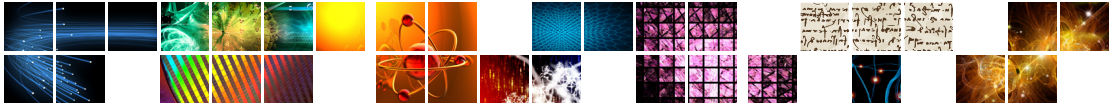




# ideas

European Research Council

Newsletter of the European Research Council



## Renewable energy in the spotlight

Investing in a green future

### What's on

Scientific Council goes local

### Focus on

Spain

### Interview with

Dr Wagemaker on  
longlasting batteries



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2014 • #3 (September)



## Editorial

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In a relatively short time, the ERC has been able to establish itself as a well-reputed institution funding excellent researchers in the EU and associated countries. I was therefore honoured to become a member of the ERC's governing body, the Scientific Council, in 2013. Since January 2014, I am also one of its three Vice-President, responsible more specifically for the domain Social Sciences & Humanities, a function which I have commenced wholeheartedly.

The Scientific Council is composed of twenty-two distinguished researchers from all scientific disciplines, coming from all over Europe. Its members represent the research community in Europe at large; that is, not any particular country. Nevertheless, we follow with great interest the developments in all states involved. In this issue of the newsletter, the spotlight is on my home country, Spain, where the ERC and its grants have received a great deal of attention.

The Scientific Council gathers around five times a year to discuss the ERC strategy. Three of these plenaries take place in the ERC premises in Brussels, and the remaining ones are spread across various places in Europe. The last gathering took place in Oslo (Norway) in June and the upcoming one is planned in Zagreb (Croatia) in October. Meeting outside Brussels is useful to establish direct contact, not only with policy makers, but also with the national research communities, which helps us better understand their needs. You will learn more about this in this issue.

A distinctive feature of the ERC is that it covers all disciplines and funds all research fields on equal grounds. There are no thematic priorities in our calls; it is truly investigator-driven. The way grants are allocated depends purely on the quality of the research projects proposed by individual investigators. In this respect, ERC-funded projects reflect Europe's excellence in research.

Project evaluation is performed in panels structured in three domains (Physical Science & Engineering, Life Sciences, and Social Sciences & Humanities; each domain being coordinated by one of the three Vice-Presidents), yet many ERC projects are covering several disciplines. In this particular issue of the newsletter, we will take a closer look at innovative research in the field of sustainable energy, showcasing projects at the forefront of Physics and Engineering.

I hope you will enjoy reading it.

**Prof. Núria Sebastián Gallés**  
ERC Vice-President

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## Research in the spotlight

### Investing in a green energy future

*Making sustainable energy more efficient is crucial for cutting greenhouse gas emissions, a major cause of climate change recognised as one of the most pressing global societal challenges. Numerous ERC grantees have chosen to develop innovative solutions for renewable energy: in this issue of the ideas newsletter, we present some of these pioneering ERC-funded projects.*

Climate change has a strong impact on the Earth's natural environment. It leads to irreversible damages, such as extinction of species, rise of temperature and sea levels, and prompts natural disasters, for example intense hurricanes, droughts and floods. Only in the EU, flooding affected more than 5.5 million people over the period 1980 to 2011, causing direct economic losses of around €90 billion.

To slow down climate change, the EU has introduced ambitious targets for climate and energy. By 2030, it aims to cut harmful greenhouse gas emissions by 40% below the 1990 level, with an ultimate goal of reducing them by 80% by 2050. In its new budget for 2014-2020, the EU will spend around €180 billion to respond to this challenge. Tackling climate change is also part of the EU's Horizon 2020 programme, which shows how seriously this issue is taken.

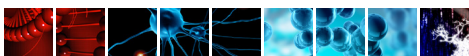
The United Nations' [report on mitigating climate change](#), published in April 2014, has identified renewable energy as the major energy production platform in a more sustainable future. According to the report, especially wind and solar power and cutting energy waste, could considerably contribute to decreasing carbon emissions, and therefore counteracting climate change.

