



EUROPEAN RESEARCH COUNCIL (ERC) - FUNDING OPPORTUNITIES AND REPRESENTATIVE PROJECT HIGHLIGHTS

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Abstract

This paper provides an outline of the funding opportunities offered by the European Research Council (ERC) under the European Commission's "Horizon Europe" Framework Programme for Research and Innovation, also highlighting some representative projects/topics funded by the ERC in specific areas of aeronautical interest. The presentation has been included in an ERC invited session together with talks/papers from ERC grantees Chiara Bisagni, Marios Kotsonis, Aimee Morgans and Tobias Schneider on their research addressing respectively multi-stable panels for an adaptive wing, metamaterials for control of fluid flows, thermoacoustic instability in aero-engine combustors, and the use of periodic orbits to quantitatively describe and control 3D fluid turbulence.

Keywords: ERC, funding opportunities, projects

1. The European Research Council (ERC)

The ERC [1], set up by the European Union in 2007, is the premier European funding organization for excellent frontier research. It funds creative researchers of any nationality and age, to run projects based across Europe. It is composed of an independent Scientific Council, its governing body consisting of distinguished researchers, and an ERC Executive Agency (ERCEA) in charge of implementation. The governing structure is depicted in Figure 1 and the current members of the Scientific Council are shown in Figure 2.

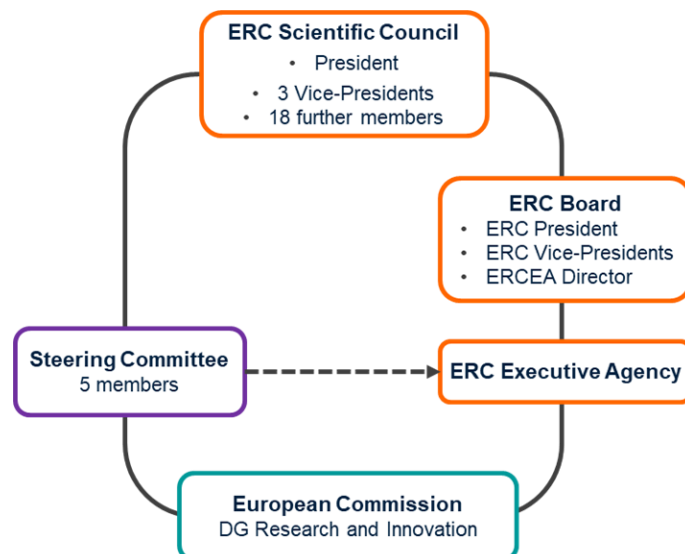


Figure 1 – European Commission and the ERC

ERC Scientific Council



Figure 2 – The ERC Scientific Council

Notably the ERC budget has grown substantially over the three EU R&I Framework Programmes since its inception in 2007, currently being allocated ~17% of the total Horizon Europe programme budget, which translates to more than 2000 M€ available annually to fund frontier research for the years to come (Figure 3).

