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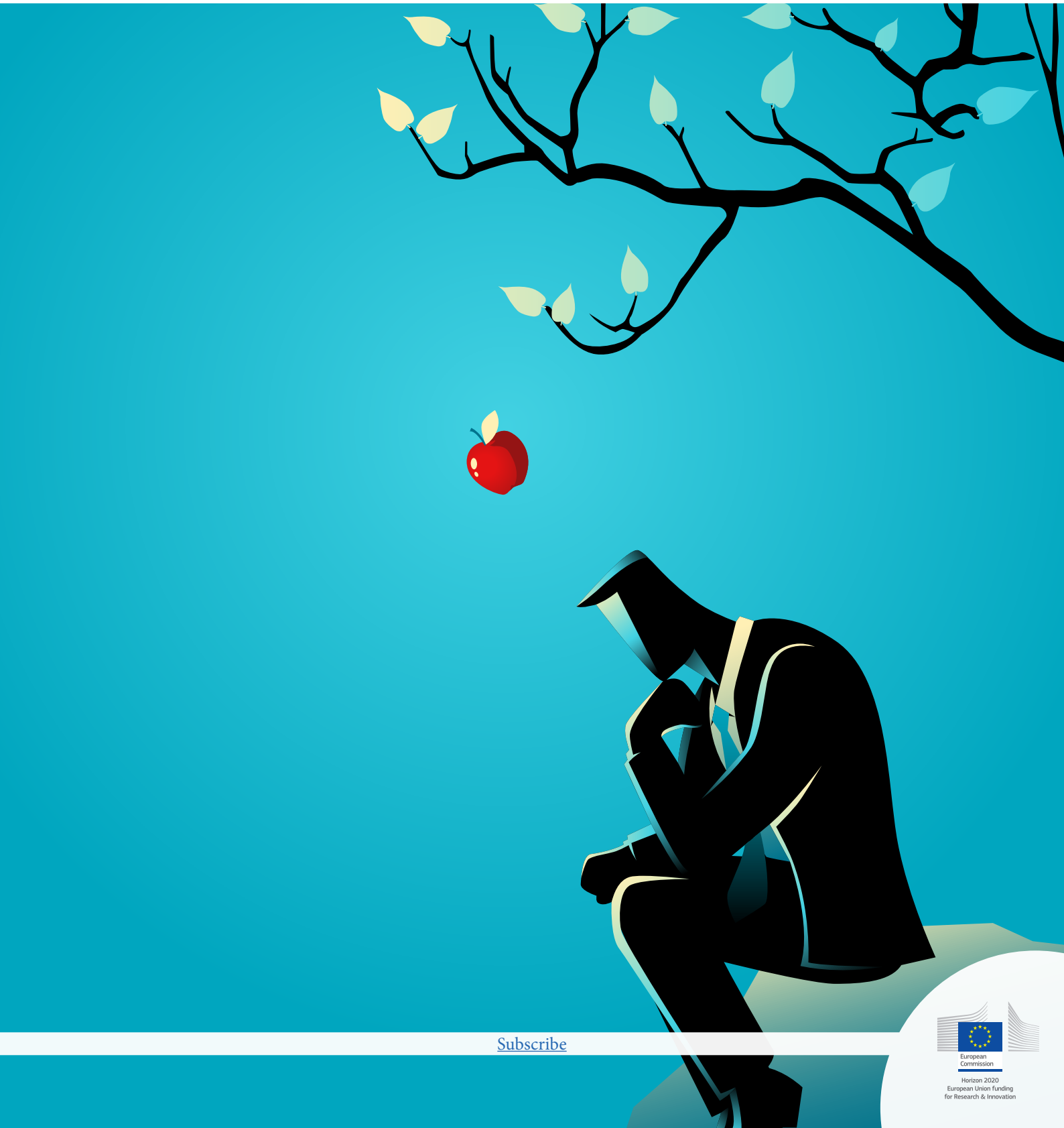
Newsletter of the European Research Council

Impact: 73% breakthroughs/ major advances

Tales of serendipity

10th anniversary celebrations continue



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Serendipity, a strange occurrence, an instance, that changes everything; a discovery that wasn't expected but that yields incredible results. Many times, serendipity has changed the way we live our lives for the better. Be it penicillin or the World Wide Web, the idea starts from something simple like a mistake, a mishap or a coincidence and snowballs into something unknown.

