IN BRIEF

AWARD-WINNING YOUNG TECH ENTREPRENEURS

Ryan Yasin's Petit Pli clothing range employs the Negative Poisson's ratio so that garments can expand as the child grows

Three young engineers have been awarded prizes for entrepreneurial innovations in the worlds of fashion and business.

Ryan Yasin, a 24-year-old graduate of Imperial College London and the Royal Academy of Art, won the James Dyson UK Award for innovation in September for his children's clothing range that grows with the child. Frustrated by how quickly his baby nephew outgrew the outfits that he bought him, and aware of the financial and clothing waste inherent in the garment industry, Ryan invented Petit Pli clothing that can comfortably fit a child from six to 36 months. The Negative Poisson's ratio, which allows materials to expand in two directions at the same time, is key to the garments' expansion. Ryan

integrated the ratio's properties by using pleated structures that have been heat treated to ensure permanence. This resulted in clothes that expand bi-directionally, are wind- and waterproof, and can be folded down small enough to fit in a pocket.

Ryan was given £2,000 to develop his idea and entered into the running for the international James Dyson Award, which will give the winning contestant £30,000 to develop their idea.

Later in September, the Royal Academy of Engineering's Enterprise Hub hosted the final of its Launchpad Competition, which is aimed at promising young technology entrepreneurs in the UK, aged 16 to 25.

The winner of the competition was 25-year-old

Nick Schweitzer, who has invented a machine-learning tool to help brands uncover future ideas. He received the JC Gammon Award, a £15,000 prize, and membership of the Enterprise Hub, which includes the benefit of mentoring from Academy Fellows.

Nick has created a web-tracking and machine-learning technology that uses the internet to offer novel solutions to business problems. It identifies the future direction of an industry to help business innovation succeed where it is currently failing. The current methods used by agencies to identify client problems

and solutions – ranging from desk research to face-to-face interviews – can be slow and prone to error.

A separate People's Choice Award was presented following an audience vote and online voting in the run-up to the event. It was won by Brittany Harris for her technology Qualis Flow, a remote sensing and data management tool to help users manage their resources more sustainably. Brittany will receive £1,000 and membership of the Enterprise Hub.

More information about the Launchpad Competition and Enterprise Hub can be found at **enterprisehub.raeng.org.uk**

(L–R) People's Choice Award winner Brittany Harris, Launchpad Competition winner Nick Schweitzer and fellow finalist Jack Pearson of EngX

ENGINEERS CELEBRATED WITH STAMPS

The Royal Academy of Engineering's Taylor Centre features on one of the Isle of Man stamps that celebrate Dr John C Taylor's achievements

Two Fellows of the Royal Academy of Engineering have been recognised on recent issues of postage stamps: Dr John C Taylor OBE FREng FRS features on a set of six Isle of Man stamps, and Carlos Ghosn KBE FREng has been honoured on a Lebanese postage stamp.

Dr Taylor, an Isle of Man resident, has over 400 patents and invented the temperature- and current-sensitive safety controls that are used in small electric motors for appliances. He developed the controls that turn

kettles off once they have boiled, as well as the cordless kettle.

The set of stamps focuses on Dr Taylor's inventions and personal achievements. One stamp commemorates the bimetal kettle switch, which is used over a billion times a day worldwide. The Otter G switch, a small temperature-sensitive control that Dr Taylor invented in the 1960s, features on another stamp. A third stamp highlights Dr Taylor's commitment to inspiring the next generation of engineers, and includes an image of the

Academy's Taylor Centre, the home of the Enterprise Hub that opened in early 2017. A generous donation from Dr Taylor helped to make the Taylor Centre possible.

Ghosn, chairman and CEO of the Renault-Nissan Alliance, is the first businessman to feature on a Lebanese stamp. He was chosen by the national post office of Lebanon, which has a tradition of creating stamps that celebrate the successes of the country's citizens. Previous collections have featured political icons and women pioneers.

3D SCANS IDENTIFY OLDEST MARINE NAVIGATION ARTEFACT

State-of-the-art scanning technology has revealed the details of the oldest-known marine navigation tool, which was discovered in a shipwreck off the coast of Oman.

Professor Mark Williams, from the Warwick Manufacturing Group at the University of Warwick, used 3D scanning technology to discover markings on the astrolabe, a tool used by mariners to measure the altitude of the sun during voyages to determine their location.

The astrolabe is believed to date from between 1495 and 1500. The ship that it was part of, the *Esmerelda*, sunk during a storm in 1503. When it was recovered in 2014, the team who discovered the artefact, led by David Mearns from Blue Water

Recovery, thought it was an astrolabe but the navigational markings were not apparent. It had been under water for over 500 years so there was significant degradation to its surface caused by corrosion and wear. The scans revealed 18 very fine markings around the edge of the disc, almost invisible to the human eye, which were each separated by five degrees, confirming the recovery team's beliefs.

