need for surgical simulators from a computational mechanics angle ■

Dr. Georges DAHM

Dr. Georges Dahm pursued his secondary studies in Luxembourg before joining the University of Strasbourg to pursue a Bachelor's Degree in Chemistry and then a Master of Science in Molecular and Supra-Molecular Chemistry. He carried out his doctoral thesis on the medical applications of metallocarbenes in the laboratory of the Institute of Physics and Chemistry of Materials of Strasbourg (IPCMS) under the direction of Dr. Stéphane Bellemin-Laponnaz. During these years of doctoral studies, he carried out many teaching tasks in organic and inorganic chemistry for undergraduate students in Strasbourg. Currently, Dr. Georges Dahm is Deputy Head of the Laboratory of «Biological Monitoring and Environmental Hygiene» within the Department of Official Laboratories of Control Analyzes of the Health National Laboratory (LNS). Dr. Georges Dahm is the author and co-author of some fifteen publications. These fields of specialization are organometallic synthesis and the use of many organic and inorganic analytical techniques (GC-MS, ICP-MS, NMR, IR, LC-MS, HPLC, DMA, UV, Fluorescence, XRF). Dr. Georges Dahm is a member of the American Chemical Society, the French Chemical Society, the Deutsche Chemiker, the Deutsche Gesellschaft für Massenspecktrometrie, the Royal Society of Chemistry ■

Dr. Emmanuel DEFAY

Dr. Emmanuel Defay has been leading the "Ferroic Materials for Transducers" group (20 people) in the Materials Research and Technology

(MRT) Department of the Luxembourg Institute of Science and Technology (LIST) since September 2014. He previously worked for 15 years at CEA LETI Grenoble in France to develop functional oxides for microsystems. From 2012 to 2014, he was Chief Scientist of the Microsystems section at CEA LETI. From 2010 to 2012, he spent two years as visiting scientist at the University of Cambridge (Pr Mathur) to study electrocaloric materials, where he was elected by-Fellow of Churchill College. He has been involved in academic and industrial projects for an overall budget of around 40 M€, published 118 scientific papers, 2 books and filed 31 patents. Besides, he has an extensive experience in training young researchers (16 PhD students and 6 post docs). Dr. Emmanuel Defay current research is on piezoelectric materials and devices. I am mostly interested in inkjet printing technique in order to fabricate functional devices as micro-sensors or actuators. He is also very much interested in the electrocaloric (EC) effect, which is a variation of temperature appearing in any EC material when a voltage is applied/removed. More generally, He is interested in developing materials exhibiting energy coupling ■

Mr. Frank DREWS

Frank Drews, born in 1980, completed his Bachelor's degree in Mathematics and Applied Physics in 2002 at the Universities of Luxembourg and Strasbourg. He continued his studies in the field of theoretical physics at the Louis Pasteur University of Strasbourg and obtained his master's degree in 2004. After complimentary studies in the audiovisual field, he obtained his Master 2 in "production and documentary filmmaking "at the Marc Bloch University in Strasbourg in 2006. He then joined the teaching team of the" Neie Lycée "high school (now: Lycée Ermesinde) as a physics teacher. He wrote his Candidature Work in 2011 in which he undertook research on "The Impact of Humor on Learning ■

JUDGING PANEL

Jack HALE

In November 2013 Jack Hale joined Prof. Stéphane Bordas' team in the Research Unit in Engineering Science at the University of Luxembourg.
Prior to this he did a PhD in the Department of Aeronautics at Imperial College London (2009-2013) under the supervision of Dr. Pedro M. Baiz Villafranca. His thesis, funded by the EPSRC through the Department of Aeronautics Doctoral Training Award, looked at how mixed variational methods, long used in the finite element method community, could be applied to the problem of alleviating the shear-locking phenomenon in meshless or meshfree numerical methods.
During his Master of Engineering at Bristol University (2004-2008) he developed analytical models for understanding plasticity in aluminium bars subject to three point bending.
He spent one year abroad at Rice University (2006-2007) where he developed Monte Carlo molecular simulations of cross-flow filtration processes.
Broadly speaking, his research interests lie in the field of Computational Mechanics. Within this, he concentrates on the following areas:

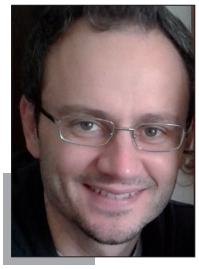
- Implicit boundary methods particularly suited to simulating models derived from medical images.
- Numerical method development; meshfree methods, XFEM and isogeometric analysis.
- Mixed variational methods in solid mechanics; particularly for the alleviation of volumetric and shear-locking.
- High performance computing; the development of partition of unity methods that can scale to modern distributed and parallel computing platforms ■

François MERSCH

After studying chemistry at the Saarland University in Saarbrücken and an end-of- study work in organometallic chemistry, François Mersch pursued a course in Environmental Sciences at the Fondation Universitaire Luxembourgeoise d'Arlon where he wrote a memoire on human

toxicology. Since 1996 François Mersch has been a professor of chemistry and in 2004 joined the European School of Alicante as a professor of chemistry and integrated sciences until 2013. During these years he took part in the symposiums of Sciences ESSS Varese in 2008 and Luxembourg in 2010, and was the coordinator of ESSS 2012 in Alicante. Currently, he is professor of chemistry at the Lycée Ermesinde de Mersch in Luxembourg and a member of the National Commission for Chemistry Programs. During his career, François Mersch held various posts and was a member of the jury of recruitment of chemistry professors in Luxembourg and participated in the working group within the SCRIPT (Central Service for Research and Educational Innovation) ■

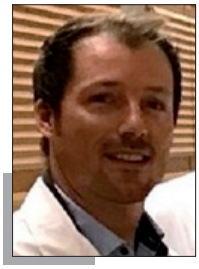
Alessandro MICHELUCCI



Alessandro Michelucci is currently a Researcher at the Luxem-bourg Institute of Health (LIH) at the NorLux Neuro-Oncology La-boratory where he leads a team of 3 scientists (1 PhD student and 2 post-docs). His research interests are in the cellular and molecu-lar mechanisms underlying the immunological properties of micro-glia and astrocytes in the brain under inflammatory, neurodegene-rative and tumorigenic conditions in order to identify specific signa-tures for therapeutic intervention. To achieve these aims, he op-timizes methods to perform molecular and functional analyses of microglia and astrocytes isolated from specific mouse models of human diseases. Specifically, he combines multicolor flow cyto-metry and FACS with single-cell RNA-sequencing to study glial cell profiles in mouse models of inflammation, neurodegeneration, and brain tumors ■

Dr. Alex SALSMANN

Dr. Alex Salsmann was born in 1977 in France (Metz). After receiving his Bachelor in plant

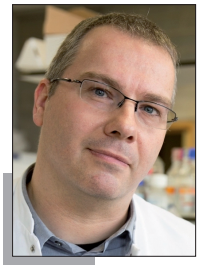


and animal cellular biology and physiology in Nancy (France), a Master's degree in microbiology, enzymology and nutrition in 2002 also at the faculty of sciences of Nancy, he did a PhD thesis at the University of Luxembourg in 2006. He then stayed at the University of Luxembourg as a research scientist, focusing on cellular and inflammatory aspects of cardiovascular diseases such as thrombasthenia or atherosclerosis.

He has been involved in teaching general biology, cellular and molecular biology as well as laboratory biosafety for now more than 12 years at bachelor and masters level. Since 2013, he is in charge of the practicals of biology of the Bachelor of biology, medicine and the Master of Integrated systems biology of the University of Luxembourg. Since 2014, he is in charge of course development and biology teaching at the Scienteens Lab, a study lab dedicated to high-school pupils aiming to discover science research (wwwen.uni.lu/lcsb/scienteens_lab).

He is also co-organizer of the Biology Olympiad of Luxembourg (www.ibolux.lu), and jury member at the International Biology Olympiad (www.ibo-info.org). He has been awarded a few month ago as best teacher of the University of Luxembourg ■

Prof. Dr. Serge HANN



Prof. Dr. Serge Haan holds the chair for Biological Chemistry at the University of Luxembourg since September 2011. He studied Chemistry at the RWTH in Aachen from which he graduated in 1996. He performed his PhD thesis at the Institute of Biochemistry of the RWTH-Medical School, where he subsequently stayed as a group leader and later adjunct professor from 2000 to 2006. His research focused on cytokine signalling and the molecular mechanisms of inflammation. Supported by a Marie Curie Individual Fellowship, he worked as a research associate in the Dept. of Immunobiology at Queen's University of Belfast (2001/2002). After his habilitation at the RWTH-Aachen, he joined the University of Luxembourg (2006) where he is heading the Molecular Disease Mechanisms group within the Life Sciences Research Unit. He is also the director of the Doctoral School in Science and Engineering. Current research activities mainly focus on the investigation of the molecular mechanisms underlying colorectal carcinoma. The team uses in-vitro, in-vivo and bioinformatic techniques as well as primary tumour material to dissect the mechanisms underlying tumour initiation, tumour progression, treatment resistance and tumour/microenvironment interactions. His scientific work is reflected in 47 publications, which obtained over 5200 citations ■

Dr. Pranjul SHAH

Dr. Pranjul Shah is currently the Principal Investigator of the microGUT project at the Luxembourg Centre for Systems Biomedicine at the University of Luxembourg. His research and innovation focus is towards development of organs-on-chip systems allowing elucidation of the role of human microbiome in pathogenesis of idiopathic medical conditions. His patent-pending invention, HuMiX, was recently awarded the Outstanding Scientific Publication award 2017 by the Fonds National de la Recherche (FNR) Luxembourg. Additionally, his subsequent invention of the model of the entire human gastrointestinal tract – microGUT – was also awarded the Outstanding Research-Driven Innovation 2017 award by FNR. Previously, Dr. Shah has acquired a PhD in Physics and Nanotechnology from the Technical University of Denmark. He has consulted numerous startups and companies in the information technology, mobile, waste management and energy sectors. Most notably, he was a consultant on Nokia's team, which designed the text input software for 6 Indian language scripts, which at one stage powered over 50 million handsets in India. He is recipient of numerous Innovation and business plan awards as well as, among many others, the Lush Prize for Young Researchers 2016 ■

ASSESSMENT CRITERIA AND RUNNING OF THE COMPETITION

- Each school can submit **3 projects plus 1 reserve.**
- Projects will be grouped according to pupils' year level:
  Junior Projects: **Years 2 - 4**
  Senior Projects: **Years 5 – 7**
- Projects may be submitted by an individual or a group of **maximum 3 students**.

A project will be judged as a senior project if at least one member of the group is in years 5 – 7.

Projects should demonstrate that the student(s) has/have undertaken some significant original work. Originality is exceptionally important. Examples must include a practically based experimental investigation carried out by the students, original design of an item or process, or survey based investigations involving the first-hand collection in 2 preliminary rounds to select the five best junior or five best senior projects.

PRELIMINARY ROUND

(A) 1st preliminary round: Report work

The student/groups will present their written scientific report of their project. The jury members evaluate these papers by giving 50% of the total preliminary points.

Find below the information given to the participants about guidelines for writing their scientific report:

The final report should be a document which describes the investigation carried out by your group. As a suggestion, you can go through the steps in the scientific process including a detailed description of your work and findings.

There is no minimum or maximum length of the report, but as a scientist you should be concise and very precise in what you write, i.e. LESS is MORE, don´t use more words than you really need. Don´t be satisfied with a first draft. You can write your report in any language but you will need to provide a translation in English, French, or German for the judges.

SCORING SHEET – REPORT WORK

Name of the jury member: _____

Title of the project: _____

Number of the project: _____

Motivation and Originality: **/10**

Motivation and ultimate aim
Originality

The Process **/20**

Planning and organization
Quality of the research work
Use of relevant experiments/data/statistics
Level of innovation and creativity
Variety of scientific skills used

Data analysis and conclusion **/15**

Presentation of data
Achievement of aims / Answering of research question
Drawing of conclusion

Significance **/5**

Global significance

Short comments on the project if it is applicable:

Total points: /50 points Signature of the jury member: _____

(B) 2nd preliminary round: Oral presentation

The student/groups will present their scientific project orally to the jury (a panel of judges composed of two experts). The oral presentation could be supported with a slideshow presentation, and/or any technological equipment that the pupils have developed. A poster will be present in the classroom, which students may or may not wish to use in their oral presentation. However, 10 points (10% of the total point) will be given by the jury (a panel of judges composed of two experts) concerning the readability of the project through the poster. They are available to provide you additional information on their project work and answer questions. The oral presentation will be maximum 10 minutes and the panel of judges will be invited to pose questions for a max of 5 minutes.

The jury members evaluate the oral presentation by giving the rest 50% of the total preliminary points.