Developing new technologies for clean energy however brings even more benefits, as it provides an opportunity to boost competitiveness and innovation. Thanks to the EU's investment in climate protection, many sectors can quickly develop, such as sustainable construction, clean transport, or energy efficient products. Equally important, by favouring sustainable energy and energy efficient solutions, the EU has a chance to reduce its dependence on imported fossil fuels. Currently, Europe bears the highest costs of energy in the world; no less

than €1 billion per day is spent on importing natural gas and crude oil.

Whilst it is widely recognised that Europe needs to wean itself off fossil fuels, and to invest heavily in renewable energy, there is still some distance between the aspiration and its effective implementation. Most agree that sources of sustainable energy are worth supporting, but in practice they pose some significant problems. Renewable energy is often difficult to store for example, and this hinders a range of applications it can be used for. It is admirably forward-thinking to ride an electric car, but as it needs frequent charging, can it realistically replace a conventional car which can be relied upon for long journeys without requiring lengthy breaks?

In the light of these questions, clean energy efficiency becomes all the more significant, not only for environmentalists and policy-makers, but also for researchers looking for innovative solutions to global problems. The ERC is not imposing any scientific priorities on its applicants, but to date some 70 ERC grantees have chosen to work on projects in the field of renewable energy. In total, the ERC has invested nearly €116 million in their studies. In the next pages you will read about research carried out by Dr Marnix Wagemaker, Prof. Claes-Göran Granqvist and Prof. Moritz Diehl, who are exploring a variety of topics related to energy efficiency; from developing 'super batteries' and materials that could enable huge energy savings in buildings, to improving wind turbine construction.





## Intelligent buildings for cutting energy consumption



Europeans spend up to 90% of their time indoors, whether in their homes, in offices or in vehicles. This lifestyle is responsible for 70% of electricity use within the EU. Yet, construction technology has never really caught up with the challenges posed by operating in this indoor world. Our modes of living and working may even be making us ill. So-called 'sick building syndrome' is caused by inadequate ventilation systems, by a lack of natural light, or by excessive air conditioning. The illness can cause nausea and headaches, and can affect breathing and our ability to concentrate. If we can design more efficient energy systems, this should not only improve our quality of life, but also make us more productive and more satisfied with our environment.

ERC grantee Prof. Claes-Göran Granqvist and his team harness the potential of nano-materials to design intelligent buildings that can benefit their users. Part of the team's research focuses on developing sensors, which are better able to detect air quality and to use solar energy for purifying indoor air. The team also works on the design of 'smart' windows that are able to adjust their light throughput according to temperature and personal preferences. The research has already led to the discovery of new materials, which allow a temperature-dependent control of the solar energy inflow through windows without significantly altering their visual appearance. The researchers hope that investing in these kinds of technologies will considerably reduce energy demand worldwide.



A prototype of a smart window developed by Prof. Granqvist's team

**Researcher:** Prof. Claes-Göran Granqvist  
**Host institution:** Uppsala University (Sweden)  
**ERC project:** Green Nanotechnology for the Indoor Environment (GRINDOOR)  
**ERC call:** Advanced grant 2010  
**ERC funding:** €2.3 million for five years





## Optimising kite power generators

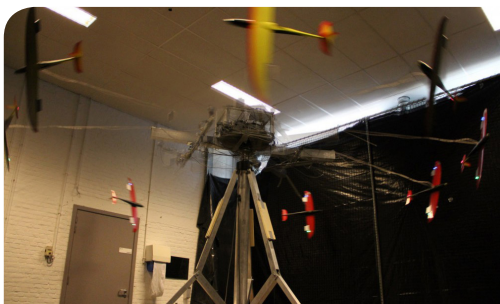


Imagine wind turbines constructed without mast and blades, operating like kites flying autonomously at high altitude. Sounds like science fiction? Prof. Moritz Diehl's ERC project aims to develop a more efficient wind power generation system by cutting to a minimum the apparatus required when creating a wind turbine. It would allow the production of wind power in a cheaper and more flexible fashion, whilst reducing carbon dioxide emissions.

