Science Foundation Ireland sfi For what's next

Boston Scientific Advancing science for life™

intel

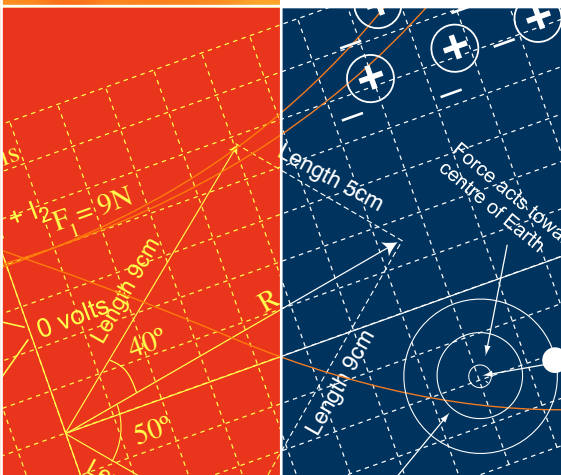
SciFest

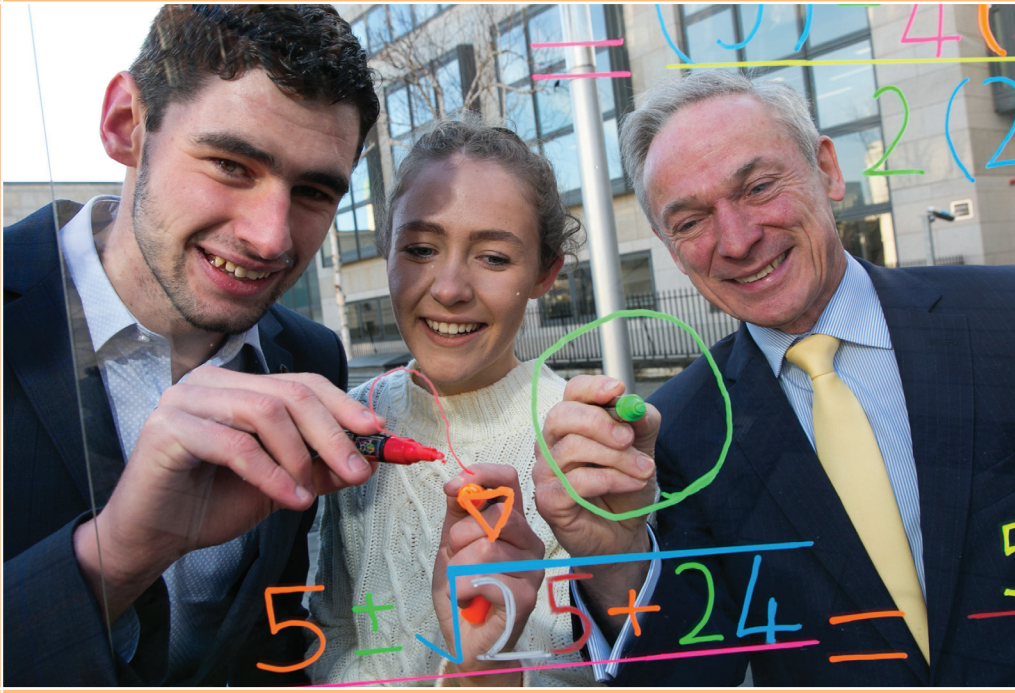
Inspiring and Promoting Excellence in STEM Education

PROGRAMME

SciFest 2018 National Final

In Association with Science Foundation Ireland




5 ± √25 + 24 =

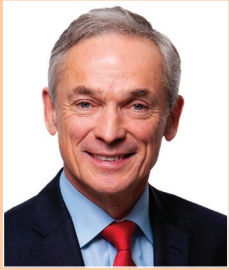
SciFest National Final 2018

in Association with Science Foundation Ireland

SciFest 2018 was funded primarily by Science Foundation Ireland, Boston Scientific and Intel Ireland and supported by a number of other organisations and institutions. The events were hosted locally in schools and regionally in the Institutes of Technology, DCU and St Mary's College, Derry. SciFest symbolises a highly successful collaboration between education, Government and enterprise and between the second and third level education sectors.

Foreword from
Richard Bruton, TD

Minister for Communications,
Climate Action and Environment



I'd like to extend a very warm welcome once again to everyone taking part in this year's SciFest National Final. It's fantastic to see such passion and energy for the science subjects and the creativity with which they have been applied to solve real world problems is very impressive to see.

Curiosity is the most powerful force in learning. SciFest harnesses this curiosity, encouraging those taking part to ask questions, to explore and understand how things work. By showing how important the science subjects are for solving real world problems, SciFest awakens a passion for the STEM subjects which can last a lifetime.

Over the years it has been a pleasure to see this event grow into the key driver and promoter of science, technology, engineering and maths that it is today. SciFest brings the STEM subjects out of the classroom and challenges the traditional image of science as inaccessible or difficult. By taking part in the competition, students are empowered to apply what they've learned to real life situations. They answer their own questions and solve the problems they see around them in a rigorous and scientific manner. I would encourage those who enjoyed their experience to spread the word and tell their friends. I would also ask that you keep the spark alive and continue with your interest in the STEM subjects.

You have shown great teamwork, dedication and adaptability by taking part in the competition. These skills are crucial and will stand by you no matter what path you choose in life. Your teachers, parents and all those who supported you also deserve a special mention – I am sure their encouragement and guidance has been invaluable to you as you completed your projects.

Congratulations to SciFest and all of the students here today for their fantastic projects, hard work and smart thinking. Well done to everyone involved and good luck to all the students participating.

Welcome from
Sheila Porter

SciFest Founder and CEO

On behalf of SciFest I am pleased and proud to welcome you, students, teachers, parents, judges, and invited guests to the SciFest 2018 National Final. Sixty-three of Ireland's most talented young creators and innovators are here today to showcase their award-winning projects. They represent not only their schools but the ten thousand plus students from all over Ireland who participated in SciFest 2018 at local SciFest@School level and/or regional SciFest@College level.

SciFest was launched nationwide in 2008. The aim was to encourage a love of STEM through active, collaborative, inquiry-based learning and to give every young person, whatever their background or circumstances, the opportunity to achieve their potential in, and have an enjoyable experience of, STEM. Entry is free and open to all second-level students, thus promoting diversity and making participation highly inclusive and accessible. With more than sixty thousand students having participated since 2008 SciFest continues to provide equal STEM opportunities for all students.

Today, of course, is all about the students and is a celebration of their achievements in the field of STEM. I would like to take this opportunity to congratulate all these incredibly talented students who've travelled here today from every corner of Ireland. The variety and quality of the projects on display testifies to the impressive spectrum of skills and creativity of the students involved. They represent the brightest young minds in the country, having already achieved success at a regional SciFest@College STEM fair.

We are delighted to have introduced a number of new awards this year. In September we launched the STEM School Award for participating schools. Then, for students, the new SciFest STEM Outreach Award encouraged finalists to submit videos describing their projects to be posted online and voted on by the public. I hope you had time to view some of these videos during the morning. Finally, we're delighted to have been invited to participate in the Broadcom MASTERS Programme for junior students. The winner of this award will have the opportunity to attend the Broadcom MASTERS International Programme in Phoenix, Arizona in May 2019.

The SciFest programme could not take place without the support of our partners, Science Foundation Ireland, Intel, Boston Scientific, the Institutes of Technology, DCU and St Mary's College, Derry. I would like to thank them, and all our sponsors, for their continued support. I would also like to thank the teachers and parents; their support and encouragement play a vital role in the success of the students.

Innovation and participation in STEM is fundamental to our country's future. I know that the future is in safe hands when I look around at the inspiring young people here today. I hope that they enjoy the experience and wish them every success now and in the years ahead.

A Message from
Margie McCarthy

Interim Director, Science for Society,
Science Foundation Ireland

It is a pleasure to attend the SciFest National Final to experience first-hand how young people all over Ireland have engaged with Science, Technology, Engineering and Maths (STEM) in such a constructive and positive way. The skills the students have developed and the results we see here today are fantastic. The experience will stand to these young people throughout their chosen future paths. SciFest is a highly inclusive programme; it is open to all second-level schools and supports the participation of students of all backgrounds and abilities. The presence of students from across the island of Ireland participating today highlights this.

Science Foundation Ireland is very proud to support SciFest. Our aim is to promote engagement and education in Science, Technology, Engineering and Maths (STEM) across the country by encouraging people to engage with STEM in their everyday lives. We know that engaging with young people at an early age is crucial. SciFest is an important programme as it nurtures and expands these students' budding interest in STEM subjects. The programme is not just a one-day event, but is ongoing throughout the year, at local and regional STEM fairs. Students in turn can make their interests a reality by developing projects that push the boundaries of science in new and exciting ways.

Attending the National Final is an excellent opportunity to see the projects that have been worked on for months and to meet the accomplished students whose work and dedication have brought them to life. It is a testament to the family and teachers around each and every student, who support them in following their passions. I wish to congratulate everyone who contributed to the projects on display today.

I would also like to take this opportunity to congratulate Sheila and George Porter, whose unwavering dedication to promoting a love of STEM among young people has seen SciFest continue to grow year after year. Now, it is seen as an important fixture on the educational calendar, recommended by teachers and principals across the country.

Finally, I offer warm congratulations to everyone participating today on what you have achieved so far. You are all great ambassadors for yourselves, your families and your schools.

Science Foundation Ireland sfi For what's next

A Message from
Hugh Hardiman

Director of Public Affairs,
Intel Ireland

Intel Ireland is proud to continue its support of SciFest. Ordinary people doing extraordinary things is at the core of what we do here at Intel; every day we use science, technology, engineering and maths (STEM) to create amazing opportunities for business and society.

STEM fairs like SciFest are an important element in promoting a student-centred, inquiry-based approach to skill development. Students can pursue their interests in STEM as they are encouraged to develop their own scientific investigations, design models, collect, analyse and interpret data, draw inferences, display, communicate and defend their findings and then receive feedback on their investigations.

SciFest creates important opportunities for students to work on exciting and innovative projects while also developing a wide range of valuable skills. In a changing and evolving environment, these traits and skills will benefit students today and into the future, in whichever career they choose.

Intel recognises the importance of educating the young people of today and ensuring they are given the opportunities to reach their full potential. It is the bright, creative and curious minds of today's students that will be responsible for the innovations of tomorrow. They hold the key to technologies and discoveries that we have yet to imagine. After observing the excellent work done by students participating in SciFest, we are confident that the future of the STEM industries in Ireland is in safe hands.