SCORING SHEET – ORAL PRESENTATION

Name of the jury member: _____

Title of the project: _____

Number of the project: _____

Evaluation of the oral presentation **/40**

How easily did student(s) express themselves? (15)
Using of supports (slideshow and/or poster and/or equipment)
Has been done clearly and explain the aim of the project? (10)
How clear were the answers? (15)

Evaluation of the poster **/10**

How well planned and organized was the poster? (2)
How well does the poster describe the aim of the project? (4)
How well were experiments/data/statistics presented? (2)
Level of creativity (2)

Short comments on the project if it is applicable:

Total points: /50 points Signature of the jury member: _____

The scores of the written and oral presentations will be added and the highest scored projects (5 from each category) will be qualified to participate in the final round. If the final points are equal, the panel of judges will make its common decision.

(2) FINAL ROUND – PLENARY STAGE PRESENTATION

The very best 5 junior and 5 senior projects (selected in preliminary rounds) will be invited to present their work on stage for a maximum of 10 minutes. Audienece and jury will be invited to pose questions for a maximum of 5 minutes.

The stage manager will indicate when the final minute of the presentation/questions-answers starts. The timing must strictly be kept for all participants.

Previous points and rankings are disregarded for the final round.

The jury will give rankings for the projects. They will take into account of the following characteristics if the projects:

- The concept – what was the motivation behind your project and what were your aims? How original is your project?
- The process – how well did you plan and organize your work? What research did you do? What experiments did you undertake? Were you innovative or creative in your approach? What skills did you use?
- The outcome – how well did your project achieve its aims? What conclusions did you draw? Personal skills –how well did you deal with any problems or challenges you encountered, individually or as a group?
- Presentation – how well is your project communicated? Do you demonstrate understanding and reason clearly? Is your final report of the high quality?
- Significance – what is the wider impact of your project?

Final rankings for each category will be added, the lower the rankings, the better the score. In the event that projects have identical ranking scores, the panel of judges will arbitrate to reach a final common decision.

The three best entrants in each category (junior and senior) of the competition (according to the above mentioned criteria) will be received the 'ESSS 2018 prize' (1st 2nd 3rd) . the 4th and 5th places will be rewarded with a 'finalist certificate of ESSS 2018'.

The winner of the senior project of ESSS 2018 will be selected for the **European Contest for Young Scientists (EUCYS 2018).**

The awarding ceremony will take place on the final day of the ESSS 2018 (April 25th).

DAY 1: 22ND APRIL 2018 (SUNDAY)

12:00 – 16:00:	Arrival of participants to Luxembourg Youth Hostel and registration
16:00 – 16:30:	Bus transfer from Youth Hostel to European School Lux II
16:30 – 17:00:	Set-up of posters
17:00 – 19:00:	Opening ceremony
19:00 - 19:30:	Bus transfer to Youth Hostel
19:30 – 21:00:	Dinner at Youth Hostel

DAY 2: 23RD APRIL (MONDAY)

7:30 – 8:30:	Breakfast at Youth Hostel
8:30 – 9:00:	Bus transfer to European school Lux II
9:30 – 11:00:	Poster presentation including individual project presentations to judges (1st session)
11:00 – 11:15:	Coffee break
11:15 – 13:00:	Poster presentation including individual project presentations to judges (2nd session)
13:00 – 14:00:	Lunch at school canteen
14:00 – 18:30:	Excursions (visit to Luxembourg Science Center and the National Mining Museum of Rumelange)
18:30 – 19:00:	Bus transfer to Youth Hostel
19:30 – 21:00:	Dinner at Youth Hostel with Notification of Finalists (5 Junior and 5 Senior Projects)
21:00 – 22:00:	Animation for students at the Youth Hostel (Science Quiz)

DAY 3: 24TH APRIL (TUESDAY)

7:30 – 8:30:	Breakfast at Youth Hostel
8:30 – 9:00:	Bus transfer to European school Lux II
9:15 – 11:00:	Presentations of five best Junior projects
11:00 – 11:15:	Coffee break
11:15 – 13:00:	Presentations of five best Senior projects
13:00 – 14:00:	Lunch at school canteen
14:00 – 18:30:	Excursion (visit to Museum of Natural History and Luxembourg City Tour)
18:30 – 19:00:	Bus transfer to European school Lux II
19:00 – 20:00:	Dinner at school canteen
20:30 – 22:00:	Physikanten Science Show
22:00 – 22:30:	Bus transfer to Youth hostel

DAY 4: 25TH APRIL (WEDNESDAY)

7:15 – 8:00:	Breakfast at Youth Hostel
8:00 – 8:30:	Bus transfer to European school Lux II
8:30 – 9:00:	Removing posters and grouping luggage by schools
9:00 – 10:30:	Closing Ceremony
10:30 – 11:00:	Coffee break
11:00 – 12:00:	Award Ceremony

SUNDAY, 22ND APRIL 2018

17:00 – Musical Introduction

European School Luxembourg II Orchestra (Conductor: Mr. Thomas MEUNIER)

- *Into the Clouds! (Richard L. Saucedo)*
- *Ode to Joy (Ludwig van Beethoven)*

17:15 – Speech of the Director of the European School Luxembourg II Mr. Per FRITHIOFSON

17:25 – Musical interlude

European School Luxembourg II Parents and Friends Choir (Conductor: Mrs. Elisabeth PATAK)

- *Calabaca (Spanish folk song from the 15th century)*

17:30 – Speech of the Secondary School Inspector of European Schools Mr. Max WOLFF

17:40 – Musical interlude

European School Luxembourg II Parents and Friends Choir (Conductor: Mrs. Elisabeth PATAK)

- *Swing the «Prélude» (M.A.Charpentier, Arr. Henry O. Millsby)*

17:45 – Scientific presentation of guest speaker Mr. Andrea ACCOMAZZO:

"The Rosette mission"

18:30 – Musical closing

European School Luxembourg II Orchestra (Conductor: Mr. Thomas MEUNIER)

- *Pirates of the Caribbean (Klaus Badelt, Arr. Michael Sweeney)*

WEDNESDAY, 25TH APRIL 2018

09:00 – Musical Introduction

European School Luxembourg II Chamber music ensemble (Isabel JENKIN (clarinet), Paul KERRACHER (piano), Annika KÜSTER (trombone), Mircea MIHAILA (violin), Luca PELACCIA (flute))

- *"The young prince and the young princess" from Scheherazade (Rimski-Korsakov)*
- *"Djurdjevdan" (Serbian traditional)*

09:15 – Speech of the Deputy Director of European School Luxembourg II Mrs. Leene SOEKOV

09:25 – Musical interlude

European School Luxembourg II student Paul KERRACHER (piano)

- *Impromptu (Frédéric Chopin)*

09:30 – Speech of the General Secretary of European Schools Mr. Giancarlo MARCHEGGIANO

09:40 – Musical interlude

European School Luxembourg II student Luca Pelaccia (flute)

- *Sonata (first movement) (Francis Poulenc)*

09:45 – Scientific presentation of guest speaker Dr. Boris LENHARD

"Fish-and-Chips Science: Studying the secrets of life using small fish and large computers"

10:30 – Coffee break

11:00 – AWARD CEREMONY

Distribution of awards to participants and winners by Mrs. Leene SOEKOV

12:00 – Musical closing

European School Luxembourg II Chamber music ensemble (Isabel JENKIN, Paul KERRACHER, Annika KÜSTER, Mircea MIHAILA, Luca PELACCIA)

- *"Count on Me" (Bruno Mars)*

JUNIOR PROJECTS PARTICIPATING FROM THE DIFFERENT SCHOOLS

SCHOOL	PROJECT N°	TITLE OF PROJECT
Bergen	1	De l'O_2 créé à partir des cyanobactéries sur Mars
Culham	2	Cleanville
	3	What Affects Creativity?
	4	Learnability of Languages
	5	Salt explosion
	6	WISER Urban Agriculture
Frankfurt	7	Can plants produce green electricity? A practical study of plant microbial fuel cells (P-MFC)
The Hague	8	Food of the Future
	9	What affects our reaction time the most?
Luxembourg I	10	SISU, a device that helps to learn to walk again
	11	Are antioxidants a viable alternative to antibacterials?
	12	The effect of drop height and surface material on the rebound height of a tennis ball
Luxembourg II	13	Blue energy dynamo for paddlers
Mol	14	Comment fabriquer un rouge à lèvres BIO ?
Munich	15	Worldcolibrì
Parma	16	Eco Chauffage
	17	A step to involtality
	18	Used water
Rhein-Main	19	From our school kitchen (part 2): Dietary, healthy and tasty cacao enriched milk chocolate
Uccle (Bruxelles I)	20	Co – Bot (constructor-bot), a 3D printer made of LEGOs
	21	Solar Portable Charger
	22	Mobility in a sustainable manner
Varese	23	The effect of odours and light colors on bugs behaviour
	24	Would you eat coloured food?
Woluwé (Bruxelles II)	25	Our Edible Water Bottle/Bubble and Our Water Distiller
	26	Modzy - The versatile, modular and inexpensive quadcopter for delivery and research
	27	The nutritional composition of products in vending machines at school and consumption of those by adolescents

SENIOR PROJECTS PARTICIPATING FROM THE DIFFERENT SCHOOLS

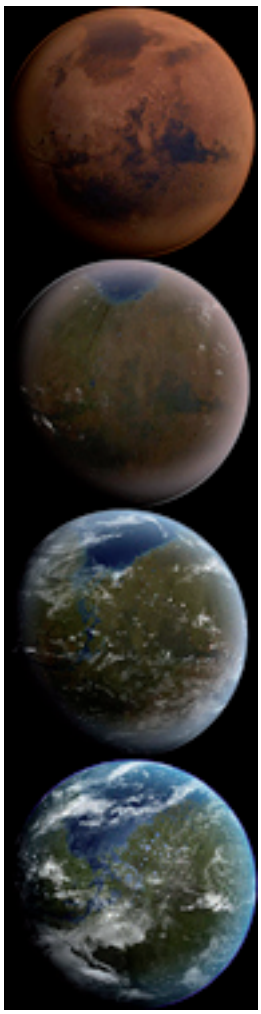
SCHOOL	PROJECT N°	TITLE OF PROJECT
Alicante	28	Can virtual reality help to prevent gender violence?
	29	The use of VR to help understand molecular chemistry
Bergen	30	How the Order of Questions Affects Performance and Confidence in an Exam or Test
Ixelles (Bruxelles III)	31	Family Accountant
	32	InsectiFind
Luxembourg I	33	Tech for a Better World
	34	Peut-on augmenter la biosynthèse de l'acide ascorbique dans une plante ?
Luxembourg II	35	Disinfection, a potential risk factor due to endotoxin release?
	36	The effects between probiotics and antibiotics on bacterial growth
	37	Growing Glowing Lamps
Mol	38	Is it possible to make fountain pen inks using absolutely natural pigments and additives?
Munich	39	ALBS–Automatic Luggage Brake System
	40	Antibacterial Silver-Nanoparticle Coating
	41	Nachweis der Feldlinien des elektromagnetischen Kraftfeldes in 3 Dimensionen
Parma	42	Lies in disguise
Uccle (Bruxelles I)	43	Persistence of Vision Display
Varese	44	The Path of the Eye: Exploring the relationship between eye path and analysis of painting composition
Woluwé (Bruxelles II)	45	Experimental Cultivation of Pisum Sativum and Phaseolus Vulgaris Under Simulated Mars Habitat Conditions
	46	Electromagnetic Train

DE L'O_2 CRÉÉ À PARTIR DES CYANOBACTÉRIES SUR MARS

Alexandar PELLETIER
European School of Bergen
S3FR

ABSTRACT

Les objectifs de ce projet sont de savoir s'il est possible de créer une nouvelle planète terre. Ce projet s'inscrit dans un ensemble beaucoup plus vaste de projets dédiés à la terraformation. La terraformation consiste à modifier les caractéristiques naturelles d'une planète. Une des étapes de la terraformation est la création de l'oxygène dans l'atmosphère. Cette première étape est indispensable pour rendre une autre planète que la terre habitable. Un des moyens est d'utiliser les cyanobactéries comme cela a été le cas pour la terre il y a des milliards d'années. En théorie les cyanobactéries devraient survivre aux conditions rencontrées sur la planète choisie (Mars) pour produire du dioxygène. Lors de cette étude nous n'avons pas encore pu le vérifier expérimentalement. En effet nous n'avons donc pas encore été capable d'atteindre des pourcentages en CO_2 aussi élevés que ceux de Mars. Nous n'avons pas pu recréer les conditions extrêmes de températures. Dans les études futures nous devrons améliorer le système expérimental.



CLEANVILLE

Sheeya PURAHOO
Europa School UK (Culham)
S3

ABSTRACT

My technological project is a self-sufficient model village powered completely by renewable energy sources, which are (at the moment) wind and solar power. I am making my own wind turbine from scratch (hopefully!).