Professor Williams' team used a seven-axis manual measurement arm mounted with a 3D laser scanner, which can produce 80,000 measurement points per second along a laser stripe that is moved across the object's surface to characterise its geometry. This produced a high-density point cloud that was

The astrolabe's markings were difficult to detect after 500 years underwater (left), but the resolution of the 3D data enabled Professor Williams' team to zoom in and identify the marks

used to create a 3D model of the astrolabe accurate to within 0.05 millimetres.

Commenting on the finding, Professor Williams said: "This technology is typically used within engineering for the measurement of components and quality assurance. The portability, high accuracy and non-invasive nature of this

technology makes it ideal for the characterisation of rare artefacts."

Both Professor Williams and David Mearns appeared at an *Ingenia* Live! event in September 2017, where they spoke about the technology and how it had helped to identify the astrolabe as well as some of the other 3,000 artefacts discovered in and around the shipwreck.

ENGINEERING INNOVATIONS AT THE DESIGN MUSEUM

The Sewco wheelchair is just one innovation on display at the Beazley Designs of the Year Exhibition. The wheelchair's set of retractable tracks allow users to travel up and down steps without assistance

The Design Museum has launched its latest Beazley Designs of the Year exhibition. Now in its 10th year, the exhibition brings together 60 global projects that have made an outstanding contribution to design in six categories: architecture, digital, fashion, graphics, product and transport.

Across the categories, the designs include: a wheelchair that has a set of retractable rubber tracks, an earpiece that translates languages, and a text messaging service and online tool that provides updates and useful information to refugees.

The transport category features: Olli, the world's first 3D-printed self-driving bus, which can carry up to 12 passengers, and can work either independently or as part of network of smart vehicles; the Autonomous Rail Rapid Transit system, a self-driving electric vehicle that is guided by a double-dashed line painted on the street rather than tracks; and SeaBubbles, a water taxi created by two aeronautical engineers that has zero noise, no CO_2 emissions, and a self-charging dock that returns energy to the grid.

The winners of each category and an overall winner will be decided by a jury of industry experts in January 2018. The exhibition runs in London until 28 January 2018. Further information can be found at **designmuseum.org**

ROBOT-OPERATED FARM PRODUCES FIRST HARVEST

In early September, the world's first farm run by robots produced its first ever harvest, 4.5 tonnes of spring barley, using a fully autonomous combine harvester.

Hands Free Hectare is a site run by Harper Adams University in Shropshire. Everything in the process of growing the spring barley crop, including sowing, fertilising and collecting samples, was done by autonomous vehicles.

Instead of building the machines from scratch, the engineers bought commercially available agricultural technology and paired it with available open-source software used in hobbyist drones. They then fitted the tractors and harvesters with actuators and robotic arms that would allow them to control the machines remotely. The next step was making the machines run fully autonomously without any human supervision.

The vehicles' navigation is entirely based on GPS and they drive towards pre-determined targets, where there are different actions designed to be carried out.

The researchers believe that robotic technology will enable future farmers to improve their yields, something that will be necessary to feed the world's growing population. Herbicides and fertilisers could be distributed more accurately and only where they are needed. Moreover, the lighter machines would not damage

Hand Free Hectare's spring barley crop is harvested by an autonomous combine harvester

the soil as much as large heavy machinery does.

"At the moment, the machines used in agriculture are large, they operate and cover large areas of ground quickly but with it comes inaccuracy," explained Martin Abell, who works for precision agriculture firm Precision Decisions, which has been collaborating with the university on the project. "Small machines working with smaller working widths would provide a means to bring the resolution down. Instead of a 30-metre sprayer, you would have a six-metre sprayer and that is just the beginning of making things smaller."

The Harper Adams team plans to use the robotically harvested spring barley to make a limited edition of 'hands free' beer that would be distributed to the project's partners as a thank-you.