Congratulations to SciFest for another incredibly successful year and, to the students participating today, Intel Ireland wishes you all the best of luck. Everyone involved should be extremely proud of what they have achieved.

A Message from
Richard O'Sullivan

Director, Research & Development,
Boston Scientific Galway

On behalf of Boston Scientific we welcome everyone to the SciFest 2018 National Final. This is our fourth year sponsoring this event and we are delighted to see that it has continued to grow. Year after year we see the students produce exciting, interesting and innovative projects that never fail to impress.

As a medical devices company with a strong focus on research, development and innovation, Boston Scientific is constantly looking for top talent in the fields of science, technology, engineering and bio-medicine. It is extremely important to promote the STEM subjects, particularly in second level education. Our aim is to inspire students to develop and pursue a passion for these subjects, thereby ensuring that we have a continuous uptake of the science and engineering disciplines at third level. As a result, we are contributing to shaping the scientists and engineers of the future.

We believe SciFest is an excellent opportunity for students to research, explore and develop their own ideas. Events such as this allow students to nurture a passion for the STEM subjects and create a positive impact on the world around us. Our commitment at Boston Scientific is to advancing healthcare while giving back to the communities in which our employees live and work. We believe STEM education is a top priority for our business, for our patients and for our communities. We are delighted therefore to see such talent coming to events like SciFest. We know that as these motivated and passionate young people go on to pursue their education in STEM-related fields of study, they will build a brighter society and a brighter future for everyone.

We want to congratulate all the students on their excellent projects here today and wish them the very best of luck in their endeavours.

Boston Scientific
Advancing science for life™

Table of Contents

SCIFEST 2018 NATIONAL FINALISTS

PROJECT ABSTRACTS [pages 15-42]

SCIFEST 2018 BOSTON SCIENTIFIC MEDICAL DEVICES FINALISTS

SCIFEST 2018 BROADCOM MASTERS FINALISTS

[pages 51-56]

SCIFEST 2017 NATIONAL FINAL AWARD WINNERS

SciFest 2018 National Final

in Association with Science Foundation Ireland

A CELEBRATION OF EXCELLENCE IN STEM

Programme 9 November 2018

9.00	Arrival and set up of projects
10.00	Judging and viewing of projects (10.00 - 11.00 – Judges only)
11.00	Judging and viewing of projects (exhibition hall open to invited guests, parents and teachers)
13.00	Lunch
14.00	Awards Ceremony Introduction – Philip Smyth, Broadcaster and Science Communicator
14.05	Dr Pádraig Kirk, Director, CPD for Junior Cycle and Vice-Chair of the Board of SciFest CLG
14.15	Mr Richard Bruton, TD, Minister for Communications, Climate Action and Environment
14.25	Margie McCarthy, Interim Director, Science for Society, Science Foundation Ireland
14.35	Aaron Hannon, SciFest 2017 SFI Intel ISEF Award Winner
14.45	Presentation of Awards » Excellence in STEM Awards » SciFest Scientist of the Future Award » ISTA Award » THEA Award » Abbott Ireland Award » SciFest STEM Outreach Award » Boston Scientific Medical Devices Grand Award » Berlin Long Night of Science Award » Broadcom MASTERS Award
15.30	SciFest 2018 Science Foundation Ireland Intel ISEF Award Intel Teacher of Excellence Award
15.45	Photographs

SciFest 2018 Judges

National Finalists Judging Panel

Mr Gerard Hughes (Chair)	*Project Manager, Sentinus*
Dr Pádraig Ó Murchú	*Former Education Manager, Intel Ireland*
Dr Deirdre Kilbane	*SFI Research Fellow, Telecommunications Software & Systems Group (TSSG), WIT*
Mr Jim Cooke	*Teacher of Mathematics*
Dr Jennifer McKenna	*European Programme Manager, Intel Research and Development Ireland*
Ms Michelle O'Flaherty	*Quality/Validation Consultant, Consultancy, Griffith College, Ireland*
Mr Bernard Capraro	*Silicon Technology Research Manager, Intel Ireland*
Mr Christopher Carragher	*DCU, ISEF Award winner (Alumnus)*
Dr Joe MacDonagh	*Lecturer, ITT and Research Ethics Board at St James's Hospital and Tallaght Hospital*
Mr Paul Hennessy	*Customer Experience Director, Abbott Diagnostics*
Mr Conor Foy	*UCD, ISEF Award winner (Alumnus)*
Prof. Patricia Maguire	*UCD Institute for Discovery*
Mr Declan Cahalane	*Assistant Chief Inspector, Department of Education and Skills*
Ms Alexandrine Naud	*Raw Materials Chemist, Oriflame*
Ms Aine Boland	*Science Advisor, Junior Cycle for Teachers*
Dr Andrew Hines	*School of Computer Science, UCD*
Mr Mark Coyne	*Innovation & Development Director, Veolia Ireland*
Dr Martina Schroeder	*Human Health Institute, Maynooth University*
Prof. Paul McCabe	*School of Biology and Environmental Science, UCD*
Dr Claudia Fracchiolla	*Marie Curie Fellow, University College Dublin*
Mr Bill Lynch	*Maths and Science Educator*
Dr Brian Keegan	*School of Computing, DIT*
Ms Noelle Campbell	*Business Development Manager, TransferMate Global Payments*

Boston Medical Devices Judging Panel

Ms Catherine Tattersall	*SciFest*
Mr Kevin McClean	*Senior Inspector, Department of Education and Skills*
Mr Peter McKenna	*R&D Engineer, Boston Scientific*

Broadcom MASTERS Judging Panel

Ms Anne Lynch (Chair)	*SciFest*
Ms Noreen McMorrow	*Senior Inspector, Department of Education and Skills*
Mr Niall Kelly	*Science Advisor, Junior Cycle for Teachers*

The Awards

SCIFEST 2018 SFI INTEL ISEF AWARD

Trophy and an all-expenses-paid trip for the student(s) to represent Ireland at the Intel International Science and Engineering Fair (ISEF) in Phoenix, Arizona in May 2019.
Sponsored by Science Foundation Ireland and Intel.

INTEL TEACHER OF EXCELLENCE AWARD

Trophy and an all-expenses-paid trip to the Intel International Science and Engineering Fair (ISEF) in Phoenix, Arizona in May 2019 for the teacher of the SFI Intel ISEF Award winner(s).
Sponsored by Intel.

BROADCOM MASTERS AWARD

Trophy and an all-expenses-paid trip for the winning student, accompanied by a parent/guardian, to participate in the Broadcom MASTERS International Programme, including attendance at the Intel International Science and Engineering Fair (ISEF) in Phoenix, Arizona in May 2019.
Sponsored by Broadcom.

BERLIN LONG NIGHT OF SCIENCE AWARD

Trophy and an all-expenses-paid trip for the student(s) and their teacher to attend the Long Night of Science in Berlin in June 2019. *Supported by the Department of Foreign Affairs and Trade.*

BOSTON SCIENTIFIC MEDICAL DEVICES GRAND AWARD

Engraved trophy and €500. *Sponsored by Boston Scientific.*

SCIFEST STEM OUTREACH AWARD

Engraved trophy and €300.

THE ABBOTT IRELAND LIFE SCIENCES AWARD

Engraved trophy and €150. *Sponsored by Abbott Ireland.*

THEA AWARD

Engraved trophy and €75. *Sponsored by the Technological Higher Education Association.*

ISTA AWARD

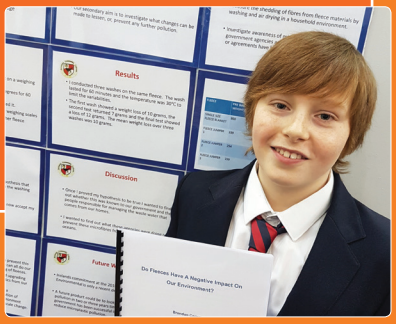
Engraved trophy and €75. *Sponsored by the Irish Science Teachers' Association.*

SCIFEST SCIENTIST OF THE FUTURE AWARD

Engraved trophy and €75.

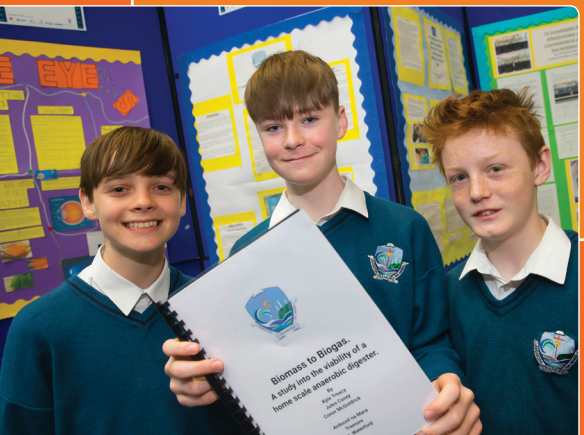
EXCELLENCE IN STEM AWARDS

Engraved plaques. *Sponsored by Science Foundation Ireland and Boston Scientific.*


Results
Discussion
Do Fleeces Have A Negative Impact On Our Environment?


Diversity
SciFest@DCU 2018
SciFest
DCU


GMO
INFO


Biomass to Biogas-
A study into the viability of a home scale anaerobic digester.


eland be prepared
an outbreak of
Q-fever?

SCIFEST 2018

NATIONAL FINALISTS

PROJECT ABSTRACTS

SciFest@AIT 2018

[STAND 1] Title of Project	**IS CLEAN COUNTRY AIR JUST A MYTH?**
Students	Juliette McGrane, Rebecca Campion, Laoise O'Brien
School	Athlone Community College, Retreat Road, Athlone, Co. Westmeath
Teacher Mentoring Project	Niall Carty

Abstract

The purpose of our project was to investigate our hypothesis in relation to the deterioration of air quality as prevailing winds pass overland across Ireland. We wanted to find out if pollutant emissions could have a negative effect on air quality as a result of the south westerly prevailing winds carrying these emissions as they blow inland.

We carried out field trips to various locations across the country, travelling over 900 km, and we used lichens as biological indicators to investigate the air quality in each area. We carried out quantitative and qualitative studies in a mixed method approach. The qualitative study involved identifying the lichens that we found in each location by analysing them and categorising them into nitrogen-sensitive or nitrogen-tolerant. The quantitative study obtained the average percentage cover of lichen in each area.

We used two formulae to grade each location on the level of nitrogen-sensitive and nitrogen-tolerant lichen present and the percentage coverage of lichen in each area. We put the results from each formula in individual tables before presenting them in graphical format.

We discovered that there was an increase in nitrogen-tolerant lichen and a decrease in nitrogen-sensitive lichen as we moved north west across the country. As a result of this we concluded that country air found in Ireland is not heavily polluted, but the air quality does deteriorate as it crosses the country. Therefore "Clean Country Air" is just a myth.

