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ERC Proof of Concept grants 2015
Examples of projects

Harnessing bionic silkworms

The natural world often serves as inspiration for technological developments. Prof. Nicola Pugno has made it his goal to understand Nature's winning strategies and recreate them in order to develop some of the most cutting-edge materials currently out there. In 2012, he received an ERC Starting Grant to study bio-inspired hierarchical super nanomaterials, for example, to create the world's toughest fibres. This Proof of Concept grant was awarded to him to help further investigate the opportunities to produce one of his materials, a bionic silk fibre, on a mass scale.

Once again, Pugno's work will exploit a natural process, the production of silk, to optimise his manufacturing protocol. By literally feeding silkworms with specifically designed graphene nanomaterials, he will harness their ability to spin long fibres, enriched with these nanoreinforcements, to produce his super-strong and multifunctional bionic silk rapidly and efficiently.

Researcher: Nicola Pugno
Host Institution: University of Trento (Italy)
Project: Bionic silk with graphene or other nanomaterials spun by silkworms (SILKENE)
Initial grant: Bio-inspired Hierarchical Super Nanomaterials (BIHSNAM)
ERC funding: €150,000

Saving gothic vaults

For Dr David Wendland, from Dresden Technical University, the vaulted ceilings of gothic cathedrals hide few secrets. Since 2012 an ERC grant enabled him to research and reverse-engineer the processes of mediaeval building.

Now with his Proof of Concept grant he aims to transfer the results of his scientific endeavours into the practice of restoration of architectural heritage. By defining practical working procedures that reproduce the original design principles, documenting these procedures and disseminating this knowledge among specialists, Dr Wendland may significantly improve the maintenance and restoration of gothic buildings. He will establish links with workshops of several major cathedrals that engage in the conservation of late mediaeval and early modern stone constructions, and in keeping alive the historical technical knowledge of stone masonry.

Researcher: David Wendland

Host institution: Technische Universitaet Dresden (Germany)
Project: Late Gothic vaults and their complex stone members: Recovering historical design procedures, implementing knowledge in restoration practice s (REGothicVaultElements)
Initial grant: Design Principles in Late-Gothic Vault Construction - A New Approach Based on Surveys, Reverse Geometric Engineering and a Reinterpretation of the Sources (REGOTHICVAULTDESIGN)
ERC funding: €150,000

Increasing satisfaction and turnout of first-time voters

Across democracies, large proportions of young people fail to vote. Could making their first election a special occasion reverse this tendency and bring young people back to democratic life? According to Prof. Michael Bruter's ERC-funded research at the London School of Economics, participation in a voter's first two elections determines turnout and democratic engagement for their entire life. Increasing participation and satisfaction in their first election is therefore crucial, yet, democracies typically ignore the specificity of these young voters.

With his Proof of Concept grant, Prof. Bruter will test six techniques—which may include election packs, a mentoring system, dedicated help at polling stations, certificates, celebrations—to optimise the experience of first time voters before, during and after the vote, and maximise their satisfaction and turnout. He secured collaborations with election management bodies in four countries and will experiment these instruments during real elections.

Researcher: Prof. Michael Bruter
Host institution: London School of Economics and Political Science (UK)
Project: That Special First Time - Boosting Turnout and Satisfaction amongst First Time Voters (FIRSTTIME)
Initial grant: Inside the mind of a voter - Memory, Identity, and Electoral Psychology (INMIVO)
ERC funding: €150,000

Algorithms that save time and money

Is a precise answer always better than a slightly less detailed one? Not necessarily. Some complex problems could take forever to compute and only tie up vast IT capacity in the process. Where solutions are needed urgently, e.g. in business or manufacturing, near-enough can be more than enough.

With an ERC Starting Grant, Professor Piotr Sankowski, from Warsaw University, produced a library of approximation algorithms that help in such situations. They can be used in areas as varied as transport (decisions about vehicle routing) and manufacturing (drilling holes into circuit boards), saving time and money.

The Proof of Concept grant will develop e-commerce support services based on this library, with the eventual aim of setting up a spin-off company. “Approximation algorithms can be used to model trade or customer behaviour. We will work on this aspect with a number of companies involved in e-commerce,” Sankowski explains.

Researcher: Piotr Sankowski
Host institution: Warsaw University (Poland)
Project: Practical Approximation Algorithms - Proof of Concept (PAAL-POC)
Initial grant: Practical Approximation Algorithms (PAAL)
ERC funding: €150,000

From cosmic rays to lawnmower tracking

"If we are able to measure and localize particles moving at the speed of light over distances of several kilometres, we should be able to accurately track any human-made object emitting radio waves as well," says Prof. Heino Falcke, astrophysicist at Radboud University.

Prof. Falcke's team will use interferometric techniques from radio astronomy—developed with an ERC grant for tracking cosmic rays–to provide precise and robust localisation services for vehicles, robotic lawnmowers, parcels in warehouses, ships, or planes in the air. The techniques were developed for the Low-Frequency Array, a giant radio telescope array centred in the Netherlands and spreading throughout Europe.