In 1945, engineer Percy Spencer, who at the time was employed by an American company specialised in military defence applications, was testing a magnetron. This machine, used for the development of radars during World War II, emits the same short-wave lengths that we use today to heat up our meals. The candy bar he was holding in his pocket melted and, soon after his discovery, popcorn was popping and being shared with his team members. The microwave oven had been invented.

One could think that the discovery of Percy Spencer opened the door for microwave ovens to enter our kitchens but actually, though very faintly, microwaves had always been there. In 1964, Arno Penzias and Robert Wilson, who at the time were employed by Bell Labs, a leading American scientific research and development company, were fine-tuning a supersensitive horn antenna originally built to detect radio waves that bounced off balloon satellites. The measurements of these faint radio waves required the elimination of the effects from all other sources. Penzias and Wilson observed that besides their thorough efforts a mysterious noise persisted in their receiver. They identified that the cause of this noise was radiation evenly spread over the sky. This led to the discovery of cosmic microwave background radiation, substantiating the cosmological model known as the Big Bang theory. Over the years, the detailed observation of the features of this radiation has become one of the backbones of physical cosmology.

The same forces that led to the invention of the very useful kitchen appliance or to the discovery of cosmic microwave background radiation, chance and a little luck, can also strike ERC grantees in their daily work. This issue of the newsletter is dedicated to the serendipitous results of blue sky research, as we will dive into some ERC grantees' unplanned discoveries. For instance, you will read about Prof. Achilleas Frangakis' research that led to new insights into how wounds heal as well as Prof. Yael Hanein's work on a new tool used in nerve damage rehabilitation. Dr Ohid Yaqub, on the other hand, focuses on the actual mechanisms of serendipity to try to harness its potential. The ERC is certainly creating fertile ground for serendipity to occur.

Over the last ten years, the ERC has supported the development of new ideas, pushing researchers to follow their curiosity wherever it may take them. This has often led to breakthroughs. We actually again have some solid proof of this now, as a new independent study shows that 73% of completed ERC-funded projects produced breakthroughs or major scientific advances. Find out more about these uplifting findings in this issue. They confirm the value of our approach, with scientific impact coming from bottom-up research.

These results are a motivation, in this year that marks an important anniversary for the ERC, to continue working in this direction in the years to come.

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Looking for one thing; finding another

Did you know that the Persian fairy tale "The Three Princes of Serendip" provided the inspiration for the first noted use of the word "serendipity" in the English language? In this story, the heroes are always making happy and surprising discoveries. In science, this concept of a pleasant surprise covers the mismatch between what the researchers expected to find and what they actually discovered, as introduced in this newsletter's editorial. It has given us innovations such as the microwave, Teflon, X-rays, penicillin, the World Wide Web and much more. What started off with a fairy tale, ended up as a byword for an influential idea in research policy-making and even headlining a recent ERC-funded project.

In the past decades, serendipity has played an important role in debates about the feasibility and desirability of targeting R&D investments. The founders of the ERC thought an EU body that would fund curiosity-driven scientific projects and give researchers complete freedom to explore, would also help bring about new and unpredictable scientific and technological discoveries, which ultimately could also trigger innovation and economic growth.

Overall, the idea that research can lead to valuable but unexpected outcomes has been around for a while. But how often do serendipitous discoveries actually happen? What is the nature and significance of such discoveries? Is serendipity pure luck or is a fair bit of wisdom also involved? Or is it merely the ability to be open to - and make the most out of - luck? Can we facilitate and manage serendipity? How often does targeted research actually hit the target? What does it all mean for R&D policy-making?

"*Researchers and policy-makers have been asking these questions for decades but, other than some famous examples, we don't really have strong evidence to draw on to support policy-making*" says Dr Ohid Yaqub from the University of Sussex. The project he is leading - *Serendipity in Research and Innovation* - was awarded an ERC Starting Grant this summer.