SciFest@LIT 2018

[STAND 2] Title of Project	SCRUM DEVELOPER
Student	Ronan Mullane
School	Desmond College, Gortboy, Newcastle West, Co. Limerick
Teacher Mentoring Project	Donal Enright

Abstract

Purpose

In rugby "Forwards win matches" and "Backs decide by how much" is an old adage; even a casual observer of rugby will know that dominance in the set pieces of scrummaging and lineouts will offer their team crucial advantage.

The aim of this project was to investigate the frequency and types of injuries encountered by the front three in the scrum and build a device that would help establish good scrummaging habits in underage players.

By integrating electronic sensors with an Arduino device into a specially designed scrum developer bag, I developed a device capable of providing immediate feedback to the coaches and players alike.

Description of Project

The Arduino will track the force each of the front row hit the bag with and it will identify if each of the players is striking the bag at the same time. I have placed the Arduino and the sensors in a padded bag, encased in a waterproof outer skin. I also placed handles on both sides of the device for players to bind onto.

Conclusions

As rugby becomes more and more physical, there is a need for more ways to reduce injuries. This scrum bag will solve some of the problems, especially the injuries that are caused due to poor scrum techniques. My device is easy to use and offers the ability to improve the technique used by underage players in the scrum by improving their posture and overall skills levels. The bag also achieves this in a fun way both for players and coaches alike.

[STAND 3] Title of Project	**COMPENSATORY GROWTH IN BARLEY AND ITS APPLICATION TO IRRIGATION IN DROUGHT PRONE AREAS**
Students	Miriam Kennedy, Aisling Casserly
School	St Raphael's College, Loughrea, Co. Galway
Teacher Mentoring Project	David Fogarty

Abstract

Compensatory growth is the accelerated growth of an organism following a period of slow development, particularly as a result of nutrient deprivation. It is well documented in animals, but less so in plants. We hoped to cause plants to display compensatory growth by depriving them of water for varying amounts of time.

About 70% of the world's freshwater resources are currently used for irrigation purposes. Irrigation is an expensive process and we wanted to see if we could reduce the amount of water required to grow crops without having a detrimental effect on crop yields.

We germinated barley plants and divided them randomly into groups, watering one control group of plants regularly while depriving the other groups of water for varying amounts of time and then resuming regular watering. All plant heights were recorded at two-day intervals for 24 days.

Our results showed that compensatory growth appears to be present in barley plants. The plants subjected to water deprivation initially displayed a reduction in growth, followed by an accelerated growth phase where the leaves elongated quickly and additional root mass was produced. Twelve days after the beginning of our measurements, not only had the plants deprived of water caught up with the control group, they had in fact overtaken them.

Our research could help to reduce water consumption worldwide. Lower irrigation levels contribute to reduced food production costs, less desertification, decreases in the rate of climate change and in improvement in the living conditions of millions of people worldwide.

SciFest@DkIT 2018

[STAND 4] Title of Project	FACE SCRUB INVESTIGATION AND REVOLUTION
Students	Emily Cathcart, Lucy Ellis
School	Ardgillan Community College, Balbriggan, Co. Dublin
Teacher Mentoring Project	Laura Sheahan

Abstract

Part 1: We aimed to find the best face scrub for teenage girls by comparing the cost, environmental impact and user satisfaction of a selection of four products.

We surveyed more than 100 people and found that the optimum price range was from €3 - €5.

We placed a solution of each face scrub on *Lepidium sativum* seeds to see whether the product caused germination failure. The results showed that some products allowed growth of the seeds while others didn't. We also conducted extensive research into every ingredient of each product to rate them as 'harmful', 'potentially harmful' or 'not harmful' to the environment and humans.

Eight volunteers tested each product for a period of three days and then filled out questionnaires rating each product in terms of appeal and effectiveness. This showed us the product with the highest rate of user satisfaction.

Thus we found the best product out of the four.

Part 2: We aimed to investigate a theory by Dr Greg Boyer who hypothesised that, if people switched to using natural homemade scrubs, it would be just as damaging to the marine environment as microbeads are. To test this theory we will compare the dissolved oxygen and bacteria levels of water samples before and after the degradation of face scrub remains.

We will also come up with real-life solutions that can help people to become more environmentally friendly every day. We are developing an app called GreenCare that allows consumers to scan products and get information about the scrubs while shopping. The scrubs will be rated in terms of their environmental impact, cost and user satisfaction.

We will also design an innovative bathroom compost device so that the remains of face scrubs can be composted instead of going down the drain.

SciFest@ITS 2018

[STAND 5] Title of Project	**ANALYSIS OF CALCIUM ION, VITAMIN D LEVELS AND DEXA SCAN IN ADULT FRACTURE IN-PATIENTS PRIOR TO SURGERY AND AWARENESS OF SECONDARY SCHOOL STUDENTS OF OSTEOPOROSIS**
Student	Rachel Mc Partlin
School	St Clare's Comprehensive, Manorhamilton, Co. Leitrim
Teacher Mentoring Project	Edel Mc Phelim

Abstract

The aims of this research were threefold. The initial aim was to establish blood calcium levels in adults who presented with hip and wrist fractures in Sligo University Hospital. The second aim was to investigate the awareness levels of secondary school students of calcium and osteoporosis and to ascertain their dietary habits.

Following the success of this research at the regional competition of SciFest 2018 it was decided that further research (aim 3) with a third cohort of participants to investigate the clinical relationship between blood calcium levels, vitamin D levels and DEXA scans should be undertaken. This research was undertaken in conjunction with Dr S. Kutty, Head of Orthopaedics and his team of orthopaedic surgeons - particularly Dr Ankit. The clinical elements (aim 1 and aim 3) of this research were carried out with fracture in-patients who had either had surgery within the defined timeline or were awaiting surgery.

Hip and wrist fracture in-patients have blood samples taken prior to surgery. Part of these tests include a calcium ion test and a vitamin D test. These blood ion levels were compared against DEXA scan results to investigate the clinical relationship.

Part two of the research was focused on conducting quantitative research with post-primary school students. A total 136 post-primary school students took part. The students were given self-completion questionnaires to ascertain dietary habits and awareness of calcium and osteoporosis. This questionnaire was devised in collaboration with the Home Economics Department in St Clare's Comprehensive.

SciFest@LIT Thurles 2018

[STAND 6] Title of Project	**NO MOWER ACCIDENTS**
Students	Aisling Dwyer, Kiara Hearty, Hazel Reynolds
School	St Joseph's College, Borrisoleigh, Thurles, Co. Tipperary
Teacher Mentoring Project	Mary Gorey

Abstract

We have created a device that will prevent accidents involving lawn mowers and other types of tractors involving blades taking place.

There have been many cases of lawn mower accidents worldwide. Each year 800 children in the US alone are run over by riding mowers or small tractors and more than 600 of those incidents result in amputation. Seventy-five people are killed and 20,000 are injured. One in five deaths involves a child. For children under the age of 10 major limb loss is most commonly caused by lawn mowers.

We began to brainstorm possible solutions to this problem. At first we thought of making a barrier system around the blades that would go around the lawn mower. After brainstorming some issues that arose from our initial idea we moved on to researching sensors that would be suitable for us to create a device for a lawn mower.

Our device uses a number of pieces of technology hardware. We used an Arduino and also a PIR sensor to make this device along with a servo motor. While our device is on display we use an IR sensor as it gives a more accurate result on the day. We coded the sensor so that when someone runs/walks out in front of the lawnmower it will shut itself down.

We coded the sensor to sense organisms that have a body temperature between 30 and 40 degrees Celsius. This way it can sense not only humans, but cats and dogs also.

SciFest@WIT 2018

[STAND 7] Title of Project	**INVESTIGATING THE BIOLOGICAL BENEFITS OF EM PROBIOTICS IN AGRICULTURE**
Students	Conn Caomhánach, Con Ó Meachair
School	Meánscoil Gharman, Brownswood, Enniscorthy, Co. Wexford
Teacher Mentoring Project	Elaine Nic Réamoinn

Abstract

In Ireland, agriculture accounts for 32% of all greenhouse gas emission to air, with fertiliser being the main source of nitrous oxide due to the use of nitrogen fertiliser (EPA, 2016). Climate change presents challenges for Irish agriculture both in the context of GHG emissions and the need for adaptation of farming practices. This research will test the EM probiotics as a natural fertilizer and will test the hypothesis that EM will decrease ammonia gas released by nitrogen fertiliser.

Stadium seeds were grown in a growth chamber using EM at a dilution rate of 10% and 20% along with a control. EM was used as a treatment on nitrogenous fertiliser (urea) at a dilution of 10% and 20% in sealed petri dishes with emerging Dräger tubes. Colour change in the Dräger tubes served as an indication of ammonia emission.

While researching these effects at Teagasc in Johnstown Castle, Co. Wexford previous results indicated that the average growth of EM (20%) treated stadium grass was 8.7 cm in comparison to the control at 8.3 cm in length over a three-week growth period. A 20% treatment of EM reduced ammonia emissions to 300 ppm in comparison to 500 ppm with the control sample. Last year's study showed that EM probiotics had a significant effect on the reduction of greenhouse gas emissions while also boosting plant growth.

SciFest@DCU 2018

[STAND 8] Title of Project	**AN INVESTIGATION INTO THE DEPOSITION OF METALLIC PARTICLES IN E-CIGARETTE VAPOUR**
Students	Gráinne Lawlor, Enya Nordon
School	Scoil Mhuire Community School, Clane, Naas, Co. Kildare
Teacher Mentoring Project	Helena Lynn

Abstract

We decided to research e-cigarettes as they are relatively new and not a lot of conclusive research has been carried out on them. When researching e-cigarettes we came across the idea of "dry burning".

Dry burning is an unofficial method of cleaning the coil of an e-cigarette, to burn a "gunk" like substance off the coil that builds up after continuous use. For all aspects of our project we took samples from both brand new and dry burned coils. To carry out this testing we worked with Trinity College Dublin, DIT and Maynooth University.

For our project we investigated if there were metals being emitted into the vapour of an e-cigarette and where within the e-cigarette these metals could possibly be coming from using an ICP-MS. From our testing we discovered that many metals were being emitted into the vapour from the e-cigarette from each coil. We were also able to locate where within the e-cigarette these metals were coming from.

We investigated the compositional changes in the e-liquid using a Raman microscope and FTIR laser before and after it was vaporised. We found that certain ingredients were not present after it was vaporised and metal oxides that were not there previously were now present.