I chose this project because the Energy Crisis is the world's problem, and for the first time in history, one of the biggest problems is not that we will run out of fossil fuels, but the amount of CO_2 released into the atmosphere due to the burning of fossil fuels. There is now over 400 ppm (parts per million) of CO_2 in the atmosphere, and the "safe" limit is 350 ppm. This causes extreme weather conditions, depletion of levels of oxygen in the ocean (ocean anoxia) and will cause the sea levels to rise drastically.

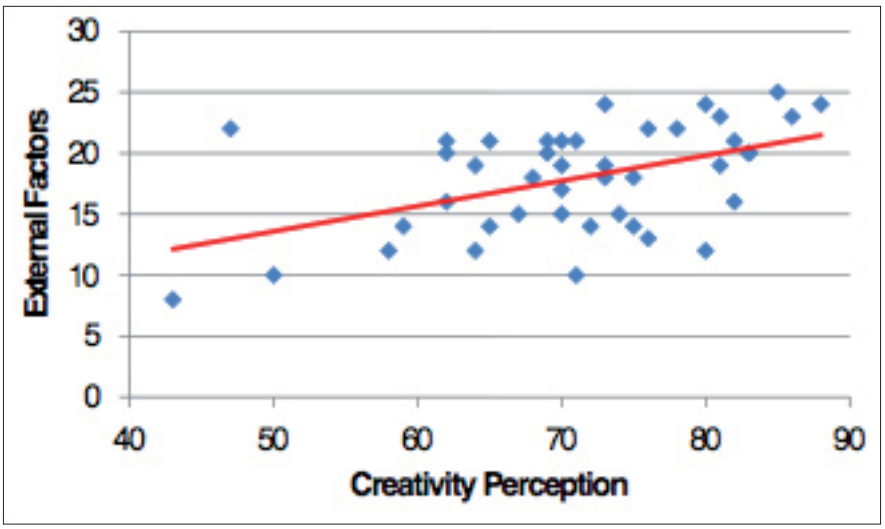
I think my project is (in some ways) original because it focuses on a single small village being completely free of fossil fuels rather than a larger area, such as a town, being almost free of fossil fuels. We should focus on using the technology we have now to power small villages and then, in maybe 10 years, when our technology advances further, use it to power bigger towns and cities.

WHAT AFFECTS CREATIVITY?

Lorenzo MATOUSEK and Oscar PRICE-NOWAK
Europa School UK (Culham)
S3

ABSTRACT

The purpose of this study was to find out what factors determine creativity. We used two different approaches to answer this question: one looking at cultural, genetic and social aspects, and the other to do with physical influences. We uncovered no single significant factor that determines creativity. We found that genetic and social aspects, for example how many cultural outings children made, had an effect on their level of creativity. But sports and hobbies did not make them more creative. Perhaps most surprising was the finding that the amount of time they spent on computers/books correlated negatively with creativity. It would be interesting to research this further to determine its cause. In the second, physical approach, we found that the sample group which stayed inactive for a few minutes before the test achieved better creative results. However, the group that did some physical activity prior to the creativity test performed worse. We did not find a significant correlation between higher calorie consumption and creativity before the test, nor between gender and creativity.



LEARNABILITY OF LANGUAGES

Anna HARDER and Arabella MEYER O'KANE
Europa School UK (Culham)
S2

ABSTRACT

The purpose of our research is to find out if the languages you already speak impact the learning pace of specific languages you are learning. It can also help people find out which language they should start learning in the future. We gathered our information from a questionnaire we created and sent to the students of the school. We discovered that 88.4% of the Italian learners that responded perceived it easy to learn a language and 85% of the French speakers and 83.3% of the Spanish speakers all perceive the language they are learning easy. 37.5% of the German speakers and 15% of the French speakers and 16.7% of the Spanis speakers perceive it hard. The conclusion of our study is that Spanish is the most learne language in our school, but Italian is the easiest of the languages that were suggested.

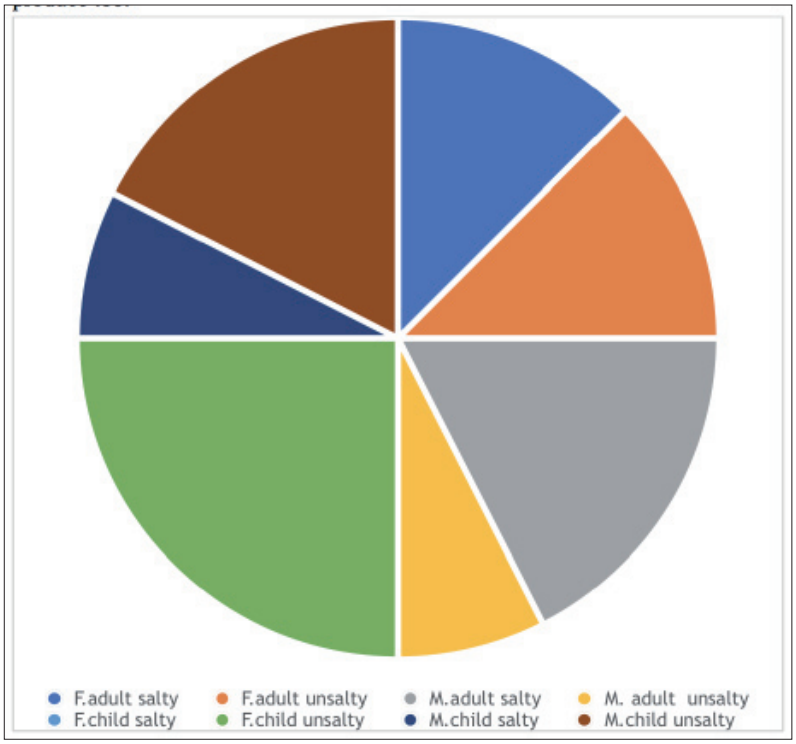
SALT EXPLOSION

Hazel BLANCHARD and Clara SAYERS
Europa School UK (Culham)
S2

ABSTRACT

Salt is becoming an increasingly large problem. Therefore, we decided to aim our project at it. We wanted to know whether the shockingly large amount of salt put into takeaway pizzas is necessary. We chose to use pizzas as they are well known for containing large amounts of sodium. In 2014, and average of 75 grams of pizza was consumed per person per week in the UK- and there are around 9.27 grams of sodium per takeaway pizza.

We decided to test 10 male children, 10 male adults, 10 female children and 10 female adults. We gave them a sheet of paper asking their age, nationality and gender. Then we gave them two slices of pizza to try : A and B. A contained the average amount of salt put in a takeaway pizza and B contained no salt at all. They did not know which slice was salted or unsalted, however, results show that they could tell the difference. They then circled their preference and which one was saltier.



Our results show that males preferred saltier produce than females and 'older' people preferred saltier produce too. This is the conclusion of our experiment: although some people may like salt in produced foods, majority people prefer no salt at all!

WISER URBAN AGRICULTURE

Julia HALL and Darcey SHAW
Europa School UK (Culham)
S4

ABSTRACT

We constructed an "irrigation system", to encourage urban agriculture by using recycled materials. We tested our construction with three fast growing crops (cress, rocket and basil) against a control group in normal pots. The motivation of the experiment was to help the environment and inspire people to grow their own plants.

WISER is formed by seven recycled plastic bottles stuck together: six bottles acting as crop containers and one in the middle as the water reservoir to irrigate the plants. The crop containers have removable caps in order to create a greenhouse effect to aid germination from seeds.

Our experiment took place in July 2017 (20 days). WISER was simultaneously tested in two different European climatic conditions, Northern Europe (UK) against Southern Europe (Italy). Plants were watered and data collected every five days.

We found out that:

- We used less water in the WISER than in the control in both climates.
- The crops grew faster in the WISER than in the control in both climates.
- The plants grew faster in southern Europe than in northern Europe.
- The cress was our most successful crop and the basil was least.

Our experiment proves that WISER could be an asset in environmental terms, both by saving water and using recycled materials to produce home grown crops more efficiently than using traditional methods (pots).

CAN PLANTS PRODUCE GREEN ELECTRICITY? A PRACTICAL STUDY OF PLANT MICROBIAL FUEL CELLS (P-MFC)

Guillermo Del Molino, Guillermo FERNÁNDEZ and James KENNEDY
European School Frankfurt
S4EN

ABSTRACT

Plant microbial fuel cells (P-MFCs) are specialized microbial fuel cells (MFCs) that, according to past experiments, are said to produce electricity. In MFCs electricity is produced by bacteria usually present in anaerobic soils. Bacteria oxidize organic compounds releasing electrons that are captured by an anode and travel through a wire to a cathode, where oxygen is reduced to water. Plant-MFCs work in a similar way, but the sources of organic compounds are living plants, that via photosynthesis produce carbohydrates that are secreted from the roots to the soil.

We decided to further investigate this subject by measuring the exact amount of voltage produced by P-MFCs using a program installed on a micro controller. The experiment was carried out for different plant species to find the most efficient ones. We also used the soil around the plants' roots to make MFCs and test out the differences between P-MFCs and simple MFCs.

Our results prove that P-MFCs do produce green electricity, and in most cases, the voltage is higher than in the corresponding MFCs. The most efficient species was Dracaena reflexa var. angustifolia with a maximum measurement of 1.08 V. We conclude that the bacterial community in a P-MFC and the technique used to make the P-MFC are more important to achieve a high voltage than the plant species.

We present here the design of a plant pot that would allow anyone to easily setup a Plant-MFC and produce green electricity at home.

FOOD OF THE FUTURE

Dora MURAKEOZY-KIS, Flora MURAKEOZY-KIS and Luna BEELOO
European School of The Hague
S2 and S3

ABSTRACT

The population of Earth increases steadily (reaching approximately 9 billion by the year of 2050), forcing an increased food output which results in an even greater pressure on the environment. Scarcities of agricultural land, water, forest, fishery and biodiversity resources, as well as nutrients and non-renewable energy are foreseen for the near future. A largely overlooked but potentially important source of nutrients is insect-derived food. We performed a series of experiments with these organisms to gain insight into their dietary adaptation.

With more than a million scientifically described species, insects form the largest group among multicellular organisms on earth. They have adapted to a wide range of environments. Insects represent a vast and diverse resource of active substances as well as nutrients as proteins.

Eating insects is as old as humanity itself. Our ancestors ate what they could find, which also included termites, ants and such. Their larvae and pupae were also consumed if found. With the advancement of agriculture, from the neoliticum onwards, the consumption of insects has largely been forgotten on many areas of the world.

For our experiments we used the two most popular insects: the house cricket (Acheta domesticus) and the mealworm/darkling beetle (Tenebrio molitor). The insects were put in large boxes with cardboard (which served as a place to hide) and given food. The crickets were also provided with a breeding box (with damp soil to lay the eggs in). We followed a precise feeding schedule and provided the right nutrition. In the first phase of our project we investigated how insects could be kept and bred most easily.

Our main conclusion after all the experiments and investigations we did is that insects cannot be bred with as little as forty-five minutes of time per day. Secondly, before anybody breeds insects at home, we recommend using a proper cricket pen instead of a plastic box, which we had used. We recommend this because mold can form as the water is trapped inside the box.

In the second phase of our investigation (to make servings of the insects) we discovered an interesting browning effect of the mealworms. We will continue to investigate the cause of it.

WHAT AFFECTS OUR REACTION TIME THE MOST?

Marco DE VINCENTIIS and Gianfranco VUCCHI
European School of The Hague
S4

ABSTRACT

To prove that an individual's reaction time is greatly influenced by the activities conducted by that individual such as: a conversation and exposure to a boring/often repeated activity relative to the individual.

The individual's reaction time will increase as they are conducting one of the afore mentioned activities. We also believe that the individual's reaction time will increase when they are exposed to new activities and lower when exposed to familiar activities.

We will select a group of individuals of roughly the same age and test their reaction time using an android application or a ruler. The individuals who have tested their reaction time using a ruler will have their measurement in centimetres and therefore for a full analysis of all the recorded measurements the individuals which have their measurements in centimetres will have their measurements converted into milliseconds using the formula $2 * \frac{cm}{9.81} = ms$

The results have proven that conversation or any activity that gets the candidate to interact with their surroundings lowers reaction time. A major impact to reaction time is humour.

It is also reasonable to conclude that the candidates with a higher amount of weekly exercise have a higher reaction time. Exposure to regular activities such as biking or using cellular devices proved to lower the individuals' reaction times.

Reaction time seems to vary between the candidates who used Android and the candidates who used a ruler. We believe that this is caused by the touch screens delay or that the screens blue light emissions have an effect on the candidates.

For the candidates that used a ruler instead of a cellular phone had a wider range of their results indicating that sometimes it was a matter of luck that they closed their hands just as the ruler was falling.

SISU
A DEVICE THAT HELPS TO LEARN TO WALK AGAIN

Henri AHOLA
European School Luxembourg I
S3 FiA

ABSTRACT

After an operation, severe accident or illness, if a person has to learn to walk again with limited muscular capabilities in their feet and/or legs, it can be really hard, and it will require a lot of time and strength from the person. Thus the name of this project, “SISU”, which comes from a Finnish word that means persistence and strength while doing something.