This radical new design will rely on tension-controlled cables operating tethered airfoils (or wings) that drive a generator on the ground. These kite-like turbines would be able to exploit strong winds, for instance off-shore, at a higher altitude than is currently possible. They should also be suitable for a wider range of locations than traditional wind turbines, as the newer models will be easier to deploy at remote locations.

The chief goal of the HIGHWIND project is to advance the status of mathematical modelling to prove the potential and effectiveness of this new technology. Models will enable more accurate simulations to be made: for instance for the algorithms needed to control the kites during take-off and landing or during sudden changes in wind speed or direction.

Although Prof. Diehl and his team also develop small scale prototypes, the main focus is on modelling, control algorithms and computer simulations. The researchers have created open source software tools that will support and guide the development of airborne wind energy. Ultimately, the aim is to prove the feasibility and cost-effectiveness of this technology, and to establish its significance in the future wind of energy generation.



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HIGHWIND test carousel for flight experiments in action

**Researcher:** Prof. Moritz Diehl

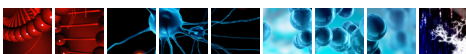
**Host institutions:** University of Freiburg (Germany) and University of Leuven (Belgium)

**ERC project:** Simulation, Optimization and Control of High-Altitude Wind Power Generators (HIGHWIND)

**ERC call:** Starting grant 2010

**ERC funding:** €1.5 million for five years

Visit the project [website](#).





## Interview with

3

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Li  
Lithium

## Dr Marnix Wagemaker – Battery research breaks new grounds



*ERC Starting grantee Dr Marnix Wagemaker, based at the University of Delft (the Netherlands), is an expert in energy storage. His work focuses on the high performance of lithium (Li) batteries and on the functioning of the electrodes inside them. The results of his research could pave the way for a more efficient use of renewable energy and electrical transport.*

**What are your ambitions for this project?**

One of the most pressing challenges globally is to find new ways to store energy. Battery-based energy storage, which already exists in laptops, mobile phones, housing equipment etc., is a technology driven by advances in chemistry, physics and material science. My ERC project is about understanding and improving the performance of batteries in storing energy. Batteries are a cheap and powerful tool with only a small footprint on the environment.

**Have you been able to improve the battery performance?**

I have always been curious to find out why batteries take hours to charge, not minutes. My objective was then to understand which processes and obstacles slow down the performance of Li batteries. My team found out that the diffusion of lithium ions in the electrolyte located in the pores of electrodes was actually responsible for this poor performance. By using in-situ techniques as well as experimental and computational methods, we discovered that we were able to charge batteries up to 80% of their energy intensity in just one minute! In other words, we were capable of creating a sort of ‘highway’ for the diffusion of lithium ions in battery electrodes and observing fundamental changes in the electrode transition mechanism. We now need to develop the concept further and improve it for its potential commercialisation.

**What could be the applications of your research in 10 to 20 years’ time?**

Lithium ion battery technology has revolutionised both the electric vehicle and energy storage markets. To advance research in energy and power density, my goal is twofold. Firstly, to decrease charging time whilst

increasing electrode thickness, and thereby improving energy density. Secondly, to develop novel high energy density systems such as lithium-air systems; an area of research currently being investigated by many scientists worldwide. These new systems would allow cars to drive up to 500 kilometres nonstop before discharging a battery, in theory. But in practice, there are still huge fundamental challenges. It may take up to 20 years before the technology can bear fruit and the new generation of cars can be fully developed.

**Do you believe chemistry to be the solution to enhanced energy storage?**

Yes. However, I also think that energy storage is a multidisciplinary field at the crossroads of chemistry, physics and material science. This is reflected in my research team - the members represent all these disciplines and work on the same research questions.