We collected vapour samples and applied them to human lung cells, testing for both reactive oxygen species and cytotoxicity. Our lung cells were provided by the Biomedical laboratories at Trinity College Dublin and were sourced from a male patient with papillary adenocarcinoma (NCL-H441).

Our results showed that there was oxidative stress on the lung cells which in time may cause health problems. We found no definite trends in cytotoxicity between different nicotine levels and flavoured e-liquids, however some e-liquids appeared to be more toxic than others.

SciFest@LIT 2018

[STAND 9] Title of Project	**EXPANSION RATES OF JAPANESE KNOTWEED (*FALLOPIA JAPONICA*) IN NORTH CLARE**
Student	Amy Woods
School	Mary Immaculate Secondary School, Lisdoonvarna, Co. Clare
Teacher Mentoring Project	John Sims

Abstract

Japanese knotweed is a big problem in Ireland. The TII is trying to eradicate it along national roads.

The aims of my research are as follows:

- To record the location of *Fallopia japonica* in selected areas of North Clare and to quantify the size of each cluster of the plant
- To discover the type of soil that *Fallopia japonica* grows on
- To map my information so that it can be used in the future to measure the expansion of this invasive species
- To estimate the expansion rate of clusters using data from research that was carried out in 2012
- To see how effective the eradication scheme on the N67 has been so far

After locating clusters of Japanese knotweed, I recorded the location of each cluster and the size of each cluster. I took a soil sample where each cluster of the Japanese knotweed grew and I tested the soil for the following:

1) Moisture content
2) Soil texture
3) Organic content
4) pH of soil

I compared the size of the clusters with the data I already had from a 2012 study.

Finally, I looked at how effective the eradication scheme on the N67 has been. I did this by looking at the number of shoots that have regrown after the sites were sprayed three times.

I discovered that clusters of Japanese knotweed are still expanding. I also discovered that 80% of sprayed sites on the N67 had regrowth.

SciFest@IT Tralee 2018

[STAND 10] Title of Project	**DEER WATCH**
Students	Darragh Fleming, Ethan O'Neill, Colm Looney
School	St Brendan's College, New Rd, Killarney, Co. Kerry
Teacher Mentoring Project	Marian O'Gorman

Abstract

Every year there are millions of documented vehicle collisions involving deer worldwide. Even more go undocumented. Studies on Deer Vehicle Collisions (DVCs) in Europe estimate as many as 1 million of these collisions occur in Europe alone. Few studies have targeted deer behaviour as a critical component of collision prevention.

For this project, we established three different strands of research. From expert interviews, research documentation and our own experimentation, we identified locations of risk and investigated patterns that occurred in road crossing behaviours in deer living in the Killarney National Park. We used the original findings as a baseline and compared these to findings when deer were exposed to two low-cost deer deterrents. We then undertook the design of smart signage and a technological alarm system to ward off the deer.

To determine the locations where DVCs were most likely to occur and to identify deterrents to discourage deer from crossing the roads we conducted interviews with members of the NPWS, Kerry County Council and others. We also conducted public surveys. We utilised crowdsourcing approaches which use smart technology so the public could report deer sightings near the roadside. We created a website called www.deerwatch.ie where the public could learn about our project and aims.

We learned of two ideas that could work as deterrents. The first was using human hair. Our second deterrent was using CDs to refract car lights into the deer's field of vision. These deterrents seem quite promising as you will see from our footage.

Our final strand was using technology to support driver awareness and as a way to scare deer from crossing the road. You can see our technological prototypes at our stand.

SciFest@ITT 2018

[STAND 11] Title of Project	**QUANTIFYING WHIPLASH: AN IOT SENSORING APPROACH TO HELP REDUCE INSURANCE CLAIMS COSTS**
Student	Odhran Brady
School	Salesian College, Maynooth Road, Celbridge, Co. Kildare
Teacher Mentoring Project	Jorge Andres

Abstract

I hoped to be able to do research into how IoT enabled sensoring can help in cases of whiplash in car related accidents. I researched the forces involved in crashes. I was able to capture these forces with the use of IoT (Internet of Things) sensors. These data were uploaded to the cloud in real time for analysis.

There was also design and experimental elements to this project. I experimented on the test rig with different crash settings, including speed, angles and weight, and analysed the output data. This gave me a better understanding of the real-life forces and influencing forces in play regarding rear-end impacts.

In order to make the data and results coming from the test rig applicable to real world collisions IoT sensor data coming from the experimentation test runs was calibrated. I also researched the biological effects of whiplash, and specifically the effects on the neck and spine. Further analysis allowed me to set limits to the measured force values seen on my test rig and relate them to real life forces at various simulated minor crash speeds that may cause whiplash injury, particularly low speed rear-end collisions. These thresholds also allowed me to distinguish impact levels and severity of a rear-end crash. Upon detection I was able to send such data to insurance companies.

SciFest@CIT 2018

[STAND 12] Title of Project	**PITH AS A BIODEGRADABLE ALTERNATIVE FOR PACKAGING MATERIALS**
Students	Benjamin Velon, Eoin Cottrell, Jamie O'Callaghan
School	Douglas Community School, Clermont Avenue, Douglas, Cork
Teacher Mentoring Project	Cian O'Mahony

Abstract

Our project offers a solution to pollution by non-biodegradable packaging materials. We have thoroughly investigated the properties of sunflower pith as an affordable and biodegradable packaging material, comparing it to currently used products such as polystyrene.

Pith/medulla originates from the stem of a sunflower. Last year we recognised the similarities between this substance and polystyrene/aeroboard. We conducted the impact peak force measurement tests and pith compared favourably with other packaging material.

We found the density of the pith by using the formula mass divided by volume. (You must measure the amount of water the pith absorbs and then you subtract it from your end result.) From our testing we found that the density is 0.92 g cm^{-3}.

We conducted two different types of flame tests: vertical and horizontal flame tests. We found that the pith did not burn or melt but it did smoulder and get reduced to ashes.

Other tests included vacuum test, insulation property examination and postal delivery examination.

Pith is a suitable candidate as a packaging alternative. It is very heat resistant, non-flammable and can absorb shocks adequately due to its light weight and stellar impact dispersion ability. Overall the pith outperformed the other packaging materials in the various tests we conducted, and it is evident that the pith is able to compete with popular packaging materials such as polystyrene.

SciFest@DIT 2018

[STAND 13] Title of Project	**GUARDIAN PI**
Student	Emma Babos
School	Jesus and Mary College, Our Lady's Grove, Goatstown Road, Dublin 14
Teacher Mentoring Project	Marc Paul Lynn

Abstract

Home security and privacy are problems that we face every day. Whether at work, travelling abroad, or carrying out daily errands, having peace of mind is a must. We all want to return home knowing that our valuables and home are as secure as can be. There are endless numbers of high tech solutions with even higher costs available. However, I have created the most complete yet inexpensive system to protect and remotely monitor your home.

I have outlined some of my Guardian Pi's main features below which are all working in conjunction with the Raspberry Pi. The system includes smart cameras which monitor your home effectively, through a webcam and a camera phone set up in strategic locations around your home. The system also includes a smart hub which alerts you to any suspect behaviour through direct communication and real time photo and video evidence. It also sends you photos when you request them to get a real time situation report. The device alerts you to any unusual noises through a sound detector.

Also, every piece of hardware including most plugged devices such as lamps and radios can be programmed to be triggered remotely to fake presence by turning lights on and off for example. With a huge range of options that can be changed to suit your personal needs, not to mention coming up with tasks that you want the device to monitor, it is a hugely customisable tool. Moreover, it was created for a once off price of €50 with no ongoing costs.

SciFest@DkIT 2018

[STAND 14] Title of Project	**AN ECOLOGICAL INVESTIGATION INTO DÚN AN RÍ FOREST PARK**
Students	Ílona Mc Carthy, Éabha Garvey, Caoimhe Byrne
School	Coláiste Dún an Rí, Kingscourt, Co. Cavan
Teacher Mentoring Project	Michelle Hough

Abstract

Our project investigates the high prevalence of millipedes, beetles, European robins and Eurasian blue tits in Dún an Rí Forest Park, Kingscourt, Co. Cavan.

We set down pitfall traps to source insects in the following locations:

A. Parkland
B. Hedgerow
C. Forested area
D. Natural waterway (river bed/bank)
E. Man-made waterway (Ladies Lake)

Millipedes and beetles were the most prevalent insect in the above locations.

We visited our pitfall traps every third day for four weeks and noted all findings in our logbook. We set out a bird feeder in a south facing location beside a laurel hedge.

To find our data, we used a wildlife camera to source bird activity. Robins and blue tits were the most prevalent birds in the above location.

Data for our project was collected by distributing our two surveys:

Survey One: Survey pertaining to the prevalence of millipedes and beetles in Dún an Rí Forest Park

Survey Two: Survey pertaining to the high prevalence of robins and blue tits in Dún an Rí Forest Park

We then conducted a statistical analysis into the results of our surveys.

In addition, we also distributed leaflets about millipedes, beetles, blue tits and robins on the importance of these animals and how to make gardens more insect and bird friendly.

We also visited three primary schools in our local area to teach young children about the importance of biodiversity and the eco-system.

SciFest@LyIT 2018

[STAND 15] Title of Project	**MAKING SOCIAL MEDIA A BETTER PLACE USING ARTIFICIAL INTELLIGENCE**
Student	Leo Camacho
School	Saint Eunan's College, Letterkenny, Co. Donegal
Teacher Mentoring Project	Jane Gill

Abstract

There are billions of people online, with many joining every day. However, many cyberbullies have flooded social networks, harassing some users regularly. This is becoming increasingly important as more and more of our lives are moving online.

This project was inspired by social media's often sluggish response to taking down harassive posts. The purpose of this project was to create an automated public robot that, when a victim of harassment signalled for help, the robot would automatically analyse the post they claimed to be harassive and report if it was harassive. The robot would also encourage its followers to report the post, so the message would be taken down faster.

I used a neural network, a subcategory of artificial intelligence, as the algorithm that predicted if a post was harassive or not. I sampled over 30,000 tweets for the neural network to train on and learn the relationships in the messages. Using Twitter's API, I developed a proprietary interface that enabled the neural network to constantly scan and report harassive tweets, without any human input. I further added the "expose" feature, that encouraged the robot's followers to report the post as well. ABUR, the Anti BUllying Robot, was created.

In conclusion, using artificial intelligence and Twitter's innovative programming interface, ABUR, a public service robot, was created.