ERC budget 2007 – 2027: EUR 36.5 billion

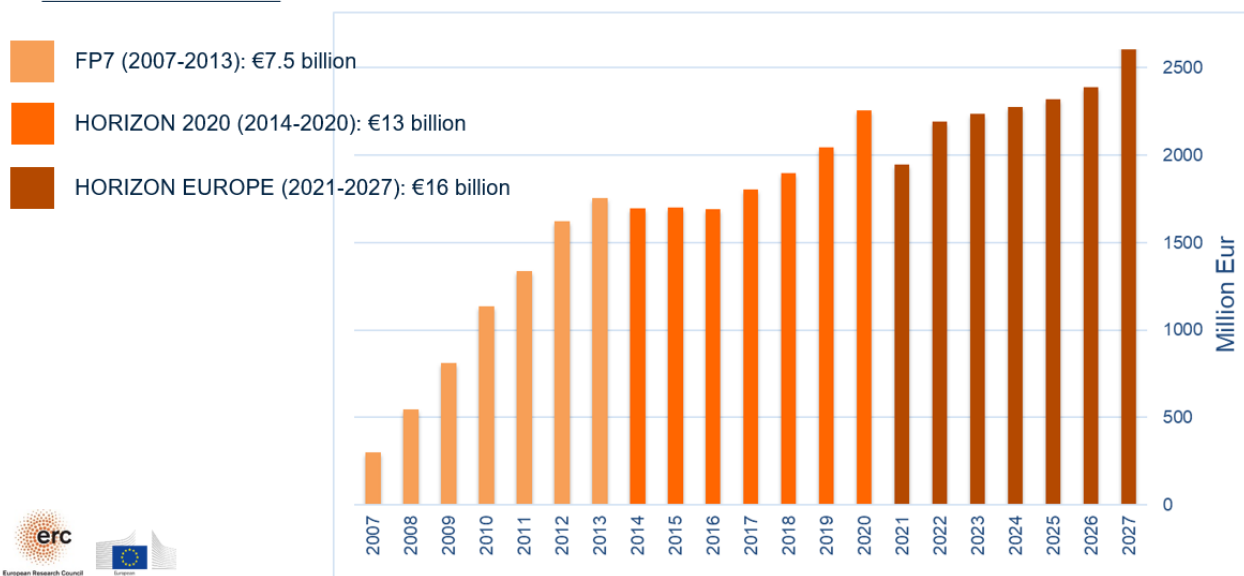


Figure 3 – ERC budget by Framework Programme (FP) for Research and Innovation

2. ERC Funding Opportunities

2.1 Introduction

The ERC offers long-term grants to individual researchers proposing pioneering projects in any field of frontier research across the life sciences, social sciences and humanities, and physical sciences and engineering domains. ERC grants offer research independence, scientific recognition and visibility, and an opportunity to work on a topic of own choice, gain financial autonomy for the duration of the grant, attract excellent team members and collaborators from around the world as well as further funding, while empowering researchers to negotiate best working conditions with the Host Institution (HI) and/or exercise “portability of grants” to any place in an European Union (EU) member state or programme-associated country. Introductory information to the ERC funding opportunities is available in a series of short YouTube videos [2], while more detailed information can be found in the current ERC Work Programme [3] and the EU Funding and Tenders Portal [4]. Information and support can be sought through the National Contact Points [5] or the EURAXESS representations worldwide [6].

2.2 ERC Grant Schemes

The grant schemes offered by the ERC are depicted in Figure 4.

ERC grant schemes

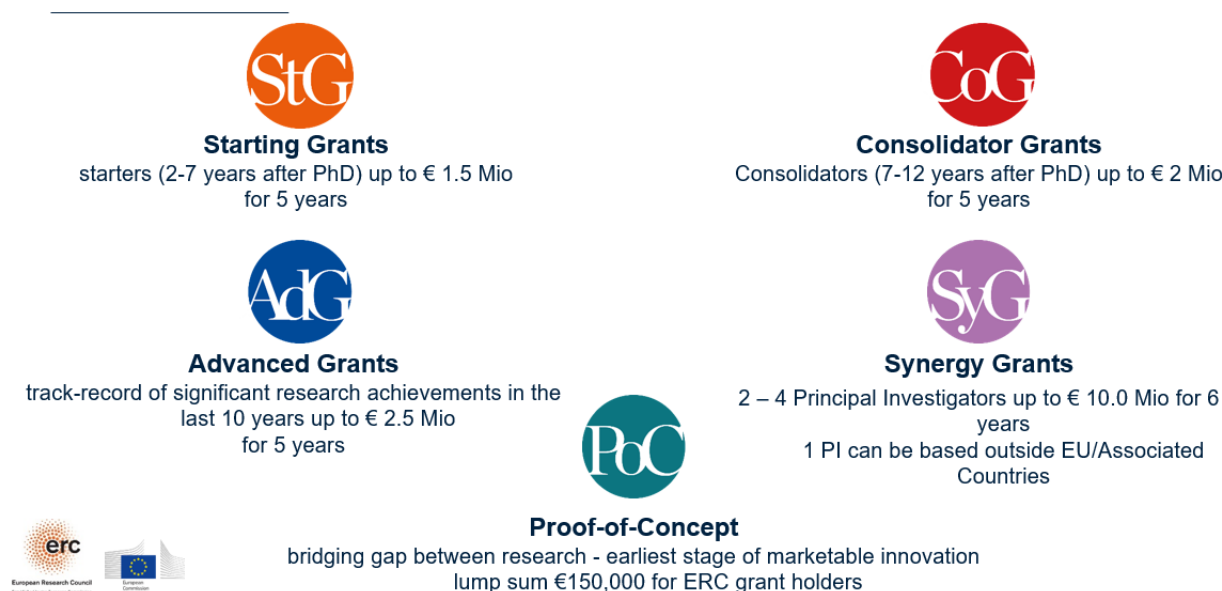


Figure 4 – ERC grant schemes

The main individual grant schemes are Starting Grants (StG), Consolidator Grants (CoG) and Advanced Grants (AdG), addressed to individual researchers (Principal Investigators, PI) of increasing professional seniority. The so-called eligibility window (from the certified date of successful defense of the Ph.D.) for StG and CoG applications can be extended beyond 7 and 12 years, respectively, for properly documented circumstances, provided they started before the call deadline, including maternity/paternity leave, long-term illness, national service, clinical training, natural disaster, seeking asylum [3].

The ERC individual main grant schemes are complemented by the Synergy Grants (SyG) scheme, which supports small groups of two to four co-PIs and their teams to jointly address ambitious research problems that could not be addressed by the individual Principal Investigators and their teams working alone, with a designated Corresponding PI. ERC SyG groups are neither networks nor consortia of undertakings, universities, research centers, or other legal entities.

PIs funded under one of the abovementioned main grant schemes of prior ERC Work Programmes will also be able to apply for complementary funding via the Proof-of-Concept (PoC) Grants, as well as for a Public Engagement with Research Award [7].