**Why is it important to publicise your research to a wider audience?**

One of my driving forces is that I feel I can contribute to solving a global issue. Science dissemination is key as it is a way to guide young students to work in a specific research direction. The ERC grant was essential: it helped me to invest, expand my lab and carry out all the required experiments. But equipment is nothing without a team, and the ERC funding allowed me to hire two PhD students and two post-docs. I now have no restrictions and I am free to reach the goals set in my proposal.

Listen to the [podcast](#)



## What's on

### Scientific Council goes local

*From Sweden to Greece, from Portugal to Latvia; every year, the ERC Scientific Council holds some of its meetings in different European countries. The goal is to engage with the scientific community and policy-makers in various parts of Europe, and to promote the ERC amongst researchers there.*

Composed of 22 distinguished European researchers and academics, including one Nobel laureate, the ERC Scientific Council represents Europe's research community in all its breadth. Headed by the ERC President Prof. Jean-Pierre Bourguignon, they typically meet five times a year to debate and agree on strategic issues concerning the ERC.

On 20 October the members of the Scientific Council will gather for the first time in Croatia, for a two-day plenary session in Zagreb. They will be updated on recent meetings and activities, and reports of its [various working groups](#) on issues such as gender equality in ERC competitions, promoting innovation, widening participation in the ERC calls and supporting open access. The Scientific Council will also discuss the state of play of ERC's granting and evaluation processes.

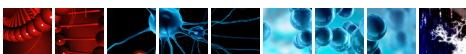
The Zagreb meeting in October will be the 28th plenary outside Brussels, and the 47th in total. The Scientific Council has previously gathered in almost all EU Member States, as well as in Israel,

Norway, Switzerland and Turkey which are countries [associated](#) with EU R&I programmes.

The Scientific Council uses this opportunity to meet policy-makers to gain insight into national research funding systems and to better understand the scientific landscape of each country. In the past, the members for example met with the Bulgarian Research Minister in Sofia (see p. 7 in this [issue](#)), and discussed national performance in ERC calls with the Norwegian State Secretary of Research (read more on p. 11 in this [issue](#)).

The visits across Europe are also the occasion for the Scientific Council to really engage with the scientific community to better understand their situation and to exchange views. At information sessions organised around these meetings, potential candidates also have a chance to learn more about the ERC, its funding schemes and its selection process.

Croatia, which has previously been associated with EU research programmes, is the newest Member State that joined the European Union in July 2013. By going there, the Scientific Council aims to promote the ERC amongst outstanding researchers in this region. An information session on the ERC funding schemes is to be held on Wednesday 22 October.





## Focus on



## Spain



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This time, we take a look at the research landscape in Spain, a country with the highest ERC visibility in the national media. Only since January, the Spanish press has reported on the ERC as much as 600 times, helping establish it as a label of scientific excellence.

The repercussions of the economic crisis and austerity measures that Spain is currently facing come along with significant funding cuts, also in the field of R&D. According to Spanish trade unions, research funding in the country is now at the same level as it was almost two decades ago.

The lack of funding opportunities is driving many of the best Spanish scientists out of the country. As a result, Spain suffers from brain drain that leaves research on the wane.

Alternative sources of research funding, such as ERC grants, can give, especially young, Spanish scientists

the possibility to continue their scientific career in their home country. According to the statistics, some 240 top-level researchers, who in total received €390 million in ERC funding, are conducting their projects at host institutions in Spain.

Spanish researchers are also involved in the ERC in other ways. Two out of 22 members of the ERC Scientific Council come from Spain: Prof. Núria Sebastián Gallés, who is also the ERC Vice-President (see editorial), and Prof. Isabelle Vernos, Chair of the [ERC Working Group on Gender Balance](#). Additionally, two Spaniards hold crucial positions in the ERC Executive Agency (ERCEA): Pablo Amor is the ERCEA Director, and Dr Jose Labastida is the Head of the ERCEA Scientific Department. Furthermore, 148 Spanish researchers currently serve as ERC external experts and evaluation panel members.