SciFest@ITB 2018

[STAND 16] Title of Project	**A STUDY OF BACTERIA FOUND ON PEDESTRIAN CROSSINGS IN DUBLIN**
Students	Alison Egan, Áine Morgan, Caoimhe Harrington
School	Castleknock Community College, Carpenterstown Road, Castleknock, Dublin 15
Teacher Mentoring Project	Grainne Mulry

Abstract

Our project's aim was to find out which types of bacteria were living on pedestrian crossing buttons. We also wanted to see if these were harmful to humans and if an alcohol wipe would affect the colony count among other things. We hypothesised that if the pedestrian crossing is a reservoir for bacteria then we will be able to detect it.

To do this we randomly selected six pedestrian crossings around Dublin and swabbed these onto blood agar plates in both spring and summer. We incubated the plates for 48 hours and then took them to a lab in UCD. We isolated unusual, recurring or interesting bacteria onto nutrient agar and incubated these for 48 hours.

In total we isolated 24 bacteria, 12 from spring and 12 from summer, after which we tested the plates using the catalase test and gram staining. From these tests we gathered that the alcohol wipe was increasing the colony counts of bacteria because of biofilm, which the bacteria form to survive. We also discovered that the main genuses of bacteria that could be found were *Neisseria*, *Staphylococcus*, diphtheroids and *Bacillus*.

We found that there was little difference in types of bacteria between spring and summer; however the colony counts were higher in summer. This is probably due to the higher temperatures. We were unable to determine which types of species lived on the buttons due to resources, but we were able to discover which genuses lived on the buttons.

SciFest@IT Tralee 2018

[STAND 17] Title of Project	**AN INVESTIGATION INTO USING CRISPR-CAS9 TO GENOMICALLY EDIT *PARAMECIUM CAUDATUM* TO PURIFY *VIBRIO CHOLERAE* INFECTED WATER IN THIRD WORLD COUNTRIES**
Student	Timothy McGrath
School	Killorglin Community College, Killorglin, Co. Kerry
Teacher Mentoring Project	Marieke O'Connor

Abstract

The inspiration for my project came from my uncle, Fr Tim O'Riordan, who visited Kenya to help develop a water irrigation system. From his visits he told me what life is like in Third World countries. At the same time CRISPR, this new gene editing tool was featured in numerous articles that I saw.

With all of this information and knowledge that I had, my idea was to help on a microscopic level. Every minute across the globe a newborn dies caused by infection due to unclean water. My mission was to use the *Paramecium* microorganism to feed on the cholera bacteria so the water could be clean for drinking.

Through genetic research and microbiology I conducted many experiments on *Paramecium* and *Vibrio* bacteria. I analysed cell behaviour and feeding, I observed pH and water quality samples, cultivated *Paramecium* and extracted cheek cell DNA. For genetic engineering I needed two machines: A PCR and microcentrifuge. With both cost and accessibility a problem I decided to build the two machines myself using my years of experience from being a part of CoderDojo. With these made, I continued my experiments by extracting *Paramecium* DNA. This pure DNA can now be used to amplify a target sequence.

During the project I contacted many researchers and establishments such as Irish Aid who believed my solution would greatly improve people's lives in the global south. I plan to continue my project and further my progress with a view to contributing to the UN Development Goals.

SciFest@ITC 2018

[STAND 18] Title of Project	**SOUND SENSITIVITY: A STATISTICAL ANALYSIS OF ITS IMPACT ON CHILDREN WITH AUTISM AND THE DEVELOPMENT OF A DEVICE TO LESSEN IT**
Students	Aoife Dunne, Alice Carew
School	Mountrath Community School, Dysartbeigh, Mountrath, Co. Laois
Teacher Mentoring Project	Catriona Egan

Abstract

Our hypothesis was, "Children with autism suffer with sound sensitivity that greatly affects their day-to-day lives, and a device can be developed to lessen it."

Aoife created a pioneering nationwide survey that examines sound sensitivity in children with autism in terms of frequency and manifestation. We investigated how it affects sufferers. We reached our goal of 500 respondents. Amongst other results, a staggering 95% of participants experience sound sensitivity at least sometimes, while just under 60% have had no treatments suggested to them.

Alice trialled a device that she had developed to lessen the impact of sound sensitivity on children with autism and their family members. Twenty participants were selected from the 315 who volunteered through the survey. The trial involved parents keeping a diary for four weeks – two weeks without using the headphones and two weeks while using the LULLS headphones. They had diary sheets that questioned how many times each day the child reacted negatively to sound, how many times the reaction placed the child in an unsafe situation, how many times it resulted in reduced participation in events and how many times it was the cause of additional stress for parents or family members.

Of the 20 parents selected 15 completed the trial in full. It was our prediction that using LULLS would lessen the impact of sound sensitivity. Overall, 93% of participants recorded significantly decreased negative impact in all four categories during the two weeks of using the device.

[STAND 19] Title of Project	APPLICATIONS OF QUEUING THEORY TO THE CHILD AND ADOLESCENT MENTAL HEALTH SERVICES IN IRELAND
Students	Tony O'Halloran, Aidan Mamo Cooney
School	Coláiste an Spioraid Naoimh, Bishopstown, Cork
Teacher Mentoring Project	Tim Kerins

Abstract

This project presents a mathematical model that can help optimise resource management in the Child and Adolescent Mental Health System (CAHMS). It does this by simulating the results of potential policy changes which could affect the queue times. We created this model by using the standard set out in Albin et al (1990). This involved first using queuing theory equations and then simulating with software to refine results.

This system has many complexities grounded in the social sciences. By accounting for these we ensured that our model is as accurate as possible. Raw data was obtained from a variety of sources. These included the HSE's Performance Reports, Quarterly Updates and the monthly Management Data Reports (Jan 2011-March 2018). These reports detailed the waiting lists for CAMHS and the breakdown of the timeframe involved with waiting for access for those on the list.

The model suggests tangible and practical solutions, e.g. it has shown that switching to a least utilisation appointment system could reduce queue length by more than 80%. This approach is practical and suitable for use by policy makers to improve decision making. Even when provided with very limited sets of information the results outputted approximate well to the real data. The margin of error was within 1.4% even when it was only provided with one data set and the simulation is within another 0.1% of that. Our method was successful for 100% of cases tested and suggests realistic changes in every case.

SciFest@ITT 2018

[STAND 20] Title of Project	**NATURE VS NURTURE: THE BIOMIMICRY OF SPIDER SILK**
Student	Evan Mather
School	Patrician Secondary School, Newbridge, Co. Kildare
Teacher Mentoring Project	Colin Doheny

Abstract

My project aimed to create a silk-like polymer that could match or surpass that of spider's silk webbing. I originally wanted to make an all-protein fibre silk, but that was not possible as I could not get one of the essential amino acids for the project, serine.

From my research I knew that fibroin is the structural centre of silk, and it is an insoluble protein. I knew that as silk moves from a silk gland (part of spider that makes the silk) it goes from a gel like protein to a long chain of protein fibres. So, since I knew what spider silk is made of I could then determine its properties and try to transfer them to a polymer. I just had to make a polymer to transfer the properties into.

The polymer is made from saline solution, sodium bicarbonate and polyvinyl acetate. Then I wanted to increase the strength of my silk and I decided to do this through doping (adding impurities to the polymer to make it stronger), with the material graphene. I tested the fibre's tensile strength by hanging weights off it, with a ruler to its side, to see when it would snap. Spider silk has a tensile strength of 1 GPa, while my fibre has a tensile strength of 1.112 GPa, making it stronger than spider's silk by 112 MPa. I hope that my fibre will be used for manual labour, parachute cables, and even bullet proof vests in the future.

SciFest@NorthWest(NI) 2018

[STAND 21] Title of Project	QUAD FOR QUADS
Students	Liam Black, Cathal Mc Donnell
School	St Killian's College, Carnlough, Co. Antrim
Teacher Mentoring Project	Sean Connolly

Abstract

Our aim was to help prevent accidents and serious injury to quad bike riders.

Most quad safety devices are anti-roll bars for preventing injury when a quad overturns, but quad manufacturers do not want them fitted as they tend to make the bike unstable and can also contribute to injuries.

Research on accidents has shown that quads overturning and helmets not being worn are the biggest causes of serious injuries. There are no modern quad safety devices which can ensure that a helmet is being worn before a quad will start, alert the rider when it is in danger of overturning and send a text for help when it crashes.

We have designed and manufactured the Quad Universal Alarm Device using a temperature and humidity sensor sensing if a helmet is being worn and transmitting the signal via an Arduino Uno and 433 MHz transmitter to an Arduino Mega, with a 433 MHz receiver, accelerometer and a GSM module.

The receiver device can use power from the quad's battery. The quad won't start until a helmet is worn by the rider and will stop if the helmet is removed. The accelerometer can tell when the bike is tilted to a dangerous position and the tilt angle warnings are easily seen and heard by the rider. The device also sends a text to a designated phone number (parent or friend) to ask for help when an accident occurs.

SciFest@ITS 2018

[STAND 22] Title of Project	**THE ATTRACTION OF MAGLEV TRAINS: A STUDY INTO THE THERMOMAGNETIC PROPERTIES OF NEGATIVELY ACCELERATING OBJECTS**
Students	Niamh Carolan, Emma Birney
School	Magh Éne College, Bundoran, Co. Donegal
Teachers Mentoring Project	Yvonne Higgins, James Gilmartin

Abstract

Our project is concerned with two integral factors of magnets, namely repulsion and emf production. The purpose of this study is to ascertain what changes may occur in magnetic retardation and propulsion when ambient temperature varies, as well as concluding whether a dynamic train system can change an electromagnetic coil system sufficiently to provide an extra source of emf.

There are currently two main Maglev systems in operation worldwide with a third in prototype development in Germany. These are: electrodynamic suspension system (EDS) in Japan; electromagnetic suspension (EMS), used predominantly in Europe; and the Inductrack in Germany, still in prototype.

We decided to look at Inductrack in Germany for two reasons. Firstly, we were looking at EDS systems that run on supercooled magnets, which we couldn't investigate due to our lack of equipment and the fact it is cooled by liquid nitrogen. This makes it very expensive and hazardous. In addition, we were aware of the potential health impact on train commuters considering the magnetic field provided by supercooled magnets could affect pacemakers. Secondly, the Inductrack uses room temperature permanent magnets composed partly of neodymium. This was an area we believed we could study and replicate.

Our results clearly show a trend between magnetic strength of retardation versus ambient temperatures. There is also strong correlation between the viability of emf production and temperature. Combining these two sets of data, we feel this study represents an important factor in the operation and design of new Maglev systems.