YOUNG ENGINEERS DESIGN FUTURISTIC SUBMARINES
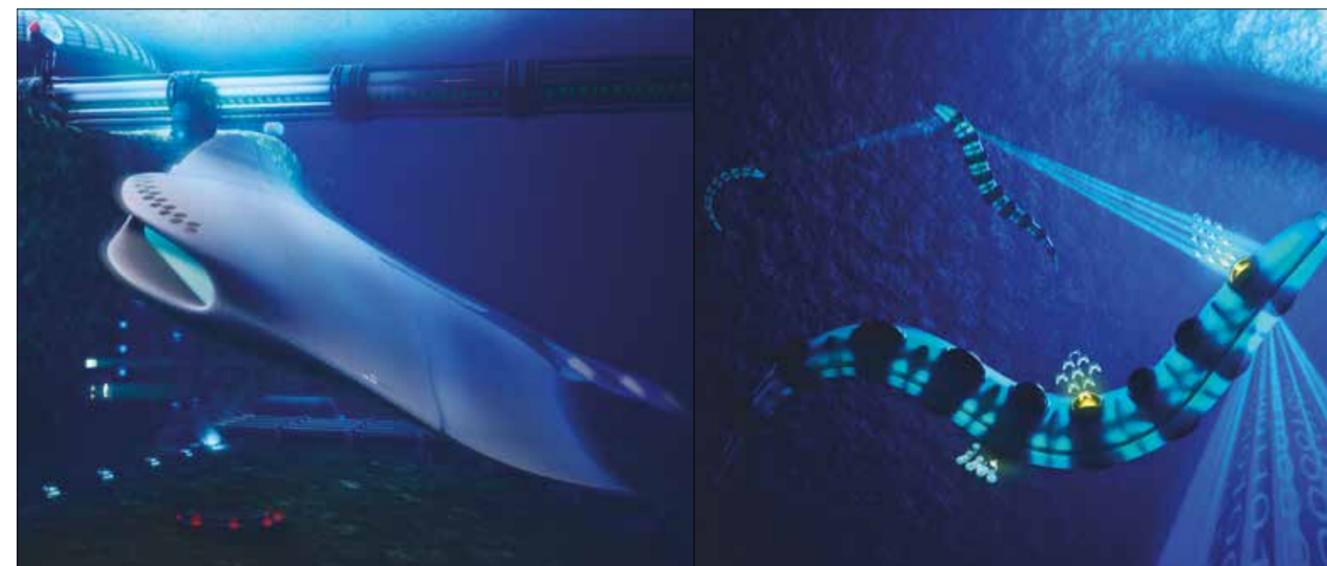
A digitally created image of what the proposed submarine would look like (left). The manta ray-shaped vessel would act as a mothership and deploy smaller underwater vehicles, such as the unmanned eel-shaped concepts (right)

The Royal Navy has unveiled several futuristic submarine concepts as part of its Nautilus 100 project, which aims to mark the 100th anniversary of the launch of the USS Nautilus, the world's first nuclear-powered submarine.

The Nautilus 100 project began in June 2017, organised by the Royal Navy in association with UKNEST (UK Naval Engineering, Science and Technology Forum). Rear Admiral Tim Hodgson, the Ministry of Defence's Director of Submarine Capability, challenged a group of UKNEST apprentices and graduates to imagine what the underwater battle space and Royal Naval submarine fleet might look like in 100 years, considering the new technologies that would be available to inspire the next generation of scientists and engineers.

The group of apprentices and graduates used this as a challenge for their futuristic submarine idea, creating a 'mothership' concept that encompassed complex systems, which could apply rapidly developing technology to make future submarines easier to construct, more effective and cheaper to run. This included a crewed mothership shaped like a manta ray that could change its form using smart materials. The group planned for the vessel to have a 3D-printed hull created from light but strong acrylic materials, and that it would have two propulsion systems: one for silent and efficient cruising for thousands of miles at up to 30 knots, which would be powered by hybrid algae-electric propulsion; the other for short bursts of high speed, powered by a Casimir force battery that uses zero-point energy to produce enormous power. The submarine would be cloaked in a pocket of air to reduce drag and enable it to travel at speeds of up to 150 knots. This air pocket would be formed by bubbles created by bow-mounted laser emitters boiling the water in front of the submarine.

The young engineers also designed smaller, autonomous vehicles that could be deployed from the manta ray submarine. This included eel-shaped underwater vehicles that could travel hundreds of kilometres using a sine wave propulsion motion. These would also be able to eject sensor pods equipped with 3D-printed micro drones that communicate with each other to provide detailed information on targets. Traditional torpedo and missile systems were imagined to be replaced by flying fish swarm drones that would be powered by microturbines in the air, with intake and exhaust vents that would open and then close as the drones reentered the water, where they would be powered by plasma batteries.

It is hoped that these concepts will inspire technology development projects and that some of the ideas will eventually be used in real-life applications.

Commander Peter Pipkin, the Royal Navy's Fleet Robotics Officer, said: "Today's Royal Navy is one of the most technologically advanced forces in the world, and that's because we have always sought to think differently and come up with ideas that challenge traditional approaches. If only 10% of these ideas become reality, it will put us at the cutting edge of future warfare and defence operations."