### ERC grants in Spain

- > 237 ERC grantees are based in Spanish host institutions, representing a total funding of around €390 million.
- > 135 researchers hold Starting Grants, 20 hold Consolidator Grants and 82 hold Advanced grants.
- > 106 projects are in Physical Sciences & Engineering, 86 in Life Science and 45 in Social Sciences & Humanities.
- > 45 Spanish ERC grantees are based outside Spain.





## Interview with

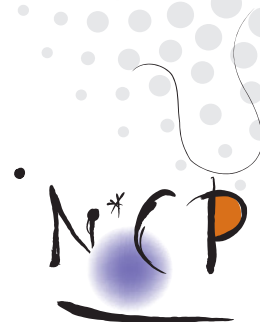
**Esther Rodríguez and Lucía Del Río,  
the Spanish National Contact Points (NCPs)**



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**What impact have the national budget cuts had on the Spanish research?**

Spain has certainly gone through very tough times recently, and the research system has also suffered throughout this period. It would be foolish to think that this has not affected research projects and programmes in Spain, but it has also forced both administration and institutions to re-think their priorities and deploy new strategies. This year, we have seen the first increase in the R&D budget since 2009. We really hope this positive trend will consolidate and grow in 2015 and beyond.

**How important are ERC grants for researchers based in Spain?**

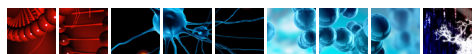
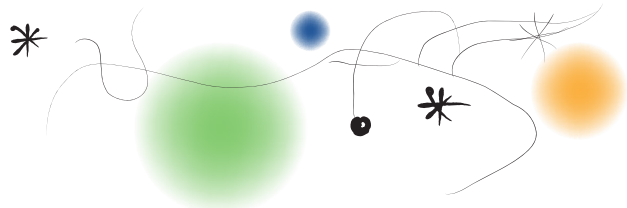
Spain is one of the countries with wide ERC visibility, also in the mass media. It is definitively seen as a label for excellence. In our view, ERC grants are fundamental for scientists working in Spain, in particular for young researchers and newcomers, for whom it may be harder to get into the system. Also, the ERC's positive impact is clear in terms of visibility and career projection. For some of the grantees, the ERC award has come along with a better position at their host institutions. For many more, the grants have been determinant in their way to scientific independence. Besides, researchers are, in general terms, very happy with the flexibility in managing their ERC funding. This freedom of 'thinking-and-doing' is one of the best things the ERC has done, and it should be kept at all costs, as it is critical for performing frontier research.

**How is Spain doing in the ERC calls?**

I am afraid we are terribly good at performing our task as NCPs! Everyone in Spain knows the ERC! Now seriously; we rank very high in terms of number of applications but, as a consequence, our success rate is not as good as we would like it to be. But we are working on it. We are making a great effort in assisting institutions and researchers to help them better understand the scope of the ERC calls for proposals. 2013 has by far been our best year in terms of the number of grants, with 47 individual frontier research grants and 3 Synergy Grants awarded in Spain. The new ERC resubmission restrictions, although very hard for candidates, have also forced the research community to prepare their proposals for the ERC more carefully. As a result, we have now more sensible numbers of applications coming from Spain.

**What is Spain doing to support high-calibre research talent in the country?**

The Spanish Ministry for Economy and Competitiveness has a 'rescue' programme "[Europe Excellence](#)", for those ERC Starting and Consolidator candidates with excellent proposals (A as a final score) who ended up without funding. But there are also other examples of programmes open to leading researchers from anywhere in the world. [ICREA](#) and [Ikerbasque](#) are remarkable regional funding models. We have also the [Ramón y Cajal](#) national programme, now with more funds per principal investigator than ever before. [Severo Ochoa](#), a very competitive funding for top internationally recognised centres for research, is another success story. In many ways, these programmes feed each other, and they are also linked to the ERC.





## Did you miss this?

### Next ERC work programme published

On 23 July, the [ERC Work Programme 2015](#), which includes the budget and timeframes of the 2015 ERC competitions, was published. In total, the ERC will spend over €1.6 billion next year to fund researchers. Besides the calls calendar, it announced an important change in calculating the eligibility of Starting and Consolidator grant applicants. In the 2015 ERC calls, the experience after the PhD award will be counted prior to January 2015, and not prior to the date of the call opening.