SciFest@LIT Thurles 2018

[STAND 23] Title of Project	**WHAT MAKES A GOOD SCIENCE TEACHER? A STATISTICAL ANALYSIS OF DIVERSE SECOND-LEVEL STUDENT AND TEACHER ATTITUDES ON WHAT CONSTITUTES A GOOD SCIENCE TEACHER**
Student	Paul Hamilton
School	Ardscoil Rís, North Circular Road, Limerick
Teacher Mentoring Project	Diane Condon

Abstract

The future of effective STEM education is determined largely by the quality of teaching and learning in our classrooms. This project provides a comprehensive statistical analysis of students' attitudes to what constitutes a good science teacher. Quantitative and qualitative data was collected from male and female students in a diverse range of secondary school contexts. The project has been extended to include the views from a cohort of secondary school teachers so that the student and teacher voice are represented in the results and conclusions.

Quantitative data from 259 students and 204 teachers was analysed using SPSS software. The analysis employed the use of general descriptive statistics, and included specific statistical tests, such as Kolmogorov Smirnov, Mann-Whitney U, Kruskal Wallis, and chi squared. Qualitative data from student interviews was also gathered to provide a pragmatic approach to the project, and to gather quotive data to add a contextual depth to the statistical results.

Results show little gender difference among student attitudes; however, school context emerged as a significant factor influencing student views of effective teaching. Teacher results broadly mirrored student attitudes indicating a positive correlation in terms of a commonality of opinion in key factors for success in STEM education.

This project is significant because few studies have included student voice as key stakeholders in the future of STEM education in Ireland. These results hold importance for policy makers, educators and for schools because they highlight the importance of the intersection of relational, technical and cognitive aspects of science teaching.

SciFest@AIT 2018

[STAND 24] Title of Project	**IRELAND'S BURNING PROBLEM: A STUDY OF THE ECOLOGICAL IMPACT OF IRISH GORSE FIRES**
Students	Emma Kelly, Brian Conlon
School	Moate Community School, Aghanargit, Moate, Co. Westmeath
Teacher Mentoring Project	Mairead Cusack

Abstract

Our project aims to identify the immediate and long-term impact of Irish gorse fires on the abundance and biodiversity of plant and animal species on Irish peatlands.

Three bogs in which gorse fires occurred in May 2017 were selected for study: Rooskey, Co. Longford, and Ballymoe and Gorthaganny, Co. Roscommon. Burned and unburned plots on each bog were surveyed from June to October 2017. Biotic factors (qualitative study of plants and invertebrates) and peat physical properties (bulk density, pH, organic matter content, water repellency and N P K content) were studied at each site.

The quantitative study of the plant species revealed that burning negatively affected both the abundance and biodiversity of plants at all sites. In addition, burning resulted in increases in peat bulk density, water repellency and pH leading to a reduction in the abundance of *Sphagnum* species which play an integral role in bog formation and carbon sequestration.

Using the results from our study we now plan to develop a peat additive to promote the re-establishment of *Sphagnum* moss on burned sites. Our pellet will include use of a nurse plant, *Polytrichum strictum*, which aids *Sphagnum* in water-stressed areas and acidic organic substances (pine needles and citrus vinegar) that reduce peat pH and promote soil flocculation.

To determine the effectiveness of our additive, we will apply our pellets to burned plots at Ballymoe, Co. Roscommon for a three-week period and compare the percentage frequency of *Sphagnum* species to control plots to which no additive has been applied.

SciFest@ITB 2018

[STAND 25] Title of Project	**AN OPEN SOURCE SOLUTION TO SIMULATING QUANTUM COMPUTERS USING HARDWARE ACCELERATION**
Student	Adam Kelly
School	Skerries Community College, Skerries, Co. Dublin
Teacher Mentoring Project	Louise Sullivan

Abstract

Quantum computers are a paradigm shift in computing. These devices will solve problems that a regular computer will never solve. Still, large-scale quantum devices are not available yet. This means the development of quantum computers and algorithms requires fast, accurate simulations.

After much research, I found that there were no available simulators that made use of the GPU. With this, I hypothesized that such a tool could significantly accelerate simulation times. I contacted many researchers in the field who agreed that my hypothesis was feasible.

The development of the simulator was an iterative process. Initially, an in-depth literature review was conducted. Then, the computation technologies were chosen. Notably, the OpenCL framework was chosen to perform the computations. This allowed the software to be parallelised and run with little hardware restriction. After the initial prototype was created the software was rewritten/optimised many times. This involved receiving feedback from members of Rigetti and IBM's quantum computing teams, benchmarking and testing against existing tools.

I published a paper about the software on arXiv (Simulating Quantum Computers Using OpenCL, arXiv:1805.00988). After this, integration with IBM's quantum computation framework was proposed/completed. This allows anyone to use the simulator in their own experiments with ease.

During final benchmarks the simulation software was up to 15 times faster than conventional simulators. This confirmed my initial hypothesis.

The software has direct applications in the verification of quantum devices, quantum algorithm design and investigations of quantum supremacy. The completed simulator is open source and available for use.

[STAND 26] Title of Project	**ARE THE NUMBER OF CANOEISTS NOT DISINFECTING THEIR EQUIPMENT AFTER USE CONTRIBUTING TO THE SPREAD OF *APHANOMYCES ASTACI* IN IRISH WATERS?**
Students	Chloe Johnston, Tara Kelly
School	Loreto Secondary School, Balbriggan, Co. Dublin
Teacher Mentoring Project	Niamh McNally

Abstract

We conducted a study to see if the canoeists that were not disinfecting their equipment after use were contributing to the spread of the Crayfish Plague in Irish rivers and lakes. To evaluate this risk we created an online questionnaire with the members of 75 canoe clubs in Ireland. We did this in order to investigate how frequently their equipment was disinfected, their locations of activity and how regularly they paddled per fortnight. We used this specific time period because we are aware that this is the survival time of an Oomycota (water mould) on the underneath of a boat.

Our results indicate that 45.39% of canoeists were paddling once a fortnight or more and were not washing their gear properly. Of this, 54.69% were canoeing in 2+ catchments in Ireland. This information outlines the time period that a range of invasive non-native species as well as aquatic pathogens have the ability to survive in damp or saturated conditions. This, along with the frequency with which canoeists are disinfecting their gear in the correct manner provides the fact that these numbers of individuals could be acting as vectors for the spread of this fungus.

We are aiming to create more public awareness about this topic, directed at canoeists and their canoe clubs. We have also devised a possible solution to this problem. This is to ensure that an increased number of those canoeing will make it a priority to disinfect their gear after use. By doing this our crayfish population can be safeguarded for future generations.

SciFest@NorthWest(NI) 2018

[STAND 27] Title of Project	**THE DEVELOPMENT OF A SIMPLE WOUND DRESSING THAT CAN INDICATE INFECTION**
Student	Kayleigh Doherty
School	St Mary's College, Northland Road, Derry, BT48 0AN
Teacher Mentoring Project	Ann Blanking MBE

Abstract

This project is about developing and testing a simple, inexpensive wound dressing that can indicate if an infection is present at an early stage. This would be important for burn victims, diabetics or those at risk of superbug infection such as MRSA.

Dressings were tested both with and without the use of hydrogels.

The wound dressings were impregnated with various acid/base indicators. The theory being that if infection was present the bacteria would emit carbon dioxide gas which would be absorbed by the moist dressing to become carbonic acid and thus induce a colour change in the indicator.

The conventional dressings and hydrogel indicators were tested using hydrochloric acid and marble chips (calcium carbonate) to generate carbon dioxide to determine if the carbon dioxide given off during the reaction would cause a colour change.

The wound dressing incorporating hydrogel impregnated with universal indicator solution was successful in indicating a pH change due to the carbonic acid formed from the carbon dioxide in the moist hydrogel.

Conventional dressings were unsuccessful as they were not moist enough to allow carbonic acid to form.

The dressings were also tested on respiring bacteria (E.coli 12) as it was hoped that the carbon dioxide emitted during respiration would cause a colour change. The results showed that red cabbage and litmus were ineffective as too were the conventional dressings.

Universal indicator in hydrogel was the best indicator to be used in the wound dressing as it produced a colour change from yellowish green to orange indicating a weak acid formed from carbon dioxide reacting with the water in the universal indicator solution.

SCIFEST 2018

BOSTON SCIENTIFIC MEDICAL DEVICES FINALISTS

PROJECT ABSTRACTS

SciFest@NorthWest(NI) 2018

[STAND 27] Title of Project	**THE DEVELOPMENT OF A SIMPLE WOUND DRESSING THAT CAN INDICATE INFECTION**
Student	Kayleigh Doherty
School	St Mary's College, Northland Road, Derry, BT48 0AN
Teacher Mentoring Project	Ann Blanking MBE

THIS PROJECT IS ALSO A NATIONAL FINALIST

Abstract

This project is about developing and testing a simple, inexpensive wound dressing that can indicate if an infection is present at an early stage. This would be important for burn victims, diabetics or those at risk of superbug infection such as MRSA.

Dressings were tested both with and without the use of hydrogels.

The wound dressings were impregnated with various acid/base indicators. The theory being that if infection was present the bacteria would emit carbon dioxide gas which would be absorbed by the moist dressing to become carbonic acid and thus induce a colour change in the indicator.

The conventional dressings and hydrogel indicators were tested using hydrochloric acid and marble chips (calcium carbonate) to generate carbon dioxide to determine if the carbon dioxide given off during the reaction would cause a colour change.

The wound dressing incorporating hydrogel impregnated with universal indicator solution was successful in indicating a pH change due to the carbonic acid formed from the carbon dioxide in the moist hydrogel.

Conventional dressings were unsuccessful as they were not moist enough to allow carbonic acid to form.

The dressings were also tested on respiring bacteria (E.coli 12) as it was hoped that the carbon dioxide emitted during respiration would cause a colour change. The results showed that red cabbage and litmus were ineffective as too were the conventional dressings.

Universal indicator in hydrogel was the best indicator to be used in the wound dressing as it produced a colour change from yellowish green to orange indicating a weak acid formed from carbon dioxide reacting with the water in the universal indicator solution.

SciFest@IT Tralee 2018

[STAND 28] Title of Project	**AN INVESTIGATION INTO USING ANTIPROTONS FOR CANCER THERAPY**
Students	Diana Meriakri, Jessica Murphy
School	Mercy Secondary School, Mounthawk, Tralee, Co. Kerry
Teacher Mentoring Project	Eimear Nolan

Abstract

Our project is the study of antiproton therapy, a form of external beam cancer treatment that kills cancer cells using antiprotons. The purpose of the project was to research and analyse the physics of antiproton therapy, and the ways in which we could make it feasible in the future.