Dr Yaqub says we can observe and measure things previous scholars could not. "*The methods, tools and techniques for data analysis and theoretical understanding of research policy have improved. So, now we have a new framework to analyse the data, and we have access to large databases on grants, publications and patents.*" He and his team will look at a sample of grants, publications that come out of these grants and patents that cite these publications. Preliminary findings show that the happy discrepancies between researchers' proposals and their reported findings occur quite often.

It is becoming a key political question how we fund research in the best, most efficient way to maximise impact. There are choices to be made about the emphasis and balance between different modes of research funding. "*It's good that there are some funders under which serendipitous events would have been overlooked or inhibited, because sometimes it's important not to lose focus on an end goal*", Dr Yaqub says. "*But it's also good that there are funders like the ERC that do allow uncertainty and unexpected discoveries to happen and indeed encourage more open thinking. Clearly, it's vitally important to have diversity when it comes to research funders that allow researchers to be able to contribute to society in different and flexible ways.*" said Dr Yaqub.

Whilst he will be looking into some of the questions surrounding serendipity, a few ERC grantees have already experienced such happy mismatches for themselves.

Take for example Achilleas Frangakis from Goethe University Frankfurt. In his Starting Grant project, he used cryo-electron tomography, a state-of-the-art imagining technique, to visualise the architecture of cell adhesion. Though essential, this process in which proteins present on the cell's surface anchor to extra-cellular proteins allowing the cell to sense the external environment and respond to it, was poorly understood.

Prof. Frangakis was trying to describe how cells interact with the outside world, but instead he learnt a lot about how they interact with each other. In particular, during the process of wound healing, neighbouring cells lock together to seal a wound, a bit like a zipper would. "*It turned out that we had rediscovered a mechanism already known to happen during mitosis, another cellular process, but as a completely new concept for tissue sealing and healing*" stated the scientist, who has opened new paths into the study of wound reparation.

Prof. Yael Hanein from Tel Aviv University also had a bit of a "eureka" moment. Her work was investigating nanotechnology tools in the field of neuron stimulation for sight restoration. Using sophisticated and accurate carbon nanotubes, her Starting Grant project created a high-acuity artificial retina.

Through a spin-off of her project, she has developed an extremely thin electrode that can be worn as a tattoo and record muscle movement. The electrode, originally made as a research tool, has a variety of potential medical applications, from mapping facial expressions and recording emotions, to restoring damaged nerves and muscles, and studying neurodegenerative diseases. Further work is going into understanding whether the tool could provide a diagnostic tool for Parkinson's disease, an instrument to optimise artificial limbs or even a test for certain psychological disorders.

Researcher: Ohid Yaqub

Host institution: University of Sussex

Project: Serendipity in Research and Innovation (SIRI)

ERC funding: Starting Grant 2017 (€1.4 million for five years)

Researcher: Yael Hanein

Host institution: Tel Aviv University

Project: Functional nano Materials for Neuronal Interfacing Applications (FuNMaNIA)

ERC funding: Starting Grant 2012 (€1.5 million for five years)

Researcher: Achilleas Frangakis

Host institution: Goethe University Frankfurt

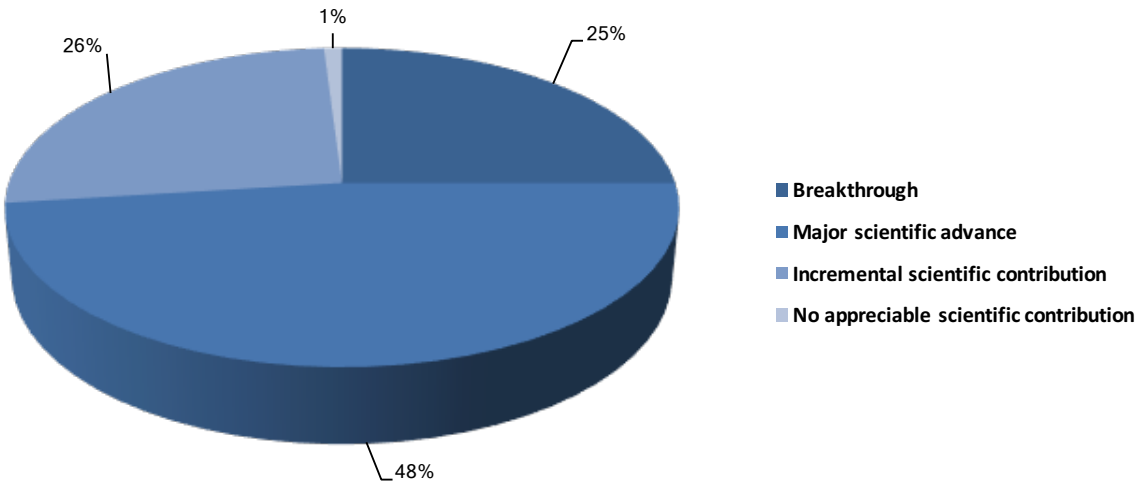
Project: Study of the molecular organization of cell junctions by cryo-electron tomography (JTOMO)