Read more [here](#)



### Fields Medals go to two ERC grantees

ERC Starting grantee Dr Artur Avila and Consolidator grantee Prof. Martin Hairer are two of four outstanding scientists awarded the [2014 Fields Medals](#), the highest international distinction for young mathematicians. ERC President Jean-Pierre Bourguignon commented: *'We are happy to see that their remarkable talent (...) has been recognised. It is a sign that the ERC continues to identify and fund the most promising researchers across Europe.'*

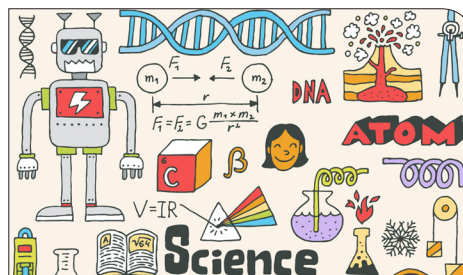
The laureates were announced at the [International Congress of Mathematicians](#), which took place in August in Seoul, South Korea.

Read more about [the award](#) and Dr Avila's [research](#)

### New call to promote ERC research

On 16 September, a [call for proposals](#) to promote ERC-funded projects amongst a wider audience was opened. With a budget of €1.6 million for four years, it aims to support an ambitious series of communication actions, which will help raise awareness of ERC projects and their scientific results across Europe, not only amongst scientists, but also amongst media, policy-makers, the business community and the public at large. The deadline for applications is 16 December 2014.

Read also the [ERC Work Programme 2015](#) (pp. 42-43)



### ERC funds 50 marketable ideas

Last week, the ERC announced the results of the first round of the 2014 'Proof of Concept' call. This time, 50 researchers who already hold ERC grants receive this top-up funding, worth up to €150,000, to test the market potential of their frontier research. The €7.5 million budget of this round will fund a wide variety of ideas, including a ground-breaking therapy for children with congenital heart defect, a novel technology for monitoring water quality in real time, and an application enabling to compare numerous factors when buying a house. The second deadline of the call is 1 October 2014.

Read also ERC [press release](#)





## Future Calls

### CALENDAR OF ERC CALLS

Grants open to researchers from anywhere in the world

Call for proposals*	Publication date	Deadline	Budget	Funding
ERC 2014 Proof of Concept Grant** (second deadline)	11 December 2013	1 October 2014	€7.5 million	Up to €150 000 per grant
ERC 2014 Advanced Grant	17 June 2014	21 October 2014	€450 million	Up to €3.5 million per grant
ERC 2015 Starting Grant	7 October 2014	3 February 2015	€430 million	Up to €2 million per grant
ERC 2015 Proof of Concept Grant**	7 November 2014	5 February 2015 28 May 2015	€20 million	Up to €150 000 per grant
ERC 2015 Consolidator Grant	13 November 2014	12 March 2015	€585 million	Up to €2.75 million per grant
ERC 2015 Advanced Grant	10 February 2015	2 June 2015	€630 million	Up to €3.5 million per grant

\*Researchers who wish to apply to one of the ERC's calls can do so through the [Participant Portal](#).

\*\*Calls open to ERC grantees only

#### Important:

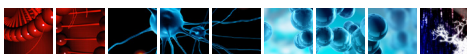
Read the new rules for re-submission of proposals. For details on these rules, please see [ERC Work Programme 2014](#) (pp. 18 and 19).

Note that there are *new rules regarding the reference date for Starting and Consolidator grant applicants' eligibility* in the [ERC Work Programme 2015](#), (see pp. 15- 17).

Since 15 September 2014, researchers applying with a host institution in Switzerland are eligible to participate in the ERC calls. Read [more](#) about the Swiss participation in Horizon2020. See also an ERC [update](#)

Stay informed on the [ERC website](#).

Candidates should apply with a host institution in an EU Member State or Horizon 2020 Associated country. (See further information on the [Participant Portal](#).)





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