Our main topics of research were proton and antiproton therapy, antiprotons, and how to reduce the production cost. Our research method consisted of gathering information from different articles and journals and piecing it together to form a concise and accurate literary review of antiproton therapy. We considered the physical aspects of antiprotons, the biological and clinical aspects of antiproton therapy, and the cost aspects, such as how to increase antiproton production as a by-product of nuclear reactors. We also compiled the various equations that are relevant to the dosimetry of antiproton therapy.

We gathered our results from many different sources. They show the results of antiprotons in killing cells compared to other forms of radiation in real-life experiments. Antiprotons have many advantages over the particles they were tested against.

Antiprotons are the particles that cause the least damage to healthy tissue and most damage to the targeted tissue. Antiproton therapy offers special advantages in cases of the recurrence of cancer. It also includes the advantage of real-time imaging using charged pions, which track the antiprotons in the body.

We concluded that by using machines with a smaller beam range, producing antiprotons as a by-product of nuclear reactions and using more energy-efficient machinery such as the 32-Tesla all-superconducting magnet, production costs are lowered.

SciFest@ITS 2018

[STAND 29] Title of Project	**LIFELINE: SAVING LIVES ONE BEEP AT A TIME**
Student	Eimear Kearins
School	Ursuline College, Finisklin, Sligo
Teacher Mentoring Project	Anthony Carolan

Abstract

Approximately 13 people die every day in Ireland from a cardiac arrest. CPR (cardio pulmonary resuscitation) is used to save a life when a cardiac arrest occurs, and it can increase survival chances by up to 74% if done correctly. I spent the summer teaching CPR and I noticed that students were giving chest compressions at varying rates. After research I discovered this is a huge problem as, if compressions are given at an incorrect rate (correct: 120/minute), the chance of survival decreases drastically. Thus, I hypothesised that there is a need for an application which can guide CPR givers to give the correct number of chest compressions during CPR. After further desk research I found out that approximately 80% of CPR givers gave CPR at an incorrect rate.

Lifeline provides a rhythmic, metronomic beating sound at 120 beats/minute for a CPR giver to follow. By following this sound the CPR giver will give the recommended 120 compressions per minute, therefore increasing the chance of survival. The application also provides a call button to contact the emergency services and a defibrillator locator. Essentially, it contains everything you need in the case of a cardiac arrest, regardless of whether you know how to give CPR or not.

Testing the app gave rise to a 100% success rate with all participants giving between 119-121 compressions/minute. Without the app, only 2 gave between 100-120 compressions/minute.

In conclusion, I have created an application that will greatly improve the success rate of CPR. The future is CPR, let's make sure it's done right – using *Lifeline*.

SciFest@LIT Thurles 2018

[STAND 30] Title of Project	**THE HEAR-BAND**
Students	Laura Kennedy, Caitríona Ryan, Aoife Butler
School	St Joseph's College, Borrisoleigh, Thurles, Co. Tipperary
Teacher Mentoring Project	Mary Gorey

Abstract

We came up with the idea when one of our team members, Laura, was out playing football with her sister and she was telling her not to hit the ball near her head or, if it started raining, she would run inside.

Playing contact sport can be difficult for her as she always must be aware of potential dangers to her hearing aids, which can hinder her confidence in going into tackles or being outgoing whilst playing the sport. These hearing aids also can't get wet, as it will cause damage to the processor. This can be an annoyance to players when they are playing in unpredictable weather. Because of these problems we decided to design a protective piece of sports headgear that would protect hearing aids while playing sports or out in the rain. While researching our project we found out that many people face these problems.

We made our headband out of the fabric neoprene. We used this to make our headband because it is waterproof, soft, and comfortable. We pulled the material in different directions to see which way would stretch more. So, we went with the side that stretched the most but that it also went back to its original size.

SciFest@CIT 2018

[STAND 31] Title of Project	**VISUAL COMMUNICATION DEVICE TO PROMOTE PATIENT PARTICIPATION AND WELLNESS DURING MAGNETIC RESONANCE IMAGING**
Student	Nicole Marinos
School	Christ King Girls' Secondary School, South Douglas Road, Cork
Teacher Mentoring Project	Denise Quilter

Abstract

80 million MR procedures are performed worldwide each year. Research shows the narrowness of the bore, movement restrictions and noises generated by the scanner can create significant anxiety in patients. To obtain the highest quality images, patients are required to remain completely still during the scanning process. Remaining still under these conditions can prove challenging and stressful for many patients.

Patient movement causes a blurring of a radiographic image known as motion artefacts. Motion artefacts compromise image quality and may interfere with interpretation. Some 2 in every 5 scans have motion artefacts, and 1 in 5 need repeat sequences. The cost of motion artefacts in Ireland is estimated at €12 million per year. Research estimates that 14.3% of patients require sedation to complete the examination at an additional cost of €36 million per year.

After extensive research it is clear that patient co-operation is the key to reducing motion artefacts. I want to shift the focus from current practices that distract and entertain the patient to encouraging patient co-operation. Having consulted with MRI experts to identify different communication solutions and investigated the technical requirements to function within the constraints of an MRI environment I have designed the "siia" patient goggles, Scan Instruction & Information Assistant. The goggles focus on patient inclusion to enhance patient participation through real time instruction and guidance on each imaging sequence while in the scanner bore. The goggles isolate the patient's surroundings, allow the inclusion of personalised information to help reduce anxiety and encourage the successful completion of the examination.

SciFest@GMIT 2018

[STAND 32] Title of Project	**A DUAL SENSOR, STEREO-FEEDBACK HEADSET FOR THE VISUALLY IMPAIRED**
Students	Aibhe Regan, Niah McCarthy
School	Presentation College, Athenry, Co. Galway
Teacher Mentoring Project	Caroline Carr

Abstract

The hypothesis of this project is that an artificial system could be effective in assisting the visually impaired and could be mastered in a relatively short time of ten hours' training.

We built a headset sensor system whereby the sensors are mounted at the front of a headset facing forward and the speakers are positioned over each ear. A non-intrusive clicking is used to communicate with the user and the clicking frequency increases as an object gets closer. We programmed a Raspberry Pie controller in Python to control the whole system. Two sensors are used – one infrared and the other ultrasonic. The two sensors behave differently, and we make use of this by giving the user stereo feedback with each sensor feeding a separate ear. The IR sensor has a narrow beam and the US sensor a broad beam and their effective ranges are different. With practice, the user learns to use this different behaviour of the two sensors to provide detailed information about their environment, including object location, distance, hardness, dimensions, etc.

To test the effectiveness of the system several blindfolded candidates were given specific, identical training and then subjected to a series of tests where they had to identify various obstacles and understand their distance from the test objects. Finally, we consulted a blind friend, and tested various subjects on their ability to navigate through complicated and unfamiliar obstacle courses. This testing demonstrated the effectiveness of the system when the user had received less than ten hours' training.


SciFest
festival
open to all
science through
SciFest
festival of science
all second-level students
courages a love of science
based learning
ovides an opportunity
ts to display
scientific
scifest.ie
SciFest 2018
Best Communication Award
newstalk


REwire
THE PROBLEM
2,617
RESULTS
TOOLS
76%
69%

SCIFEST 2018

BROADCOM MASTERS AWARD FINALISTS

PROJECT ABSTRACTS

SciFest@DCU 2018

[STAND 33] Title of Project	**WHICH PAPER SHOPPING BAGS DECOMPOSE MOST EFFICIENTLY?**
Student	Aoife McMahon
School	Santa Sabina Dominican College, Sutton, Dublin 13
Teacher Mentoring Project	Paul Nugent

Abstract

In recent years, there has been a lot of emphasis put on the fact that plastic bags take up to one thousand years to decompose. There has been a huge increase in the amount of recyclable paper bags being used instead of plastic ones.

My project is an investigation into which paper shopping bags decompose most efficiently. I have selected bags distributed by seven popular shops in our community. I constructed an indoor composter and left a sample of each bag to decompose over five weeks. I then measured the loss in area of each sample.

I found very interesting results based on the chemicals and inks used during the manufacturing process.

I wish to promote the composting of paper bags as it is much more environmentally friendly. It is also a more energy efficient method of recycling compared with breaking down and processing by mechanical means.

SciFest@DkIT 2018

[STAND 34] Title of Project	**AN INVESTIGATION INTO SOUND POLLUTION IN MY ENVIRONMENT**
Student	Roisin Murtagh
School	Eureka Secondary School, Kells, Co. Meath
Teacher Mentoring Project	Mary Byrne

Abstract

We are exposed to sound constantly throughout our lives. The physical and social environments that we experience everyday have varying levels of noise. Noise disturbs sleep and increases stress, increasing the risk of heart disease and high blood pressure.

I wanted to investigate the problem of noise pollution and find out more about levels of noise that I experience in my daily life in the countryside. Using a sound meter app (ABC Apps) on my smartphone I measured the decibel level over a 30 second period, periodically throughout the day over 5 weeks.

The decibel levels recorded ranged from 14 dB (safe) to 87 dB (negative impact on health). Analysis of results showed that I experienced decibel levels over 40 dB every day. Cars and humans contributed a lot of this. It would be wise to have some quiet time every day to counteract the high levels of noise we experience.

SciFest@ITB 2018

[STAND 35] Title of Project	**LASERS: A SOLUTION WITHOUT A PROBLEM**
Student	Jack Crushell
School	St Vincent's Castleknock College, Castleknock, Dublin 15
Teacher Mentoring Project	Tom Tierney

Abstract

My project is about lasers, how they work, how they could work, how they are used and how they could be used. I will show how they work and how they are applied in everyday life in objects such as cd players, laser measures and barcode scanners.

I will try to find a way to find and map the contours of an object using lasers. I will also try to map a room with lasers. I found that these could be useful as NASA uses a similar (if much more refined and hi-tech) method to map Mars' moons, Phobos and Deimos.

SciFest@ITS 2018

[STAND 36] Title of Project	THE INVESTIGATION OF HOW MICROWAVE RADIATION AFFECTS LIVING ORGANISMS
Student	Éabha Kenny
School	Scoil Muire gan Smál, Convent of Mercy, Roscommon Town, Co. Roscommon
Teacher Mentoring Project	Padraig Harlow

Abstract

Today we are surrounded by radiation. Radiation can come from many sources – light, heat, energy, etc. My project will investigate if microwave radiation influences living organisms, in this case radish plants. I will expose 200 radish seeds to 0, 5, 15 and 30 seconds of microwave radiation (50 seeds per group) before planting them.

The microwave oven I am using is a 900 W oven. I will examine the radishes to see if the microwave radiation has any effect on them. I will also record the daily height for each radish. Once matured I will measure the diameter of the radishes to see the effect, if any, that the microwave radiation has on the radish plants' growth.