ERC funding: Starting Grant 2009 (€1.7 million for five years), Proof of Concept Grant 2012 (top up of €150,000)

ERC blue sky research continues to make an impact

73% breakthroughs or major advances

Impact study of ERC projects 2017



The outputs of ERC-funded research have proven once again to be of high scientific value, as a new independent study concluded. Some 73% of completed ERC projects led to major advances or breakthroughs. It shows that the ERC is achieving its goals of funding high-risk/high gain research and also stresses the high proportion of interdisciplinary research.

The pilot study announced last year and also commissioned by the ERC Scientific Council (see last year's article), was seen as a novelty as few funding agencies invest in assessing in-depth the scientific impact of the research they support. Subsequently, the Scientific Council requested this new independent qualitative evaluation, in which peer reviewers evaluated a random sample of 155 concluded Starting and Advanced Grant projects.

As in the pilot exercise, the analysis of projects was carried out by panels consisting of three independent high-level scientists each; two with experience as ERC panel member and one without any previous experience on an ERC panel. Next to marking projects, the evaluators also answered a series of questions related to scientific impact, new methods, interdisciplinary, and societal and economic impact of each project.

From this evaluation comes that 25% of the projects have led to scientific breakthroughs and another 48% were classified as leading to major scientific advancement. About 26% of the projects delivered an incremental scientific contribution, and only 1% had no appreciable scientific output. These findings confirm the results of the pilot exercise, yet with a slight improvement. One of the main conclusions is that the ERC indeed funds projects of a high-risk/high-gain nature, in accordance with its mission, and that such projects are more likely to lead to breakthroughs. It also highlights the interdisciplinarity of many ERC projects.

> ***I am pleased that this report delivers even slightly better results than the already very uplifting findings of the pilot study. It shows that the European Union's investment, through the ERC, into risky frontier research continues to pay off, triggering real breakthroughs. The pioneering work of ERC grantees is clearly leaving its mark on science and is already starting to benefit European citizens in countless ways, as this impact study strongly suggests. There are many more bright ideas to fund in Europe.***
>
> ERC President Jean-Pierre Bourguignon

The evaluation also found that impact went beyond scientific spheres, despite that this aspect was not taken into account at the time of funding. ERC research has the potential to benefit the economy and society at large, with nearly half of the projects already having had impact in this respect and more than three quarters predicted to have such impact in the medium and long term.

Similar reports, to be conducted on different samples of finalised ERC-funded projects, are foreseen for the coming years.

Read the study
Explore examples of ERC-funded blue sky research
Impact ERC research revealed (2016)

ERC10: the celebrations go on

The 10th anniversary activities of the ERC continue well beyond March 2017, when it celebrated in Brussels a decade of success. National and local happenings under the umbrella of the "ERC Week and beyond" initiative are still in full swing, extending the festivities to more than 160 locations to date. With this article, we highlight some from the summer, when several countries celebrated their national achievements and their outstanding grantees in style.

Finland

On 6 June, the National Academy of Finland held its annual Science Forum in Turku. Former ERC Vice President and Scientific Council member Mart Saarma was present, highlighting how Finland has maintained its eight position in terms of grants per capita after 10 years.

Spain

Spain has been very active throughout the ERC Week. Regional festivities continued with events in Madrid on 12 June, organised by the Consejo Superior de Investigaciones Científicas, and in San Sebastian on 14 June, under the patronage of the Basque Government. These were part of a rich calendar of more than fifteen events around the country. More are coming up, such as the regional celebration in Barcelona on 26 October.