The SISU device consists of a shoe sole -shaped pressure sensor, a microcontroller and an LED ring. It measures pressure applied by the person and tells him/her if a pre-set limit has been exceeded. It can also send the pressure data to a computer through a USB cable for real-time reviewing. The device can be calibrated so that it shows the person’s weight on the sensor in percentage out of the limit, which could be for example 20% or 50% out of the person’s weight. This limit can then be re-calibrated to give the person more exercise. It can also be re-calibrated to work with other weights. For instance for a person who weighs 50kg the maximum is 50kg, so 20% is 10kg and so on. Then for a person who weighs 70kg the maximum is 70kg and 50% is 35kg and so on.

ARE ANTIOXIDANTS A VIABLE ALTERNATIVE TO ANTIBACTERIALS?

Elisa LAZZAROLI and Daria NIKOLOVA
European School Luxembourg I
S4

ABSTRACT

Antibacterials are used every day in our lives to treat and/or prevent bacterial infections. However, bacteria are growing more and more resistant to antibacterials, and this is a huge problem, especially for the younger generation, as everything we eat, even when we believe it to be natural, is stuffed with antimicrobials, which leads us to becoming resistant to all antimicrobials. Using antioxidants on a regular basis doesn't have quite the same negative effects as antimicrobials, as they are natural and – as far as we've seen – there isn't much resistance to them. Using antioxidants as antimicrobials could reduce the need to resort to antibiotics, and thus lower the risk of resistance to such important antimicrobials.

Our aim is to research the efficacy of chemical antioxidants against microbial growth. We would test the effect of the antioxidants Sodium Metabisulfite and Sodium Nitrite against microbes found in the air, and also against specific bacterium.

Antioxidants are molecules that inhibit the oxidizing process of free radicals. They can sacrifice one of their electrons to a free radical to stabilize it, without becoming free radicals themselves. Antioxidants are commonly thought of as playing an important role when it comes to maintaining your optimal health, as they can slow down the aging process, repair damaged molecules, and it is sometimes argued that help get rid of cancerous cells, amongst other things.

During our online research on antioxidants, something interesting that we spotted is that in all the natural antibiotics we looked at (such as honey, garlic, etc.), there were high levels of antioxidants. This could lead to the assumption that antioxidants may play a role when it comes to the natural antibiotics' antimicrobial properties, but after researching this topic

further online, we saw that there is quite a bit of controversy among scientists over this. The majority of them lean towards no, however there are some that believe that antioxidants could have antimicrobial properties. After some more research, we concluded that the antioxidants found in natural antibiotics would not be very effective against microbes, however we found two other chemical antioxidants that have a much higher chance of having antimicrobial properties.

These two antioxidants are: Sodium Metabisulfite ($Na_2S_2O_5$) and Sodium Nitrite ($NaNO_2$). Both of these are used as food additives and preservatives, and they are bactericides, inhibiting the growth of disease-causing microorganisms, and are even used in medicine. Because of this, we decided that we would test the antimicrobial properties of these two antioxidants for optimal results.

First of all, we would have to make our own agar to test the microbes on. We'd have to make three types of agar: one would be normal agar, another would have Sodium Metabisulfite (rather than using normal salt when making the agar, we'd use an equivalent amount of Sodium Metabisulfite), and then the last type would have Sodium Nitrite (once again, rather than using normal salt when making the agar we'd use an equivalent amount of Sodium Nitrite).

Once the agars are ready, we'd put them in petri dishes, and then expose them to various microbes, by leaving the petri dishes open to the air for around an hour and then incubate them for some 72 hours, and then compare the ratio of fungi and bacteria found on the agar with and without the antioxidants. We'd also try putting a drop of bacteria in the center of the dishes, and then once we've incubated them we'd examine them to see the effects the antioxidants had on the microbes, and see if by having incorporated the antioxidants in the agar we managed to reduce the growth of bacteria.

If we do find a difference between the different agars, we could try to see if the bacteria that grew on the antioxidant plates is now more resistant than it originally was by growing them again on agar that has antioxidants in it, and then seeing if this time it grows more or less than the first time.

This experiment would be repeated various times using different concentrations of antioxidants when making the agar, depending on the initial outcome. We'd keep increasing the concentration of the antioxidants until we reach a concentration on which the bacteria can't go.

THE EFFECT OF DROP HEIGHT AND SURFACE MATERIAL ON THE REBOUND HEIGHT OF A TENNIS BALL

Rumen MITOV
European School Luxembourg I
S2

ABSTRACT

The purpose of these experiments is to find out if different materials have an impact on how a high a tennis ball can bounce back up off a surface of a certain material.

My experiment showed that the bounce of the ball is a result from the friction of a material, the height from which I'm dropping the ball from and the height of the material. I would like to explore this a little further and see if it correlates with other measurements.

BLUE ENERGY DYNAMO FOR PADDLERS

Laura SCHIANO and Jasmine BAHLAWANE
European School Luxembourg II
S3DEA

ABSTRACT

Kayak is a water sport that can take you several days in remote areas. Unlike bicycles which have adapted dynamo systems to convert a part of the rotation energy of the wheels into electricity, no autonomous system is available for Kayaks.

Electromagnetic electricity is generated as a result of the interaction of electrons in metallic wires to a changing magnetic field. Dynamos in bicycles work based in this principle. Although various concepts can be applied to convert kinetic energy into electricity, the electromagnetic energy generators are more suitable for use in wet environments.

To design a dynamo system for kayak we do proceed in five steps in this project:

- Designing a hydrodynamic system to convert linear motion of water into rotation. This would involve a hydrodynamic intake funnel, set of adapted turbine blades, pivot and hub. For this purpose, a 3D-polymer printer will be used.
- Magnets, coils and their respective supports

  • The distance between the magnet and the coil will be optimized, by building a pendulum to allow the magnet to swing over the coil and measure the produced electricity. This might be experimentally realized and modelled using freeware such as: FEMM.

  • Type of magnet, testing how strong the magnet must be to produce the maximal electricity without interrupting the rotation of the wheel.

- The electrical connection of the coils should be optimized (serial and parallel) to maximize the produced current and voltage.
- Electrical signal treatment device (rectifier) to enable its storage in battery.
- Fixation on the Kayak: Figuring out which is the best way to fix the generator on the Kayak without slowing it down. The last step would be to put the generator together and try it out on a river.

COMMENT FABRIQUER UN ROUGE À LÈVRES BIO ?

Lilli Rose DEMELAS and Charlotte GENTET
European School of Mol
S2FR

ABSTRACT

L'idée était de réaliser un rouge à lèvres constitué à partir de produits naturels.

Il a d'abord fallu rechercher un protocole et les produits nécessaires à la réalisation de l'appareil de base.

Puis nous avons extrait et testé différents colorants naturels pour donner l'aspect recherché à notre rouge à lèvres.

Il resterait à concevoir un contenant naturel ce que nous n'avons pas eu le temps de faire.

WORLDCOLIBRÌ

Cecilia EUFE and Francesca SCHOLZ
European School Munich
S3

ABSTRACT

This is a website that aims to help students, but also teachers of this school, to deal with the environment in a more sustainable way.

The site will include a book market and other second-hand markets. Of course there will also be explanations about the website and its main contents.

We intend to make it clear to the students how important it is for the environment to dedicate time and effort to recycling.

The basic idea is that only the pupils and teachers of the European School have access to the website.

The site is easy to understand so that everyone can use it. Of course, it should be secured so that no private information is freely available on the Internet.

The students should be able to participate themselves. A staff member or senior student will take care of the content and administration.

So far we have started to create the website. We have also started to inform us about the contents of the pages by many sources (library, internet ...).

ECO CHAUFFAGE

Giulia VITTORANGELI and Chiara QUAGLIA
Scuola per l'Europa di Parma
S3FR and S4FR

ABSTRACT

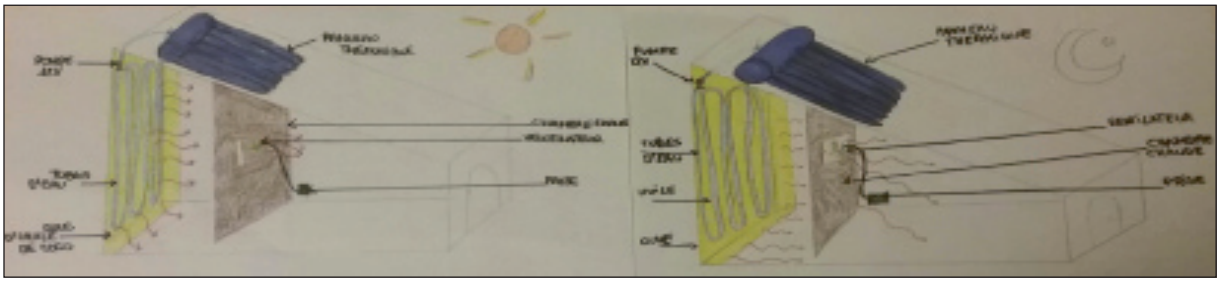
Notre projet est un moyen économique, écologique et confortable pour chauffer une maison. Cette méthode de chauffage se base sur : l'utilisation d'un matériau à changement de phase : l'huile de coco. Nous avons choisi cette huile car son point de fusion est de 24°C, son point de solidification est de 19°C et il arrive à absorber l'énergie même après s'être liquéfié tout en gardant la même température.

Ce Matériau à Changement de Phase est chauffé grâce au soleil pendant la journée (grâce à un panneau thermique) et, la nuit, il relâche l'énergie accumulée. Pour expérimenter le projet nous avons construit un modèle réduit d'éco maison (maison chauffée grâce à l'Éco chauffage). Nous avons testé l'Eco chauffage en trois étapes :

• Construction, montage et adaptation de l'Éco chauffage (voir dessin ci-dessous).
• Monitorage des températures à l'intérieur et à l'extérieur de la maison pendant plusieurs semaines (calcul de la chaleur relâchée et accumulée)
• Calcul des frais d'installation et de manutention.

Fonctionnement de Eco chauffage :
La journée, l'eau poussée par une petite pompe dans le panneau thermique est réchauffée. L'eau chauffe la maison et l'huile de coco, la chaleur ainsi générée est dispersée grâce à un ventilateur. Pour permettre un réglage de la température, nous avons construit une paroi qui sert à garder la chaleur.

La nuit, l'huile relâche toute l'énergie accumulée pendant la journée qui est emmagasinée dans une petite chambre chaude (la paroi) et, un petit ventilateur réglable disperse la chaleur dans toute la maison. La pompe n'est pas en fonction durant la nuit comme le panneau thermique.



A STEP TO INVOLTALITY

Fernanda DIZIOLI & Sofia Cardoso FREIRE
Scuola per l'Europa di Parma
S4EN

ABSTRACT

"A Step to Involtality" aims to share with the world the possibility of having an ever-lasting battery supply to any mobile device at an affordable expense and using renewable energy only.

To achieve such goal, it is essential to combine fundamental pieces of technology such as the piezo transducer, first studied in the mid-18th century, and the commonly used pop-socket, in a unique approach. A capacitor would be a component in the final product. Two simple prototypes were executed to allow a more in-depth analysis of the amount of energy made. Both of them showed successful results although some adjustments were required regarding the voltage of the transducers obtained. Initially, the results were barely a spark of light from a little bulb. Later on, the outcomes were in a numeric form, ranging from 0.03 to 1.3 volt.

USED WATER

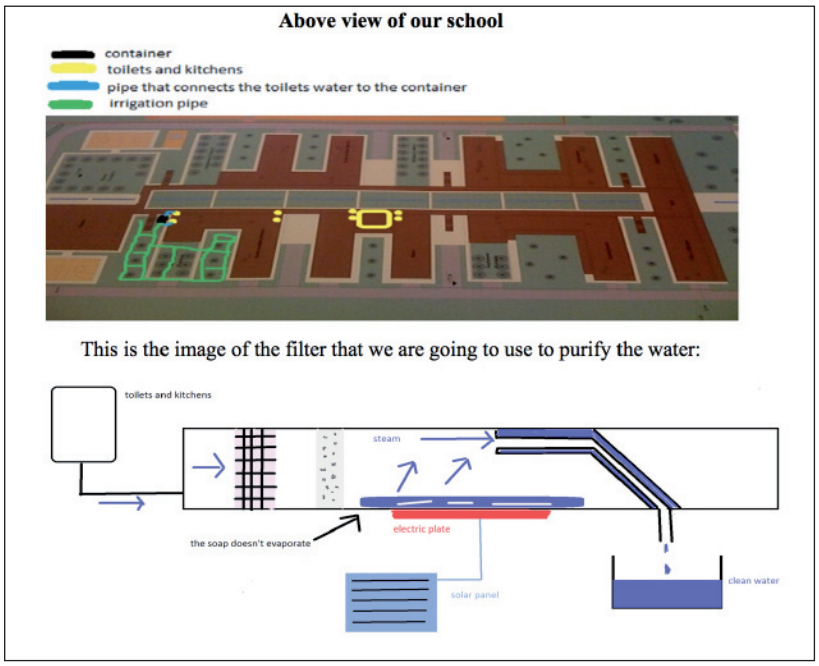
Davide QUAGLIA and Thomas FONTANA
Scuola per l'Europa di Parma
S3FR and S3ITA

ABSTRACT

Our new school was built in the countryside and it is surrounded by uncultivated land and there isn't any method of irrigation.

