Results of Competition: EUREKA GlobalStars Japan

Competition Code: 2006_FIC_CRD_GJGS_OPEN

Total available funding is £1.5m

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
VECTOR PHOTONICS LIMITED	Bright Laser diOdes fOr aDvance metaL addItive maNufacturing systEms (BLOODLINE)	£698,862	£489,203
COMPOUND SEMICONDUCTOR APPLICATIONS CATAPULT LIMITED		£79,672	£79,672
University of Glasgow		£216,770	£216,770

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
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Project description - provided by applicants
Additive manufacturing (AM), or 3D printing, is an enabling technology and is the future of manufacturing in a digital, local, low turnaround time, personalised world. Industry 4.0 aims to update manufacturing practice bringing it into the digital world through creativity, intelligence and connectivity. Direct digital manufacturing by allowing user access to 3D printing machines, is a key driver for industry 4.0, providing custom parts with rapid turn-around and reduced environmental impact. Designing, ordering, and delivery is now possible within 24 hours. This expanding field has the potential to revolutionise many aspects of human life. The plastic and metal parts which can be manufactured through 3D printing can significantly reduce waste during the manufacturing process, as well as reduce the weight of parts shipped (reducing carbon emission for key sectors such as aerospace). These systems can also produce individually tailored parts for medical applications, such as orthopaedic implants, giving improved quality of life over a one size fits all approach. Selective laser melting (SLM), is a leading AM process for making metal parts. Current SLM systems repeatedly deposit a layer of metal powder on a bed, then a high-power laser is scanned over the surface, melting only areas which require metal deposition on the layer below, akin to writing with a pen. This is repeated layer by layer, building a complete 3D structure. The SLM systems are expensive, and \>60% of the cost of the parts manufactured in this way are time dependant, holding back the deployment of these systems. We will develop a rapid 3D printing technology using individually addressable direct diode (iADD) semiconductor laser arrays. The novelty in this work is the development of new laser systems based on photonic (light controlling) structures pattered on the nanoscale. These new laser arrays can allow an entire layer to be written in one go instead of one spot at a time. The full 3D parts can then be built between 4 to 10 times faster using our 1D array SLM system and between 10 and 100 times faster using our 2D array SLM system. We predict that this time and cost reduction will do for additive manufacturing what the printing press did for publishing.

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AMPHIBIO LTD	Delivering next-generation smart clothing: Developing safe, sustainable, smart life jacket	£498,975	£349,282
AZUL Energy Inc.		£328,621	£0

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Project description - provided by applicants
Smart clothing integrates wearable technology (sensors, wireless connectivity, flexible batteries) into garments. Smart clothing is driven largely by increasing demand to monitor user data in sports and fitness; however, like the broader textile and clothing industry (one of the most polluting global industries), smart clothing has not yet integrated sustainability into its core design principles. Furthermore, smart clothing has only reached maturity in relatively simple products (e.g., electrically heated garments). When it comes to smart outerwear/PPE, multiple product concepts have been developed integrating safety features including real-time localisation sensors. Prominent prototype concepts include jackets with integrated GPS such as O'Neill's NavJacket (2008) and Byborre's BB.Suit (2014). However, ultimately, these smart clothing concepts and prototypes are challenging to commercialise since they offer poor durability in real-world applications. To date, it has also proved difficult to manufacture these integrated products at scale. This project unites two close-to-market technologies - mono-material waterproof breathable textiles developed by Amphibio (UK) and metal-air batteries developed by AZUL Energy (Japan) - to deliver durable, safe, and sustainable next-generation smart clothing/PPE, which delivers performance in use and can be recycled at end-of-life. Amphibio is developing recyclable waterproof breathable textiles and clothing, which are manufacturable at scale using zero-waste, automated digital 3D knitting. Digital 3D knitting is already commercialised - Uniqlo launched a 3D knitted collection in 2017 and is now using 3D knitting to produce seamless cotton jumpers. However, 3D knitting has not yet been applied to produce waterproof garments since conventional waterproof breathable textiles rely on laminated multi-layer construction, which requires traditional cut-and-sew production. By producing our waterproof breathable textile from a single material, we can use digital 3D knitting to produce high-performance seamless garments. This is important since seams are the most common failure point of any waterproof garment. Metal-air batteries are receiving significant research attention because they have a high theoretical energy density and are a safer, more sustainable, and readily recyclable alternative to lithium metal/ion batteries. AZUL Energy has developed a green catalyst material for metal-air batteries that offers industry-leading durability and efficiency. Since metal-air batteries have a long battery life and can be produced in a thin-film and flexible form factor, they are ideal candidates for integrating into smart clothing. With EUREKA GlobalStars Japan support, we will integrate recyclable textiles and innovative wearable technology into a safe, sustainable, smart clothing/PPE demonstrator that delivers on the triple bottom line of People, Planet, and Profit.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
INGENZA LIMITED	Unleashing Putida: Biobased Methacrylates for a Sustainable Future	£649,322	£454,525

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Project description - provided by applicants
This project will apply world-class biotechnology to deliver the world's first bio-based commercially viable manufacturing process for methacrylate ester (MAE), the building block of poly-methylmethacrylate (Perspex(r)) with a game-changing improvement in sustainability. The collaboration of Mitsubishi Chemical Corporation (MCC --Japan), Lucite International, its UK headquartered subsidiary and UK based biotechnology SME, Ingenza Ltd thereby brings disruptive innovation to a product, currently manufactured solely using unsustainable feedstocks and chemical manufacturing processes. As market leaders with a one-third share of the annual global 3.7 million tons ($6.7bn) methacrylates market, MCC and Lucite possess unrivalled knowledge of the market potential and needs, as well as process scale-up and engineering expertise to provide a compelling route to market and a sound business plan for the project outputs. MCC's corporate vision demands a rapid realisation of biobased methacrylates being brought to the market, thereby fulfilling its sustainability commitments according to the corporation's KAITEKI principles of lower dependence on fossil fuel raw materials, reduced water consumption and overall lower carbon footprint. Ground breaking technology, including fluorescence activated cell sorting (FACS) based screening will select isolates of the microbe used in this fermentation based manufacturing process, meeting required performance criteria of product tolerance, productivity, operational robustness and feedstock conversion efficiency. The project will deliver the optimised production organism and a validated, scalable bio-manufacturing process that de-risks post-project progression to commercial piloting, in preparation for cost-competitive, sustainable manufacturing of one of the world's most important and versatile durable polymers. The project thereby aims to deliver a world-leading example of commercial industrial biotechnology success. _PERSPEX_(r) is a registered trademark of _Perspex_ International.

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