SciFest@IT Tralee 2018

[STAND 37] Title of Project	**THE REAR GUARD**
Student	Lily-Sue Eyers
School	Killorglin Community College, Killorglin, Co. Kerry
Teacher Mentoring Project	Kevin Foley

Abstract

My project is aimed at investigating road safety for cyclists and the viability of a traffic alert system which could alert cyclists and other road users to the proximity of motor vehicles.

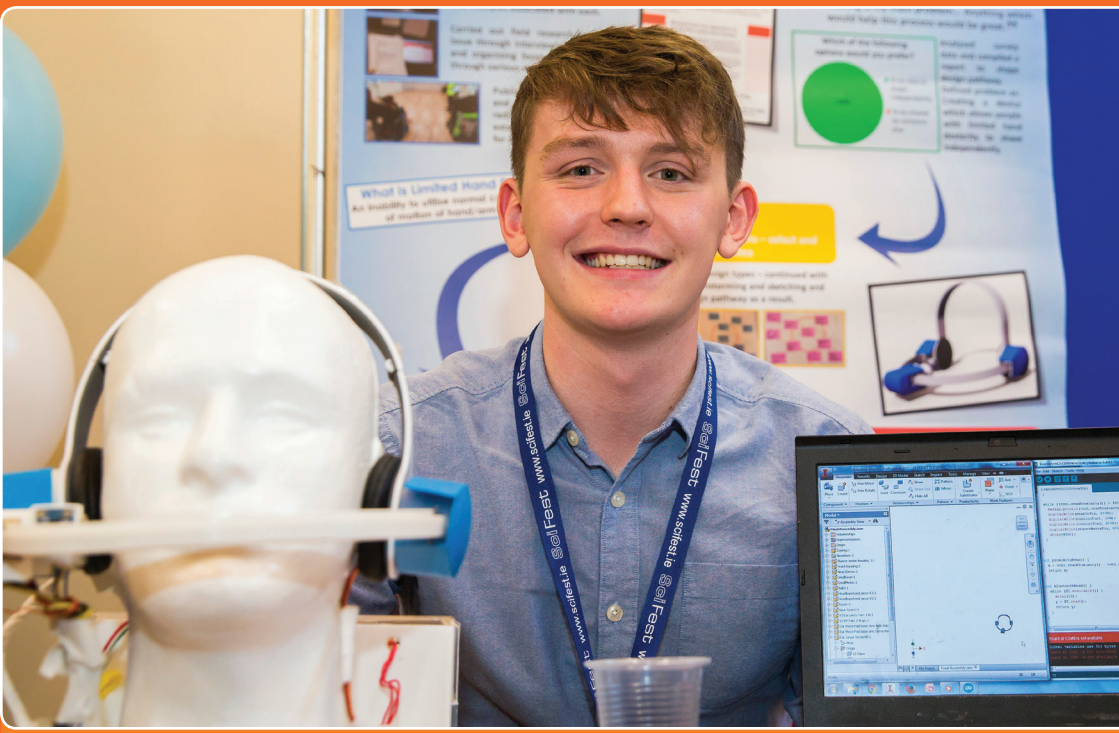
A public survey was carried out to assess opinions of both motorists and cyclists of road safety, awareness of other road users and the potential for a proximity alert system. Using the technology of ultrasonic detection, a basic design was then made which could be fitted into a rucksack or helmet. It could then be used by cyclists to alert them to approaching traffic and its proximity, so that a collision could be avoided.

Since SciFest 2018 I have developed this project to include a visual warning, which may alert motorists to a cyclist in front of them. I have also been looking at educational aids for students to help them understand the rules of the road and road safety.

SCIFEST NATIONAL FINAL

PREVIOUS WINNERS

2011-2017



SciFest 2017
SFI Intel ISEF
AWARD WINNER

SciFest@ITS 2017

[STAND 38] Title of Project	DESIGNING A FACIAL SHAVING DEVICE FOR PEOPLE WITH LIMITED HAND DEXTERITY
Student	Aaron Hannon
School	St Muredach's College, Ballina, Co. Mayo
Teacher Mentoring Project	Kevin Boyle

AWARD AT INTEL ISEF 2018 IN PITTSBURGH, PENNSYLVANIA

1ST Place in the Embedded Systems Category

SciFest 2017
Berlin Long Night
of Science
AWARD WINNERS

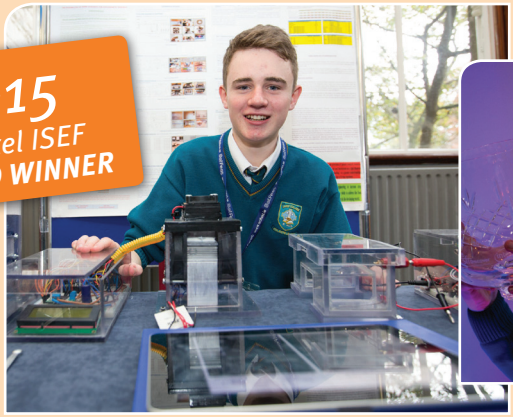
SciFest@LIT 2017

[STAND 39] Title of Project	**HEIGHT ADJUSTABLE CRUTCH**
Students	Thomas Curtin, Dylan Moloney
School	Desmond College, Newcastle West, Co. Limerick
Teacher Mentoring Project	Donal Enright

2016
SFI Intel ISEF
AWARD WINNER

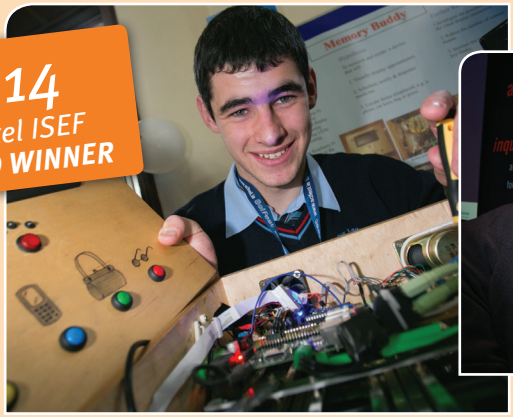
Caolann Brady

2015
SFI Intel ISEF
AWARD WINNER



Louis Madden

2014
SFI Intel ISEF
AWARD WINNER



Christopher Carragher

2013
SFI Intel ISEF
AWARD WINNER

Paul Clarke

2012
SFI Intel ISEF
AWARD WINNER

Simon Bluett

2011
SFI Intel ISEF
AWARD WINNER

Eoghan Flynn,
Ruairi O'Neill

The SciFest 2018 Team

Sheila Porter	SciFest Founder and CEO
George Porter	SciFest CFO
Hugo Rowsome	SciFest Project Manager
Virpi Lynch	SciFest Operations Manager
Anne Lynch	SciFest Schools Liaison Officer
Tim Regan	SciFest Schools Liaison Officer

REGIONAL COORDINATORS

Prof. Hugh McGlynn Ms Norma Welch	Cork Institute of Technology
Mr Ciarán O'Leary Dr Julie Dunne	Dublin Institute of Technology
Dr Eilish McLoughlin	Dublin City University
Dr Edel Healy	Dundalk Institute of Technology
Mr Kevin Healion	Limerick Institute of Technology Thurles
Ms Marie Walsh	Limerick Institute of Technology Moylish
Dr Cormac Quigley	Galway-Mayo Institute of Technology
Dr Larry McNutt Ms Aideen Hodges	Institute of Technology Blanchardstown
Dr Noreen Morris	Athlone Institute of Technology
Dr Dina Brazil	Institute of Technology Carlow
Dr Bill Crowe	Institute of Technology Sligo
Dr Brian Murray	Institute of Technology Tallaght
Mr Denis McFadden	Letterkenny Institute of Technology
Dr Sheila Donegan Mr Eoin Gill	Waterford Institute of Technology
Dr Joseph Walsh Ms Mary Horgan	Institute of Technology Tralee
Mr Mark Logue	St Mary's College, Derry

Partners and National Sponsors

SCIFEST PARTNERS

SCIENCE FOUNDATION IRELAND
BOSTON SCIENTIFIC
INTEL IRELAND
THE INSTITUTES OF TECHNOLOGY
DUBLIN CITY UNIVERSITY
ST MARY'S COLLEGE, DERRY
SENTINUS (NORTHERN IRELAND)

GOLD SPONSORS

ABBOTT IRELAND
THE BUSINESS EXCELLENCE INSTITUTE
BOTTLETOP MEDIA
SEAGATE (SCIFEST@NORTHWEST(NI))

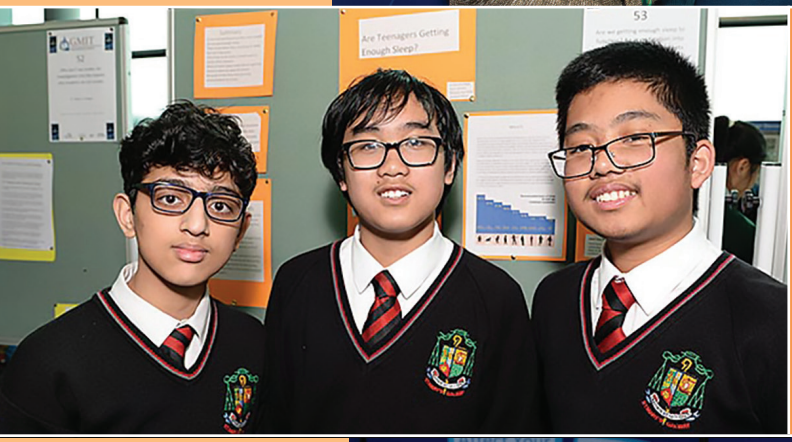
SILVER SPONSORS

NEWSTALK
BIOPHARMACHEM IRELAND
EUROPEAN SPACE EDUCATION RESOURCE OFFICE IRELAND (ESERO IRELAND)
IRISH SCIENCE TEACHERS' ASSOCIATION
DEPARTMENT OF FOREIGN AFFAIRS AND TRADE
ESB ENERGY FOR GENERATIONS FUND

BRONZE SPONSORS

ROYAL SOCIETY OF CHEMISTRY REPUBLIC OF IRELAND SECTION
INSTITUTE OF PHYSICS IN IRELAND
TECHNOLOGICAL HIGHER EDUCATION ASSOCIATION


SciFest
Science Foundation Ireland
For what's next
intel
Boston Scientific
Advancing science for life
Fest
www.scifest.ie


Are Teenagers Getting Enough Sleep?
53


Vision ?
RESULTS
EXPERIMENTAL METHODS
CONCLUSION

SciFest

T: (+353) 1 298 8312

M: (+353) 86 379 6143

E: info@scifest.ie

W: www.scifest.ie

9 November 2018