Our idea started with the desire to recycle water. On this soil the grass must grow. On the land surrounding the maternal cycle the teachers want to cultivate a vegetable garden with the children.

In the areas near the primary and secondary cycles it is necessary the fast growth of trees and plants such as to shade the green spaces. (in Parma during the months of May and June temperatures can reach 36°C). A lot of water is needed for all this. It's very important to recycle water used in toilets and kitchens otherwise it will finish in a very short time.



We decided to adapted it to the toilets and kitchens of our school (about 50 toilets and 2 kitchens in all the building): use the dirty water, purify it and use it to water the green spaces of the school.

FROM OUR SCHOOL KITCHEN (PART 2): DIETARY, HEALTHY AND TASTY CACAO ENRICHED MILK CHOCOLATE

Luca Alexander WILDE and Etienne YINH TINH THAI
Europäische Schule Rhein-Main
S3DEA

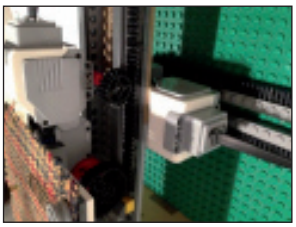
ABSTRACT

Dark chocolate with high cacao content has been proven to support a balanced and healthy diet with several physiological active ingredients like magnesium, calcium, iron, antioxidants as well as monounsaturated fatty acids. Unfortunately, many chocolates with high cacao content exhibit a bitter taste not preferred by many consumers. In contrast sweet and smooth milk chocolate is one of the most liked sweets around the world. Sadly, milk chocolate contains 50% and more sugar (especially glucose known to be directly linked to many widespread diseases in western countries, like caries, diabetes mellitus, adiposity and most likely also neurodegenerative diseases – i.e. Alzheimer´s disease).

Based on the experience with alternative sugars in gummy bears prepared last year (part 1), we produced highly accepted milk chocolate with high cacao content, using pure 100% chocolate from Mindo, Ecuador, non-insulin promoting sweetener Erythritol/Stevia powder (1:1) and lactose depreviated creamy milkpowder. Different self-produced, almost sugar-free milk chocolates (approx. 30 up to 60% cacao content) have been tested and rated by 21 schoolmates and teachers in order to evaluate the taste and acceptance of such “healthy chocolates”. As a result a chocolate with 60% cacao, 19% cream and only 2.6% remaining lactose has been rated high (8.1/10) by both gender. This chocolate had a reduced fat content and therefore approx. 17% less calories compared to the 100% dark chocolate from Ecuador. Because no professional conche was available, a household “Thermomix” was successfully used to suspend powdered 1:1 mixture of Erythritol and Stevia glycosides as well as low carb cream powder in the molten chocolate mass.

CO – BOT (CONSTRUCTOR-BOT), A 3D PRINTER MADE OF LEGOS

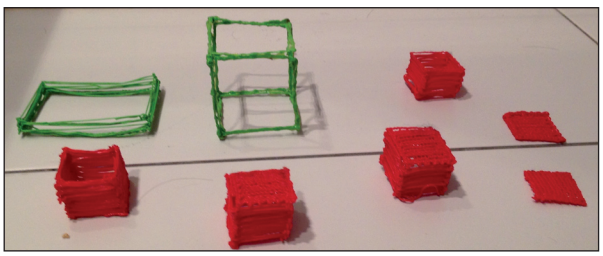
Julian MÁTHÉ
European School of Brussels I (Uccle)
S2ENA



ABSTRACT

I have constructed a 3D printer using the LEGO Mindstorms EV3 “intelligent brick” and motors for the automation and LEGO Technic pieces for a refined action. Co – Bot works by ejecting a thin stream of thermoplastic material onto a coated print bed. It moves in three dimensions following programmed instructions and is useful for producing uniform figures, including delicate 3D shapes and hollow forms. I have taken my inspiration from similar projects online, incorporating the features that I thought were best and adding some of my own. The printer is built of different modules: including the three axes - x, y and z, the extruder (the part that ejects the plastic), the print bed and the computer. The axes are built with gear racks which support gears powered by EV3 motors. I have used a 3D pen for the extruder—but a glue gun could be used as well. The print bed sits on the y axis motor. I discovered that the print bed needed to be coated with a material that “grabs” the thermoplastic material (wool or felt work well); otherwise the thermoplastic material drags and doesn’t keep a shape.

I programmed the EV3 using LabView, the built-in programming platform. The code was relatively simple because Co – Bot doesn’t use sensors to initi-ate motion. Instead the motion of the of the axes is controlled using distance settings (number of gear rotations) and speed settings (power of rotation).



I endeavoured to build a structure that is stable and grasps the extruder well. I had several challenges to overcome related to the behaviour of the thermoplastic material, calibrating speed and movement to shape edges and corners and creating precise and sturdy layers. I hope to further develop Co – Bot to create curved lines and solid objects and to expand the choice of material. Ideally, the activation/deactivation process can be completely mechanised as well.

SOLAR PORTABLE CHARGER

Alejandra ALCANTARILLA SÁNCHEZ, Cristina JIMÉNEZ PELARDA and Marta LÓPEZ SERRANO
European School of Brussels I (Uccle)
S3ES

ABSTRACT

The purpose of our project is to prove that we can charge our devices without a plug or electricity using a portable solar charger. This project will be useful for the environment and in situations where we run out of battery and we don't have a plug next to us. We made two prototypes, one in a backpack and the other in a phone case.

To create this portable charger, we need to open a female usb or a charger that works with your phone, once you open it you find different cables, usually there are 4. A positive one, a negative and 2 data cables. We connected the positive cable to the diode so that the energy does not go from the phone to the panel when the panel is receiving no energy. We connect the negative cable to the negative pole and the data cables together or to the resistances, 2 resistances are connected to each cable and the 4 are connected to the diode to the same point where the positive cable is connected.

In the case of the prototype for the backpack we used 4 different panels of a lower voltage with a serial connection and a voltmeter.

MOBILITY IN A SUSTAINABLE MANNER

Carl SKINNEBACH
European School of Brussels I (Uccle)
S2DAA

ABSTRACT

The purpose of this science project is to enhance mobility in an efficient, yet sustainable manner. Concretely, the project is centered around constructing an electric skateboard from secondhand materials.

Riding a traditional skateboard is an easy way to get around the city, but while it is exhausting, it is not fast. An electric skateboard is fast and comfortable, but also costly if to be purchased commercially. The price for a company produced electric skateboard ranks from about 400-1500, but this project should be realizable in a few hours at the cost of around 15 euro.

I got my idea for the electric skateboard both from the hoverboard scene in “Back to the future” and from several youtube videos. It is built from a drill a plank of wood and a baby bike. The materials I have found in the street, the bike I bought on a flee-market and the drill is a defect one I found in my garage. In addition, I used a pair of wheels from an old skate board of mine. (Actually found in the street)

The concept of the electric skateboard is based on an engine provided by the electric drill which will pull a chain driving the rear wheel. I experienced some challenges trying to cut the wood and getting parts of the bike. This required extra expertise and man power both of which I received from my grandfather. I expect the final project to provide a sustainable means of transportation, which can take the rider on 30 minutes rides in the city.

Since Brussels is a very busy city, an electric skateboard would be a great solution for many people so they could get to and from work quickly, easily, and almost at no costs.

THE EFFECT OF ODOURS AND LIGHT COLORS ON BUGS BEHAVIOUR

Celeste CECCONELLO DELLA TORRE and Matilde COMAI
European School of Varese
S2ITB

ABSTRACT

The goal of this project is to observe the reaction of bugs when exposed to different colors and odours. In this experiment we have observed the behaviour of the insects in a box where the colors of light and the smell could be modified. The results have shown that different bugs react to different colors, specifically red and green. On the other side the smell doesn't seem to influence their behaviour. We decided to do this experiment because we wanted to find an easy and not aggressive way to repel these kind of bug which, during summer of 2017, have risen in population, increasing disturb and problem to the plants and environment. We considered Asiatic (Halyomorpha) and Green (Nazara viridula) bugs for this epxeriment, these are parasite which can be found on nettles and flowers, especially in northern Italy. This species of bugs are much bigger than normal bugs and they multiply very fast, they migrated to Italy approximately in 2007 - 2010, damaging a lot the fruits making it uneatable .

WOULD YOU EAT COLOURED FOOD?

Sofia MUNDA and Greta PICCINELLI
European School of Varese
S2ITB

ABSTRACT

Our project aims at showing that people´s taste is influenced by food colours. We have designed an experiment where mayonnaise sauce, in different colours, has been given to 50 individuals. Mayonnaise sauce has been selected because it is popular among teenagers and it does not provoke allergic reaction to many people.

For carrying out the experiment we have used: mayonnaise sauce, tasteless food colourings (red, green, blue and yellow), bowls and tablespoons. First of all, we have prepared four bowls where each of them contained mayonnaise sauce mixed with one of the food colouring taken into consideration. As a second step, at school the different types of mayonnaise sauce have been proposed to students of different ages and sex and to a group of teachers. All of them got as a first try, the uncoloured mayonnaise sauce and then the coloured ones. We asked if they experienced any difference in taste.

The answers got can be summarised as follows:

- the red version was the less appreciated one, respondents said it was too sweet;
- the yellow one was evaluated as too sour, probably it was considered a kind of mustard;
- the blue and green ones were defined to be too salted and too sour;
- all individuals liked more the natural one.

Since the food colourings used were without flavour, our conclusion is that taste is influenced by sight, which of course depends on colours.

OUR EDIBLE WATER BOTTLE/ BUBBLE AND OUR WATER DISTILLER

Inês CHAVES and André INOCÊNCIO
European School Brussels II (Woluwé)
S3PTA

ABSTRACT

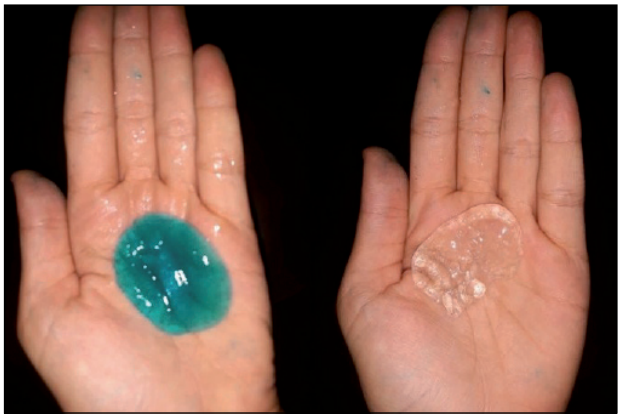
The motivation behind this project was to find ways to reduce pollution and to enable people to have access to drinkable water. This is still a big problem in many regions of the world.

We developed an edible water bottle to reduce pollution in the world. As is well known plastics and therefore plastic bottles are a big source of the pollution of the oceans and the environment. This is due to the very slow degradability of plastic in natural environments.

The edible bottles are bubbles made from sodium alginate ($C_6H7O_6Na)_x$) and calcium lactate ($C_6H_{10}CaO_6$). These materials can be easily produced from sea weeds. Therefore, the bottle is edible and biodegradable. We investigated the biodegradability explicitly and will demonstrate it at the Symposium.

For the easy access to drinkable water, we developed a water distiller that anyone can build with tools that can be found in your house. It uses cheap materials: cotton and bandages.

It has the form of a box which is easy to transport. It only uses heat to distill the water which can come from the sun or any other heat source. It is cheap and easy to build and one only needs to replace the cotton and the bandage from time to time.



With this project we hope to help improving the world and making it a more livable place for lots of people. Our bottle and our water distiller are small steps along this way.

MODZY - THE VERSATILE, MODULAR AND INEXPENSIVE QUADCOPTER FOR DELIVERY AND RESEARCH

Kristaps ZILGALVIS and Petras VERSECKAS
European School Brussels II (Woluwé)
S4EN

ABSTRACT

The quadcopter was created to be used in many fields such as research and delivery, to help people and to make our findings open source. We saw that all high quality quadcopters had extremely high prices, so we decided to build our own. The drone was built and programmed from scratch using c, c++, c# and different micro controllers. Each part was tested individually and with the drone to use the lightest and most effective electronics for the quadcopter. The drone was created using a carbon fiber frame, a radio receiver, a flight controller, a power distribution board and to power all of this a lithium ion battery. The drone was programmed for flight, for cameras, for the use of sensors and for GPS to make it fully modular. Different batteries and controllers were tested to make the highest power to mass ratio while maintaining all of the drone's functionalities. We estimate that the quadcopter can have a high range of approximately 25km on one charge of the lithium ion battery. The drone can reach speeds of over 140 km/h. We are already developing the drone's capabilities to fully incorporate GPS and sensors into the design. Our drone is a lightweight, inexpensive and effective technology that can be easily manufactured, easily used and can be modified for use in any field from medical delivery to the observation of forest fires.