Localizing ‘things’ as precisely as possible – from space or on the ground – has become an ever more important aspect of modern day life. However, there are circumstances where GPS does not work well. Astrophysics may offer a solution. The Proof of Concept grant will help Prof. Falcke, to develop a solid business case and work towards a start-up that can commercialize results of his frontier research.

Researcher: Heino Falcke
Host institution: Radboud University (Netherlands)
Project: Precision tracking with tools from astrophysics (AstroMetrix)
Initial grant: From Black Holes to Ultra-High Energy Cosmic Rays: Exploring the Extremes of the Universe with Low-Frequency Radio Interferometry (LOFAR-AUGER)
ERC funding: €150,000

Revolution in wound healing

Serious burns don't have to mark patients for their whole lives. In her ERC Starting Grant project, Prof. Ursula Mirastschijski has developed a novel drug-based treatment to prevent excessive scarring and to treat chronic wounds based on the use of medical inhalants. Now, with the help of her Proof of Concept

grant, she will carry out preliminary clinical tests to verify the safety and the market potential of the new therapy.

The inhalants used in the treatment are pulmonary surfactant, i.e. lipoproteins produced by lungs that help reduce surface tensions. Until now, they have been used to treat respiratory diseases in preterm infants, but Prof. Mirastschijski's research showed that they can be also beneficial for wound healing and might reduce scars. If successful in clinical tests, this novel drug-based treatment could revolutionise wound healing.

Researcher: Ursula Mirastschijski
Host Institution: University of Bremen (Germany)
Project: Surface modulation of wounds: heal by inhalants! Novel drug-based treatment for excessive scars and chronic wounds. (SUMOWO)
Initial grant: Keratinocytes and Matrix metalloproteinases: driving force of skin wound contraction? (WOUND CONTRACTION)
ERC funding: €150,000

Nimble energy generation

Thermoelectric energy solutions, with their ability to convert temperature changes into electricity, are considered amongst the most promising technologies for energy harvesting. However, so far, these solutions are usually bulky and fragile. Professor Maarit Karppinen has received a Proof of Concept grant for the development of thin, flexible films that will increase the number of applications of thermoelectric appliances.

Karppinen and her team aim to use the new, layered structures created by tightly binding different organic and inorganic materials, exploiting their different individual properties. This will allow the development of films that can be sewn into fabrics, added to polymer materials or used as coatings.

Researcher: Maarit Karppinen
Host Institution: Aalto University (Finland)
Project: Novel Thermoelectric Energy Solutions based on Flexible Thin-Film Materials (TES-FlexThin)
Initial grant: Molecular-Layer-Engineered Inorganic-Organic Hybrid Materials (LAYERENG-HYBMAT)
ERC funding: € 150,000

Pick-and-choose solution for presbyopia

If you are older than 45 and reading this, you probably have presbyopia, Greek for "seeing like an old man". Many solutions to this condition exist, but doctors mostly work on a trial and error basis, and use their personal experience to determine what type of lenses fit the needs. Prof. Susana Marcos has

received a Proof of Concept grant to develop a simulator allowing patients to try out treatments before they are carried out.

Often trying different contact lenses over and over again can prove frustrating and time-consuming. In addition, some therapies can involve intraocular implants or corneal surgeries. The simulator will allow patients to test different types of commercial lenses and to see the world as they would after an eye operation, thus allowing them to pick the most comfortable solution.

Researcher: Susana Marcos
Host Institution: Spanish National Research Council (Spain)
Project: Simultaneous Vision Simulator for optimizing selection of presbyopic corrections (SimVisSim)
Initial grant: Bio-inspired optical corrections of presbyopia (PRESBYOPIA)
ERC funding: €150,000

Customizing chemotherapy

Choosing the appropriate chemotherapy treatment is based on criteria such as cancer type and patient physiology. Yet these factors, along with DNA mutations, are not the only ones to influence disease progression and response to chemotherapy. Epigenetic factors, which impact how the DNA sequence is read, can also regulate how sensitive the cell is to chemotherapy and contribute to resistance.

Dr Genevieve Almouzni has studied how alterations in epigenetic factors lead to cancer, and how one can exploit this information to improve treatment decisions, including predicting the response to particular chemotherapy drugs. With her Proof-of-Concept grant, Dr Almouzni and her postdoc Dr Zachary Gurard-Levin, along with oncologists and the pharmaceutical industry, aim to validate distinct epigenetic factors as biomarkers to help oncologists determine the chemotherapy drug that will most benefit the patient.

Researcher: Genevieve Almouzni
Host Institution: Institut Curie (France)
Project: Docetaxel, biomarkers, chromatin dynamics, breast cancer, companion diagnostics, precision medicine, personalized medicine (EPOCH28)
Initial grant: Epigenetic challenges in centromere inheritance during the cell cycle (ECCENTRIC)
ERC funding: €150,000

More information:

ERC website