Germany

This year was also big for Germany, which celebrated its 1000th ERC grantee Annika Jahnke, as well as the ERC's anniversary. The event took place in Berlin on 21 June, with the participation of ERC President Bourguignon and German Science Minister Johanna Wanka. Chancellor Angela Merkel, who was present at the Berlin launch of the ERC in 2007, contributed by video-message congratulating the ERC, and all the excellent researchers that have been a part of its success.

ERC event at CERN in Geneva

Switzerland

For its 60th plenary session, the Scientific Council met in Geneva in July. This provided a great opportunity to shine a light on Switzerland's achievements as an associated country to Horizon 2020. An event about the role of the ERC was hosted at CERN by Swiss State Secretary Mauro Dell'Ambrogio. Prof. Bourguignon and Scientific Council member Reinhilde Veugelers joined CERN Director Fabiola Gianotti in a round table about the ERC's past, while DG Research and Innovation Director-General Robert-Jan Smits provided an outlook on the next research framework programme.

More on the horizon

Several universities and research institutions also organised more local celebrations, putting their grantees in the spotlight. Paris Saclay, Imperial College London, ETH Zurich and TU Berlin all congratulated their ERC grant winners, both past and present, in June and July. The year is not yet concluded, with international events still taking place in Thailand, Argentina and Singapore, and at a European level in Denmark, Portugal, Netherlands and many more.

We want to thank again all those involved in the organisation of these festivities. Check the "ERC 10 years" website for new events and follow #ERC10yrs on social media to stay updated.

Celebrations in Germany

What's under the sea?

MARCAN

A box canyon, thought to have been formed by groundwater seepage, Wakanui coastline, New Zealand

With the ERC Scientific Council gathering for its first plenary in Malta later this month, it is timely to turn our eyes to a fascinating researcher from this country surrounded by sea. Ever since observing a map of a marine landslide as a young geology student, Dr Aaron Micallef was hooked on the beauty of the sea floor. Now, he works on understanding the forces that shape the Earth's landscapes, both above ground and below the sea level. His MARCAN project studies the impacts of groundwater on canyon formation in Malta and New Zealand. This investigation may reveal where we will be getting our drinking water in the future.

In the last 2.5 million years, sea water levels have mostly been lower than what they are today. This allowed large quantities of rainwater to infiltrate into the exposed sea floor, developing groundwater reservoirs. After sea water level rose, these reservoirs became trapped under the sea. Dr Micallef claims that offshore groundwater plays a part in the formation of large geological features, like submarine canyons. These structures are the most dramatic and widespread in the world. They serve as channels for the flow of marine currents, accumulating nutrients that attract biodiversity, as well as waste. He specifically focuses on describing and modelling the effect that the flow and seepage of offshore groundwater water has on the seafloor.

The first expedition involved a 4-week long oceanographic cruise in New Zealand

© Aaron Micallef, MARCAN project 2017

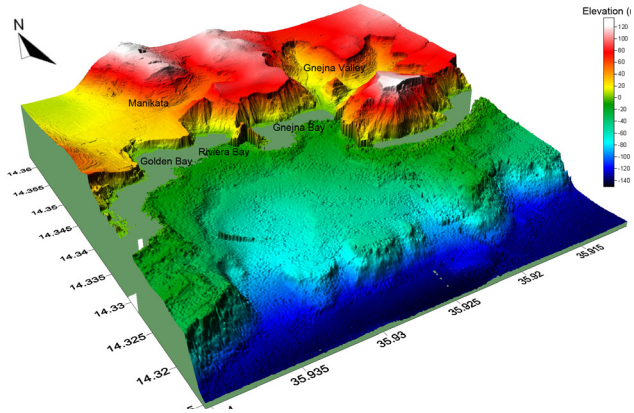
Outcrops of coralline limestone at the head of the box canyon in Gnejna, North-West Malta.

This year, in the course of a long ship expedition in New Zealand, the scientist and his team worked on retrieving samples to obtain an idea of the composition of the seafloor, as well as electromagnetic information on where these freshwater reservoirs are actually found. The new data will shed light on these geological processes, as well as on whether the reservoirs have the potential to provide drinking water, especially in areas that are already under much water stress.