THE NUTRITIONAL COMPOSITION OF PRODUCTS IN VENDING MACHINES AT SCHOOL AND CONSUMPTION OF THOSE BY ADOLESCENTS

Kertu Birgit ANTON and Laura BANDOS
European School Brussels II (Woluwé)
S4EN

ABSTRACT

Students in the EEB2 (European School Brussels II) eat a couple of times a day and thus the food offered there comprises a considerable part of their diet. This study had two aims: first, to investigate the nutritional properties of the products sold in the vending machines in the EEB2 from the perspective of healthiness. Second, to understand students' purchasing habits and reasons. Data in the first part was obtained from the food packages and the majority of the products that are sold (n=58) were included. The second part was carried out by a voluntary online survey (17.1% of students replied, n=290). We found that most students reported buying rarely or never from the vending machines, hence the products sold there are not a significant part of their diet. Age/school year and the frequency of eating breakfast and lunch have an impact on the frequency of buying from the vending machines. The most common reasons for purchasing were: hunger in the afternoon and dissatisfaction with the lunch in the canteen. The products sold are mostly unhealthy (high in sugar, fat and sometimes salt by various national standards), but students are aware of it as many of them proposed adding healthier options. However, most students rarely or never read the labels on the packages and do not find the ingredients and nutrients very important. The results of this study could be used by the operator of the vending machines to align the range of the products with students' wishes and needs, by the school to improve students' awareness and by the canteen managers to provide appetizing, yet healthy meals to reduce consumption of unhealthy snacks.

CAN VIRTUAL REALITY HELP TO PREVENT GENDER VIOLENCE?

José ESTEVE RONDA
European School of Alicante
S5ES

ABSTRACT

My motivation for this proposal was a report that stated that more than the 20% of the Spanish teens saw "as a normal thing" violence in a couple. Since this headline shocked me, I wanted to carry out a research to study and eventually prevent this behavior. The objective of this project is to describe the teenagers' opinions and perceptions about certain kinds of gender violence related behaviors using virtual reality and evaluate its use to change them.

To this end, I will use a pre-post experiment design. Twenty European School students will be selected (50% female and 50% male, age ranged 13-17). Participants will experience a 360º scenario of virtual reality (VR). This experience consists in the vision of three types of videos with scenes of increasing abuse behavior from a teen boy to a teen girl -control of messages on the phone, control of friends through mobile and control of the way of dressing-. In these videos, the girl has two types of answers: in one, the girl accepts the control of the boy (passive response) and in the other she rebels (assertive response). Participants will be allocated to either one of the videos mentioned.

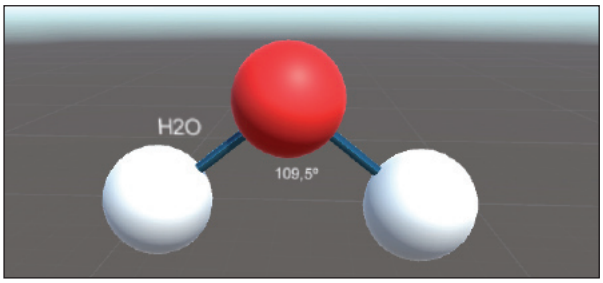
The experiment consists in two sessions separated at least 48 hours. In the first session, all of the participants will complete sociodemographic information and afterwards the IAT questionnaire, whose goal is to measure the strength of associations between concepts (gender) and evaluations (violence). They will be introduced in what VR is by playing a game (Suicide Squad). In the second session, they will watch the videos, and after each video they answer a questionnaire about gender violence and opinions and perceptions about the girl attitude. Afterwards, they will do the IAT questionnaire, to see if their strength of association between concepts (gender) and evaluation (violence) had changed.

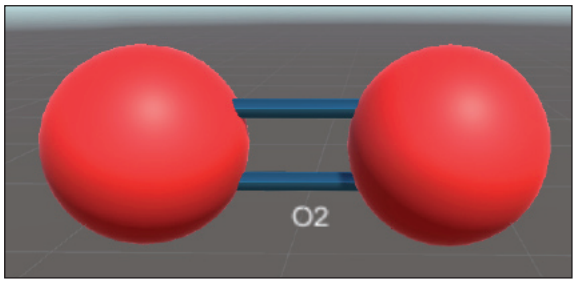
THE USE OF VR TO HELP UNDERSTAND MOLECULAR CHEMISTRY

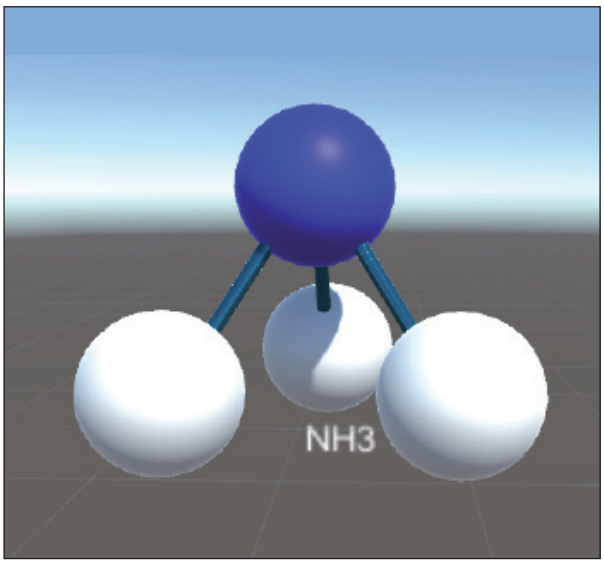
Alejandro CANALS ROMERO, Enrique URIBE ARIAS-PAZ
European School of Alicante
S7ES

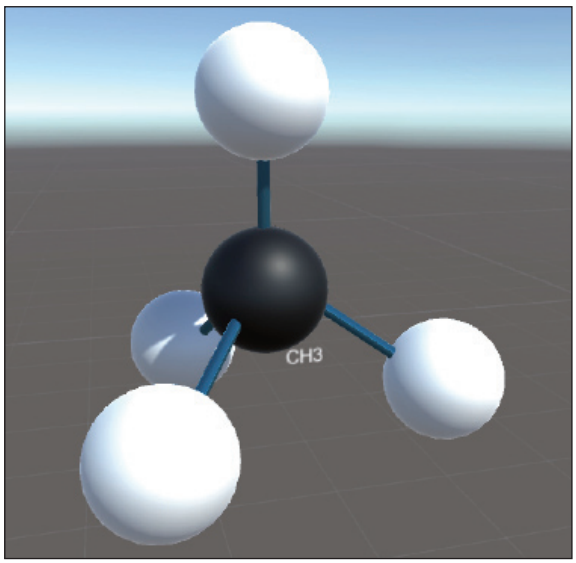
ABSTRACT

The aim with this project is to help the students with the complex concept of molecules, by giving them the opportunity to see the molecules in front of them. We want to achieve this by making 3D models of some of the most representative molecules and then watching them in Virtual Reality and/or Augmented Reality.









HOW THE ORDER OF QUESTIONS AFFECTS PERFORMANCE AND CONFIDENCE IN AN EXAM OR TEST

Nikko A. TEN HAVE
European School of Bergen
S5EN

ABSTRACT

The purpose of this project was to investigate how the difficultly of questions and how they are ordered affects the confidence and performance of students. I created a test to investigate this, with two separate versions; both have identical questions, only in one version the easier questions are given first followed by the harder questions on the next page. In the second version the harder questions are given first. The students only had to state their class, sex and average grade in maths and asked them to rate their confidence before the test, after the first part of the test and after the test. I made sure that the questions were harder by running a trial test; I asked the students of S5E maths-6 to time themselves while answering questions. I found that the questions I thought were harder took longer therefore, by assuming that hard questions take longer to complete as they were indeed harder. After several classes did the test, I found that if the hard questions were asked first the confidence of the students would fall, but then rise significantly after the second, easier part. I then ran a t-test to make sure the results were significant; the resulting P-value was 0.022492, which indicates that the results are statistically significant. I could even see that in half of the classes, the students who received the harder questions first, made less mistakes overall. Therefore, it is in fact better to ask harder questions first, due to there being the 'Illusive Relief' effect, the students feel relief and their confidence surges if easier questions follow the hard ones, however, this was not present if the easier questions were asked first, therefore this relief is fabricated.

FAMILY ACCOUNTANT

Christiana Galani and Aikaterini Skounti
European School of Brussels III (Ixelles)
S5

ABSTRACT

We are aware of the fact that people are short-sighted, unware of the distinction between what they need to survive in a modern society and what they want.

As we know from behavioral economics, people associate low prices with low quality when it does not necessarily have to be that way. They need someone to inform them about all this and help them manage their economic activity without flooding them with overcomplicated economic terms and theories.

This is why we created Family accountant. It is an app dedicated to help families manage their economic activity, that is, their spending, income and level of savings and propose solutions to any abnormalities in their habits like for example overconsuming unnecessary, expensive goods. Its friendly avatars, Ian and Iris will guide the user through the process and point out problematic behavior. It also educates people via pop-ups and tips of the day on small changes that they can do everyday to improve not only their economic management but also their health. It will diversify between a person's age, gender and income.

INSECTIFIND

Anirudhh RAMESH and Ariane GEORGIANNAKIS
European School of Brussels III (Ixelles)
S5

ABSTRACT

All around us there are billions of insects, that play an active role in our environment; Yet we can barely identify a handful of them. In fact, we held an online survey, which was filled by 35 participants anonymously, who were asked to identify various insects in 10 photos. In average, they scored only 42%.

Our project InsectiFind ensures an easy-to-use, offline insect identification app for Android devices, which may be downloaded from the Google Play Store. Using the power of neural networks (a certain type of artificial intelligence which imitates the ways our brains work, however with repeatable, more confident results, and hard-coded knowledge from the training given to it) we have managed to develop a highly accurate tool that identifies several species of insects and arachnids via the user's camera, providing further information about the identified entity.

Thanks to the extensive training we gave it on images of arthropods, we have already managed to score 75% in our previously mentioned online survey with our Insect identifier, and with even further training planned for our AI, we believe we can rapidly increase this percentage.

This useful asset can therefore resolve the lack of education on insects, which can be classified as a global concern. It is far better than current applications on the market due to its modern AI recognition system which easily outperforms the old library apps in which the user must find and match their insect in the old-fashioned way. We can therefore conclude that our project InsectiFind, will enable a highly effective way for everyone to learn about new insects, with more reliable and practical means, allowing for optimal conditions to discover these directly from your phone!

TECH FOR A BETTER WORLD

Catarina NUNES
European School Luxembourg I
S7PtA

ABSTRACT

The quality of life around the globe keeps on improving year after year. However, there are always problems we encounter during our everyday life, whether it is the heavy luggage we carry which causes us pain or the forest fires which ravage southern Europe during Summer. But what if we could either solve or prevent them using technology?

The aim of my project is to develop a series of technological devices, including robots, that perform simple tasks to generally improve the lives of people in our society. These devices will be simple to build and use and will not require an extensive background knowledge in electronics or robotics to operate. They would also be semi-autonomous, only needing human intervention from time to time in case of maintenance. The goal is to solve small problems that exist in today's society, which although are manageable, could be solved or prevented with the appropriate technology.

Most of these devices will be based around the Arduino microprocessor, as it is fairly easy to use and program and is also very cheap.

I will be starting by developing a robot which carries our luggage for us. Most often than not the weight we carry on our bags causes us health problems, whether it is simply a back or shoulder pain or even scoliosis. To counteract this problem, we can simply turn to technology. This robot will be programmed using Arduino Uno and will follow the user by using IR (infrared) sensors and LEDs to make it "see" the person and carry their luggage for him/her.

New devices and robots will be added to this project over time, since this is a project which is intended to be everlasting.

PEUT-ON AUGMENTER LA BIOSYNTHÈSE DE L'ACIDE ASCORBIQUE DANS UNE PLANTE ?

Marta LIZER
European School Luxembourg I
S5Pla

ABSTRACT

L'acide ascorbique est une vitamine nécessaire pour qu'un humain fonctionne de la manière correcte. La vitamine C participe dans plusieurs processus corporels et son manque peut dégrader l'homéostasie de l'organisme. Comme l'humain ne possède pas de capacités de la synthétiser, il doit l'ingérer avec des aliments, ce qui n'est pas toujours souffisant. Une solution, souvent proposée par des médecins, est de la consommer sous forme des tablettes. Mais cette solution porte plusieurs inconvéniants : la production de ces tablettes n'est pas seulment couteuse, mais aussi compliquée. La méthode utilisée est principalement la synthèse chimique modifiée par la biotechnologie (Chlorella pyrenoidosa, Gluconobacter oxydans).

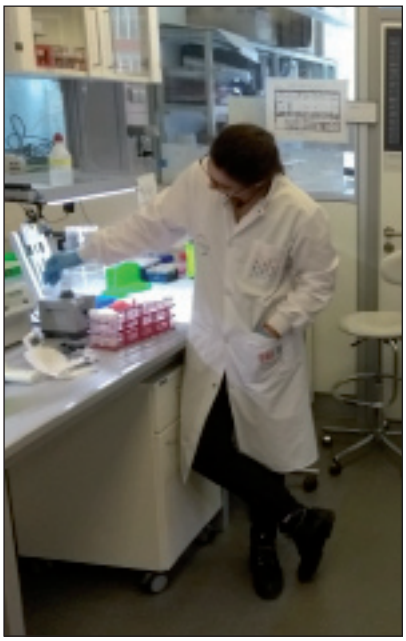
Ce projet essaie de trouver une solution plus facile, pour que l'acide ascorbique puisse être produit par chaqu'un, même à la maison. Pour ce faire, on a analysé le processus de la biosynthèse de vitamine C dans les plantes. Le substract de la réaction est la D-glucose, mais la chlorophylle joue aussi un rôle important. Ce projet consiste alors à augmenter la production de la vitamine C dans une plante, en augmentant le contenu de glucose (le glucose fait aussi augmenter le contenu de la chlorophylle). Si la thèse était exacte, on pourrait consommer des plantes qui ont un grand contenu de glucose, en ne risquant rien, car la vitamine C est une vitamine hydrosolube.

Les plantes (Ocimum basilicum L.) ont été arrosées par la solution de glucose de 0% (échantillon de contrôle), de 1,5%, de 3% et de 5%. Le contenu en chlorophylle et en vitamine C vont être marqués avec l'utilisation de spectromètre. Les différences entre le contenu dans les échantillons de contrôle et les échantillons de 1,5%, 3% et 5% vont montrer si on peut augmenter la biosynthèse de l'acide ascorbique dans une plante.

DISINFECTION, A POTENTIAL RISK FACTOR DUE TO ENDOTOXIN RELEASE?

Ines BAHLAVANE and Lavinia KADAR
European School Luxembourg II
S7DEA

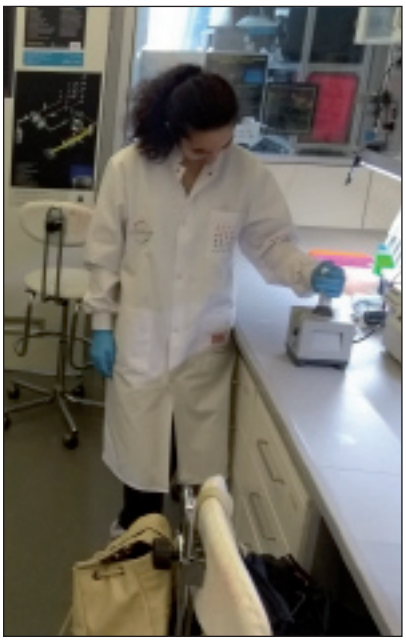
ABSTRACT



Endotoxins (LPS) form part of the outer membrane of gram-negative bacteria and are released when these bacteria die. High concentrations of LPS within the bloodstream may cause a severe immunological reaction and lead to septic shock.

The majority of surface bacteria are killed in the disinfection process. Since bacterial death leads to endotoxin release, the question of whether or not the disinfection of open wounds, cuts or abrasions could be a risk factor is posed.

To answer the question, bacterial samples were collected. After a treatment with either miliQ water (negative control) or ethanol, the LPS were detected via Limulus Amebocyte Lysate (LAL) testing.



Further studies could focus on the development of a sanitizer that not only destroys bacteria but also binds to the released LPS. This would prevent endotoxin release and hence decrease the chances of an adverse immunological response.

THE EFFECTS BETWEEN PROBIOTICS AND ANTIBIOTICS ON BACTERIAL GROWTH

Tihana ŠTEFANIĆ, Nela FÚČELOVÁ, Ariana PURDEA
European School Luxembourg II
S6ENA

ABSTRACT

This project will study the impacts of probiotics on bacterial growth in comparison to antibiotics, and the potential advantage in using probiotics over antibiotics in the digestive system.

Probiotics are hypothesized to be an alternative of medication in the removal of harmful bacteria instead of antibiotics by inducing growth of beneficial bacteria, or rather inhibiting harmful bacteria in your body. This experiment aims to conclude whether the hypothesis is valid.

The experiment will involve growing samples of bacteria in petri dishes. Both substances, antibiotics and probiotics, will be individually applied to each dish, and the growth results will be compared to determine which of the substances has a better inhibiting impact, if any.

The bacteria being observed is K-12, a strain of Escherichia Coli, and the substances being applied to it are the antibiotic Ciprofloxacin and probiotic organism Lactobacillus acidophilus.

The project requires three preparatory experiments; growing the K-12, transforming the bacteria with plasmid DNA, and forming solutions of the antibiotic and probiotic. The transformed K-12 strain allows us to better observe the bacterial growth in UV light, and the solutions are how we plan to apply the substances. The starting bacteria will have to be decently grown before being collected to transform, and some of the experiments are expected to be repeated to be done properly. Bacterial growth will be observed and recorded for a few days.

All the experiments will be carried out in the school laboratory and science classes with the assistance of a teacher.

GROWING GLOWING LAMPS

Ailsa TYRRELL, Daniel PLANOVSKY, Katie DEMPSEY
European School Luxembourg II
S6ENA

ABSTRACT

We decided to take part in this year's Science Symposium as all three of us have enjoyed science throughout our education and are fascinated by the subject. Since it is being held in our school this year, we saw it as a prime opportunity to participate and decided to take this amazing chance to share our passion for science.

We are very excited to present our experiment which, we hope, could change the future of light for the better. Our project is under the supervision of Vaishali Naik from the European School Lux II. We called our project "Growing Glowing Lamps" as the aim is to make plants glow using chemiluminescence. We decided to try this experiment as it seems very interesting and original. We knew that no other participants of this year's Science Symposium would have an experiment like ours, so we hope that it will be intriguing and help us to stand out. We also did some research before conducting this experiment and it seems that very few people have tried it before.

The basic method of our experiment is to mix luminol, sodium hydroxide and a bit of water. Then to add a few drops of DMSO as an oxidizing agent for the luminol which will make it glow. We then added this solution into the soil of an ivy plant as it is very durable and extremely easy to grow anywhere. After doing this, we photographed the plant everyday and checked for any signs of fluorescent light in the leaves. As a control, we monitored an ivy plant that had not been treated with any chemiluminescence. The point of this is to compare it to the ivy plant that had been treated with chemiluminescence and record any differences."

Due to time constraints and lack of resources, we were unable to determine the duration of the glowing effect and have yet to see the durability of ivy against the chemicals we are using. We were planning on trying a different method using bioluminescence involving bacteria which would glow and be less harmful to the plant however, sadly the school could not provide us with the resources we would need to conduct this experiment.

Most mechanisms that generate electricity release greenhouse gases, such as carbon dioxide, into the atmosphere. If our experiment was to work, then we have found a form of light that requires absolutely no electricity and has no negative impact on the environment. So, a pot plant could replace your desk lamp. We are also concerned about the number of road accidents related to poor light conditions. If our glowing ivy was planted along the sides or dim lit roads, drivers would find it easier to follow the road safely and see possible upcoming danger. Another way this plant could help is by reducing the amount of money spent on street lamps. If every second street lamp on motorways was replaced with a tree covered in glowing ivy, then the money spent on repairs and the upkeep of the street lamps would be halved.

We hope that our experiment will inspire others to take action and make a positive impact on their environment, safety and economy.

IS IT POSSIBLE TO MAKE FOUNTAIN PEN INKS USING ABSOLUTELY NATURAL PIGMENTS AND ADDITIVES?

Pashwana NICOLE and Gayen PRITHA
European School of Mol
S6EN

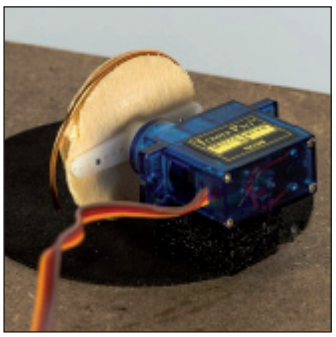
ABSTRACT

We decided to investigate this because we found out that chemical based inks contain high amounts of volatile organic compounds (VOCs) like toluene, benzene and xylene. These compounds can be very harmful to the environment, wildlife and people. For example, benzene is a carcinogen. Also natural pigment based inks are cheaper than chemical inks as less materials are required to produce them. They help in paper recycling as it is easier to remove these types of inks than chemical based inks. We have tried to make 3 different colours of fountain pen ink.

ALBS–AUTOMATIC LUGGAGE BRAKE SYSTEM

Felix ENGELHARDT, Nicolas RICCIO and Simon STENGER
European School Munich
S6

ABSTRACT



Our project, the Automatic Luggage Brake System, is, as the name already states, a brake system primarily designed for suitcases.

Our goal was, and is, to make life easier for all those who fly a lot and for those who have experienced the annoying fact, that suitcases usually do not have brakes. This can be especially problematic at the slightest gradient and in an accelerating train, since you have to hold on to your luggage, in order to prevent it from rolling away or falling over.

To solve this problem, we had the idea of an automatic brake system that slows down the suitcase the exact moment the owner takes his hand off the handle. We started by building a tiny button into the handle, that, once it is released it sends an electric impulse to the Arduino we have inserted in the suitcases bottom. This single board computer then signals the two servo motors to brake the wheels and thereby slow down the whole suitcase. The entire process happens in less than 500 milliseconds.

We then started building a model of our system to make the change of single components uncomplicated during the tests that followed. These tests involved trying different versions of our self-programmed software as well as the optimising of the mechanical and electric components involved in the system.

We are happy to tell you that, by now, we have a fully functional, very effective model.

Furthermore, we would like to point out that the ALBS is not necessarily only useful on suitcases. It could also be transferred to strollers and buggies, or shopping carts.

It also benefits from the low construction and materials value, since it therefore is affordable for everyone.

ANTIBACTERIAL SILVER-NANOPARTICLE COATING

Katarina JUHART, Sofia QUITTER and Leandra ZINKE
European School Munich
S6

ABSTRACT

Silver-Nanoparticles (Ag-NP) act antibacterial, because they release Silver-ions, which influence the bacteria in many ways. The ions pass through the bacteria's membrane and inhibit their enzymes, destroy their membrane and alter their DNA. This leads to the bacteria's destruction. The paper reviews how we can synthesis, characterize and use Ag-NP as an antibacterial coating and how effective it is on different substrates.

The Ag-NP were produced by means of chemical synthesis. Two different approaches were tested: Polyol-process (using silver-acetate as precursor and ethylenglycol as reductant) and synthesis with sugar (using silver-nitrate as precursor and glucose as reductant). Polyvinyl pyrrolidone (PVP) was used as a stabilizer. The syntheses were conducted in a microwave at a temperature of 60 °C, for 600 s, at 300 W. The silver and glucose content were varied. The Ag-NP were identified by using UV-VIS spectroscopy. For the aimed application some necessary specifications, such as particle size, pH-value and viscosity were measured by using Dynamic Light Scattering (DLS), pH-Indicator and viscosimeter, respectively. The size of the Ag-NP in the coating solution varied between 3 to 13 nm.

Three different kinds of substrates were coated: aluminium, steel, and plastic. All substrates were pre-treated by plasma. Three different coating methods were tested: spraying, rub in and dipping.

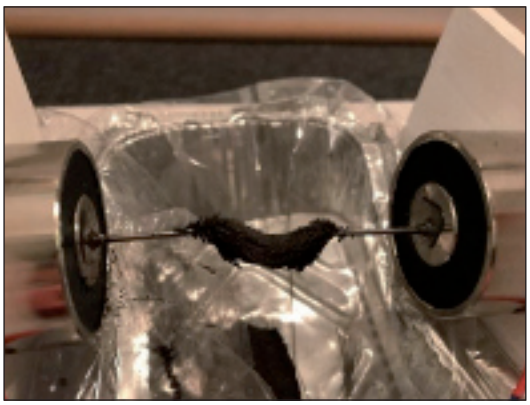
To prove the functionality of our coating, we tested them using probiotic bacteria from an Omni-Biotic Power sachet. These bacteria exist in our intestines naturally and are not harmful to us. We applied the bacteria onto our coated substrates and an uncoated substrate, as a blank test. We then proceeded to take sample bacteria off the coated sheets and put them on agar plates to promote bacterial growth. This was done in different time intervals to determine the speed and effectiveness of our Ag-NP. The agar plates showed little to no bacterial growth, which proved the antibacterial effect of our coating.