"*Without the ERC funding I would simply not be doing this job,*" states Dr Micallef, who is based at the University of Malta. "*I would have had to leave, or I would mostly be teaching, since there is little local funding for projects like mine and for non-applied research.*" His Starting Grant project started in January this year, with the expedition to New Zealand in April 2017. He is preparing a second expedition around Malta in early 2018.

© Aaron Micallef, MARCAN project 2017

Scientist carrying out an electromagnetic induction survey to quantify sub-terrain resistivity and map the water table along the Wakanui coastline, New Zealand.



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Digital elevation model of the study area in the northwest of Malta.

Researcher: Aaron Micallef
Host institution: University of Malta
Project: Topographically-driven meteoric groundwater – An important geomorphic agent (MARCAN)
ERC funding: Starting Grant 2015 (€1.7 million for five years)
Website: http://www.marcan.eu/

ERC awards Starting Grants

On 6 September, the results of the 2017 Starting Grant competition were made public. This time, 406 early-career researchers, with a record number of 48 different nationalities and based in 23 countries across Europe, have been awarded a total of €605 million. The share of women was the largest ever in an ERC competition. Topics include for instance research on chronic infections or asthma, disaster management, network security and climate change.

President Bourguignon re-appointed

On 14 September, the European Commission announced the renewal of Jean-Pierre Bourguignon's mandate as President of the ERC. Prof. Bourguignon has led the ERC for almost four years, and will continue for two additional years, until the end of 2019. "*He has been vital for the continued success of the ERC*" stated Commissioner for Research, Science and Innovation Carlos Moedas. His leadership was also praised by the ERC Scientific Council.

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ERC plan for 2018

The ERC Work Programme, established by the ERC Scientific Council, was adopted on 3 August. It announced around €2 billion for ERC grants. The novelty this time around was the reintroduction of Synergy Grants, the funding scheme for groups of two to four scientists who jointly address ambitious research problems. Some 900 new grantees are expected to benefit from ERC funding next year across all schemes. They will employ an estimated 6,000 post-docs, PhD students and other staff members as part of their research teams.

Proof of Concept: second round

In the second round of this year's Proof of Concept call, 51 ERC grant holders were awarded funding. These top-up grants, worth €150,000 each, will help them to explore the commercial or innovation potential of the results of their frontier research. The selected projects cover a variety of innovative topics, ranging from new health therapies and the creation of detailed 3D maps of forest structures, to an ocean surveillance model for fish conservation.

Calendar of ERC calls

Grants open to researchers from anywhere in the world

Call for proposals*	Publication date	Deadline	Budget	Funding
ERC 2018 Starting Grant	3 August 2017	17 October 2017	€581 million	Up to €1.5 million per grant
ERC 2018 Synergy Grant	3 August 2017	14 November 2017	€250 million	Up to €10 million per grant
ERC 2018 Proof of Concept Grant**	6 September 2017	16 January 2018 18 April 2018 11 September 2018	€20 million	Up to €150.000 per grant
ERC 2018 Consolidator Grant	24 October 2017	15 February 2018	€550 million	Up to €2 million per grant
ERC 2018 Advanced Grant	17 May 2018	30 August 2018	€450 million	Up to €2.5 million per grant

*Researchers who wish to apply to one of the ERC calls can do so through the Participant Portal.

**Call open to ERC grantees only.

For more information regarding ERC Proof of Concept grants, please see the ERC Work Programme 2018

Candidates should apply with a host institution in an EU Member State or a Horizon 2020 associated country.

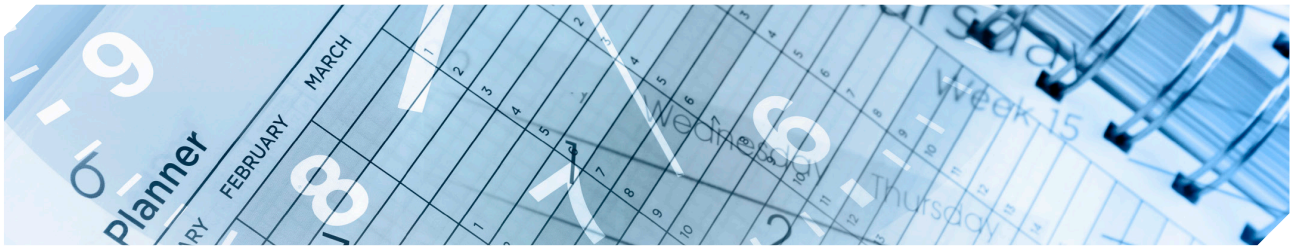
See further information on the Participant Portal.