NACHWEIS DER FELDLINIEN DES ELEKTROMAGNETISCHEN

KRAFTFELDES IN 3 DIMENSIONEN

Arturo LUCIANI, Ruben PITTORRU and Federico SEMINO
European School Munich
S5

ABSTRACT



Mit diesem Experiment stellen wir die Feldlinien des elektromagnetischen Kraftfeldes in drei Dimensionen dar. Durch die Konstruktion von zwei Elektromagneten aus einer Nadel, einem Kupferdraht, Isolierband und einer elektrischen Quelle, stellen wir ein elektromagnetisches Kraftfeld her. Nachdem wir die Elektromagneten aufgestellt haben und Eisenpulver in die Mitte gestreut haben, beobachten wir das das Pulver Brücken bildet. Danach distanzieren wir sie und erhöhen die Elektrizität und beobachten wie das Pulver sich bewegt.

Wenn wir zwei, nicht von uns gemachte Elektromagneten nutzen sind die Feldlinien klein, aber trotzdem gut erkennbar. Um diese leichter erkennen zu können haben wir Lupen in unserem Experiment eingebaut.

Unser Projekt wird in der Schule ähnlich vorgestellt, in einer Schale. Die Resultate sind aber nur in 2 Dimensionen sichtbar.

In unserem Experiment fällt es leichter sich das Kraftfeld in drei Dimensionen vorzustellen. Weil die Feldlinien nicht auf einer Fläche liegen, sondern sich in der Luft bilden.

LIES IN DISGUISE

Mandu HEMPEN, Pablo NILSSON and Radoslav SERAFIMOV
Scuola per l'Europa di Parma
S6EN

ABSTRACT

The purpose of this project is to see the gullibility of the human mind. We hope to see how easily one's perception and understanding of a certain piece of information (such as a news article) can be changed by various factors, such as aesthetic appeal or precision of facts. We did this by writing three false news articles, on varying topics, which we then adjusted to suit the goals of the experiment. Each of the articles was then adapted into four different "versions" giving us a total of 12 article variants. One version was written with a basic language, one other used that same simple language but added pictures, another had statistics and a fourth used a much more formal and intriguing language than the original version.

We then uploaded the total of 12 articles onto various survey sites and sent these out to as many people as we could reach. Each one was accompanied by a questionnaire, used to give feedback about the credibility and appeal of an article. An age filter was also applied in order to observe the effects that age has on the trustfulness people show. We also performed face to face tests by handing both article and questionnaire to people we encountered.

We managed to observe a small but perceptible rise in the conviction experienced with the addition of photographs and statistics, but a decrease with the complication of the language. In a world oversaturated with information one must know how to distinguish between truths and lies in disguise and our subjects proved just how hard to learn, and how important this skill is.

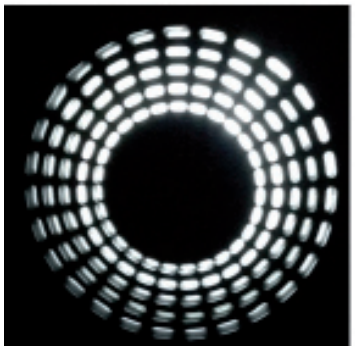
PERSISTENCE OF VISION DISPLAY

Anna Charlotte MÁTHÉ and Julien GREEY
European School of Brussels I (Uccle)
S5

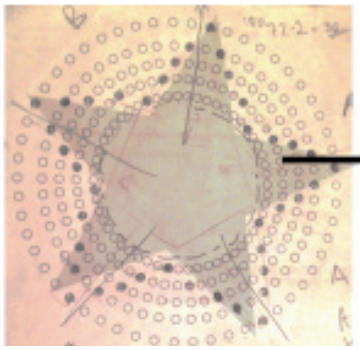
ABSTRACT

We will be looking at a phenomenon called “persistence of vision” and how it might be used in displays. We have built a prototype POV device that can display simple forms and figures as still or animated images. We used the metal shaft of a standard tabletop fan to spin a thin wooden propeller with 5 LEDs controlled by an Arduino Nano. We installed a magnetic sensor on the propeller and a magnet on the fan to be able to track the position of the propeller, and run the loop accordingly. The 5 LEDs have been programmed to light up in different configurations that yield different images.

The programs are set to run the looped LED pattern when the magnetic sensor reading changes; in other words, only when the device is spinning does it function properly as a display. By increasing or decreasing the delay time (that is, the amount of time each LED stays at 0 or 1) we can broaden or narrow the ‘stripes’ of light omitted by the five aligned LEDs. We mapped out all the points the LEDs lit up (at a given delay time), and used this as a template to design still or animated images. We hope to develop our device by increasing its resolution and adding additional features such as color or depth. The device’s current applications are in the area of entertainment/amusement (bicycle spoke displays, fan clocks, 3D globes) but we believe it has potential as a lightweight, more efficient alternative to screens.



Stripes of light



Design template

POV display result

THE PATH OF THE EYE

EXPLORING THE RELATIONSHIP BETWEEN EYE PATH AND ANALYSIS OF PAINTING COMPOSITION

Camilla RUFER and Kalliopi VAKALI
European School of Varese
S5

ABSTRACT

What makes you admire a painting? Is there a pattern or characteristic that attracts your eyes?

Artists allegedly use certain techniques that guide attention and make the observer focus on certain aspects of their paintings. These are important to make the images both aesthetically pleasing and memorable. Examples of these elements include the golden ratio, the Fibonacci spiral, rule of the thirds, dominating lines, colour analogies and other configurations. In this investigation we concentrated particularly on prevailing lines, Fibonacci spirals and focus points. We explored the relationship between eye path and the geometric features in paintings and we wanted to investigate if these features actually affect how we view pieces of art.

The experiment was conducted using a special eye tracking device that follows the pupil focus of the subject while observing a painting (Pupil-Lab). Together with the customised software and the help of volunteers we gathered data that we then analysed.

Short videos were recorded showing the focal trail on the painting and then interpreted to identify the geometric features.

We concluded that: when people observe paintings their eyes are guided by prevailing lines and stop at specific points. Certain geometric features are noted by all, but each subject follows his own additional set.

This investigation was relevant to understanding brain/eye function and how it is associates to what we find compelling in images.

EXPERIMENTAL CULTIVATION OF PISUM SATIVUM AND PHASEOLUS VULGARIS UNDER SIMULATED MARS HABITAT CONDITIONS

Titas GARDZIULEVICIUS, Levin MEINKE and Jonas ZURBA
European School Brussels II (Woluwé)
S5EN

ABSTRACT

With plans of visiting Mars for extended human stays approaching quickly, one key question is still left unanswered. What would we eat? Since it would be extremely difficult to bring all the food from Earth for periods of two years or more, we tried to help solve this problem by investigating the viability of growing peas (Pisum sativum) and beans (Phaseolus vulgaris) on Mars. The conditions we simulated were those of a greenhouse built on Mars with regulated atmospheric values. This setup would allow for a gas exchange between the astronauts and plants as an added benefit along with the psychological benefits from the interaction with the plants.

To best simulate these conditions, we built custom wood cultivation containers. The lighting was simulated using two LED light bulbs with a special spectrum used for growing plants. The LEDs regulated by a micro-chip controller were simulating the day-night cycle at the equators of the two planets respectively, using a program that we wrote. Aluminium foil was wrapped around the cultivation containers to disperse the light equally on the inside and to prevent external light sources from the outside. The Mars regolith we used was made by ORBITEC in cooperation with NASA, matching the composition of Mars regolith found at the equator. The Earth's soil was bought at a gardening centre.

Our results show that Martian soil produces smaller plants and the worse light conditions make the beans grow longer stems – a strategy used by plants on Earth when there is not enough light for the plants.

However, we found that both types of plants can successfully grow both in Martian lighting conditions and in Martian regolith.

ELECTROMAGNETIC TRAIN

Antoine FALCH, Garbhan DONNELLY and Gediminas VIDZICKAS
European School Brussels II (Woluwé)
S6

ABSTRACT

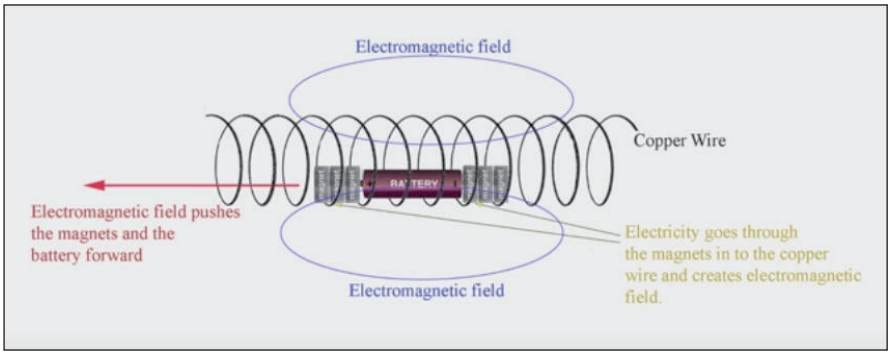
For our project we decided to make an Electro Magnetic Train using only Copper, Batteries and Magnets. We would then put a magnet on either side of the battery which we would then place in the copper coil.

Using basic magnetic principles, the 'Train' would shoot through the coil. This would happen because the front battery would be pushed and the back one pulled by the coil which acts as an Electromagnetic field created by the friction of the magnets with the copper coil.

We decided to do this project, to make it easier to show how an Electro Magnetic Train works using not many household items. We also thought of how this could be applied to the real world and realized this uses no fossil fuels whatsoever which makes it incredibly environmental friendly. Our goal for the Luxembourg Symposium is to increase the initial speed of the train which was 0,39m/s by using v=S/T.

We also managed to calculate the Kinetic Energy which was ½ m v2 = 5.7 mJ.

Our results show that Martian soil produces smaller plants and the worse light conditions make the beans grow longer stems – a strategy used by plants on Earth when there is not enough light for the plants.



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ACKNOWLEDGMENTS

DEAR PARTICIPANTS OF THE 15TH EUROPEAN SCHOOLS SCIENCE SYMPOSIUM

The European School Luxembourg II is pleased and honoured to host the 15th European Schools Science Symposium.

This annual science competition is an important event for the entire European Schools' system, as it encourages the students to pursue their scientific interests beyond the work done in the classrooms. It also helps them develop a critical mind, and improve their presentation and communication skills. The success of this event lies in the scientific initiatives and interests of all the participants, their teachers as well as their parents. We appreciate the time, effort and skills of the contestants. I would like to congratulate all the participants of the contest who all are winners already as the work they have done on their projects speaks for itself.

The organisation of the ESSS 2018 started at the beginning of this academic year and has been continuing throughout the year to reach the culmination on 22nd -25th April. I would like to thank the colleagues who worked on organising and planning this event with so much passion and zeal. The success of the event relies to a large extent on their hard work. It was a team effort that is appreciated by the whole school community.

Our dedicated team of teachers together with the support of the management and our secondary secretaries have invested much time and energy to make the event a great success. I am especially grateful to our fabulous coordinators Martine Thoma and Igor Stefanic for their commitment, optimism and aspiration throughout the year in cooperation with the support team of science teachers: Heike Boche, Ljubov Dombeva, Marie Maquet, Vaishali Naik, Angela Piccolomini, Thomas Schmidt, Ioannis Volakakis, Pascal Waechter. Thank you for your excellent work.

Our special thanks go also to our secondary secretary Valentine Guillot for sorting out millions of different details and double checking all the plans, as well as to Véronique Labis for the support in the administrative issues, to our music teachers Thomas Meunier, Elisabeth Patak, Paul Rhodes for preparing special performances, to our art teacher Christian Lesourd dealing with the artistic design of all the materials, to Stephen Haselock and the ICT team and our technicians Horst Sommerer, Denis Dour and Frédéric Goosse whose input is vital for the success of the event. I would also like to thank all the performers.

ACKNOWLEDGMENTS

Our team is very grateful for the encouragement and support of the ES Science Inspector Mr Max Wolff. His vision and dedication to the development of the event guided us through the preparation phase to dock the ship of ESSS successfully at the end of April. Many thanks to him for his valuable contribution to the event.

We acknowledge the support and financial contribution of our parents' association for the success of the event.

We also thank all our volunteers and the pupils who facilitated the organisation of the activities.

We also thank all our sponsors. Without their support and trust, this event would not have been possible at all.

Our thanks go to the panel of the judges.

We are greatly honoured by the attendance to the event by our speakers Mr Andrea ACCOMAZZO, head of the Solar and Planetary Missions Division in the Mission Operations Department, and especially the Flight Director for the Rosetta mission and Mr Boris LEHNARD, Professor of Computational Biology at Imperial College London.

I would request all the participants here to share our vision of the beauty of science with as many people as possible.

Again, my thanks to all involved for their participation.

Leene SOEKOV
Deputy Director Secondary
ES Luxembourg II

THANKS FOR SUPPORTING
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