Stay informed on the ERC website and the Participant Portal.

Information on the ongoing selection:

In the 2017 ERC Advanced Grant call, 2,166 applications were submitted. Results to be officially communicated in Spring 2018.

- The highest number of applications was submitted in the domain of Physical Sciences and Engineering (994 or 46%), followed by Life Sciences (630 or 29%), and Social Science and Humanities (542 or 25%).
- 18% of proposals were submitted by women – a slight improvement from the past years (16.5% in 2016, 17% in 2015)



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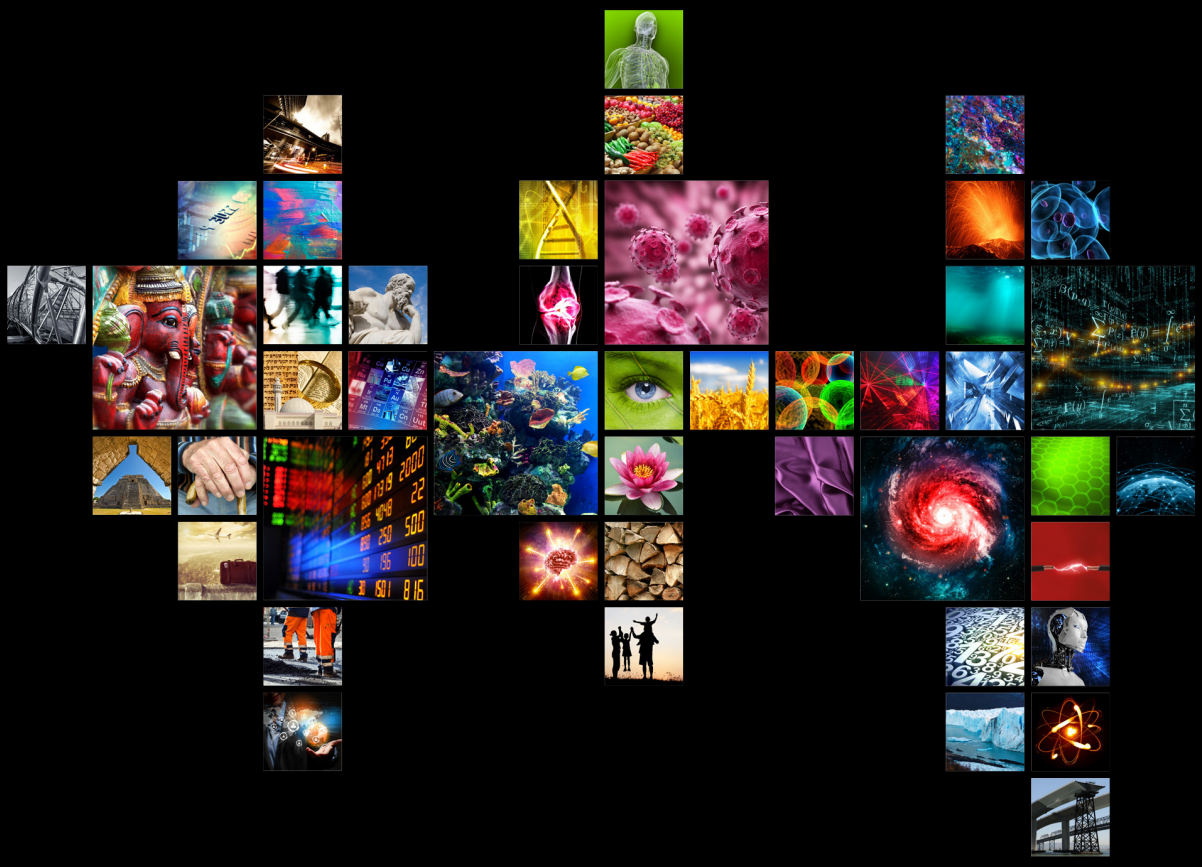

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