2.3 Who Can Apply

ERC applicants/grantees can be of any nationality and age and can submit a proposal on any research topic (the ERC is a completely bottom-up funding scheme without any thematic priorities). At the time of application, applicants can be located/working anywhere in the world, however their application must be accompanied by a letter of support from an HI, which is based in an EU member state or in a country associated with the Framework Programme (Pillar 1), where the proposed research will be carried out if the application is successful. During the grant, PIs must spend at least 50% of their time in the EU or an associated country, and, depending on the grant scheme, a minimum percentage of their working time on their ERC project.

Grantees may also keep affiliation with an institution outside Europe, as long as they fulfill the aforementioned “significant part of work time in Europe: at least 50%”. Project team members can be recruited internationally and can be based outside Europe. Exceptionally, one of the co-PIs of SyG can be located outside the EU or associated countries altogether.

Furthermore, international readers may be interested in the so-called “implementing arrangements” that have been put in place through appropriate agreements between the ERC and national funding bodies. These agreements provide funding to international researchers to join ERC project teams for a period of time. Information on such possibilities, currently available in Argentina, Australia, Brazil, Canada, China, India, Japan, Korea, Mexico, Singapore, South Africa, Thailand and the U.S. can be found in [8].

2.4 Standard Maximum Grant Amounts and Additional Funding Possibilities

The standard maximum amount for each ERC grant type is indicated in Figure 4. This maximum amount is reduced pro rata temporis for projects shorter than the indicated (standard) duration.

Grant amounts can be complemented by up to 1 M€ for the main individual grant schemes, and up to 4 M€ for SyG to cover the following eligible costs when these are necessary to carry out the proposed work:

- (a) “start-up” costs for PIs moving to the EU or an associated country from elsewhere as a consequence of receiving the ERC grant, and/or
- (b) the purchase of major equipment, and/or
- (c) access to large facilities, and/or
- (d) other major experimental and field work costs, excluding personnel costs.

Additional funding is not subject to pro rata temporis reduction for projects of shorter duration.

All funding requested is assessed during evaluation. A (fixed amount) lump sum approach is taken for PoC grants and, as from the ERC Work Programme 2024, a pilot lump sum approach is introduced for AdG; in the latter case, the requested grant amount (up to the maximum standard amount plus any additional funding) is determined and justified in the proposals and assessed for endorsement during evaluation.

2.5 ERC Panel Structure

As the ERC is completely bottom-up with no thematic priorities in the research that it is funding, the evaluation process and subsequent scientific project follow-up are (currently) structured in 28 panels in the three main scientific domains [9] (Figure 5): Life Sciences (LS – 9 panels), Social Sciences and Humanities (SH – 8 panels) and Physical Sciences and Engineering (PE - 11 panels). The panel descriptors do not represent ERC scientific priorities.

Applicants select the panel they prefer to submit their proposal and may identify a secondary panel, if deemed appropriate, i.e. in case of multidisciplinary proposals. Only exceptionally will a proposal be evaluated in a different panel than originally submitted with the goal that it is duly assessed by experts having the appropriate expertise. Relevant cross-disciplinary reviews are also sought to cover all aspects of multidisciplinary proposals.

It is worth noting that the available budget in each call is distributed between panels on the basis of demand (total requested budget by the proposals evaluated), so as to ensure a (nearly) uniform success rate across evaluation panels, hence disciplines and topics.

Evaluation panel structure (2024)

Life Sciences

- LS1 Molecules of Life: Biological Mechanisms, Structures and Functions
- LS2 Integrative Biology: From Genes and Genomes to Systems
- LS3 Cell Biology, Development, Stem Cells and Regeneration
- LS4 Physiology in Health, Disease and Ageing
- LS5 Neuroscience and Disorders of the Nervous System
- LS6 Immunity, Infection and Immunotherapy
- LS7 Prevention, Diagnosis and Treatment of Human Diseases
- LS8 Environmental Biology, Ecology and Evolution
- LS9 Biotechnology and Biosystems Engineering



Physical Sciences & Engineering

- PE1 Mathematics
- PE2 Fundamental Constituents of Matter
- PE3 Condensed Matter Physics
- PE4 Physical and Analytical Chemical Sciences
- PE5 Synthetic Chemistry and Materials
- PE6 Computer Science and Informatics
- PE7 Systems and Communication Engineering
- PE8 Products and Processes Engineering
- PE9 Universe Sciences
- PE10 Earth System Science
- PE11 Materials Engineering

Social Sciences and Humanities

- SH1 Individuals, Markets and Organisations
- SH2 Institutions, Governance and Legal Systems
- SH3 The Social World and Its Interactions
- SH4 The Human Mind and Its Complexity
- SH5 Texts and Concepts
- SH6 The Study of the Human Past
- SH7 Human Mobility, Environment, and Space
- SH8 Studies of Cultures and Arts

Figure 5 – ERC Panel Structure

Panels of main interest to the aerospace community lie primarily within the PE domain (Figure 6). Although not immediately obvious, PE8 “Products and Processes Engineering” is the panel covering areas like Aerospace Engineering, Fluid Mechanics, Propulsion Engineering, and Environmental Engineering. Of interest may also be the PE7 “Systems and Communications Engineering” panel, which includes areas like Systems Engineering, Control Engineering, Networks and Robotics. Furthermore, Earth Observation is covered by the PE10 panel, and Space Sciences in PE9.

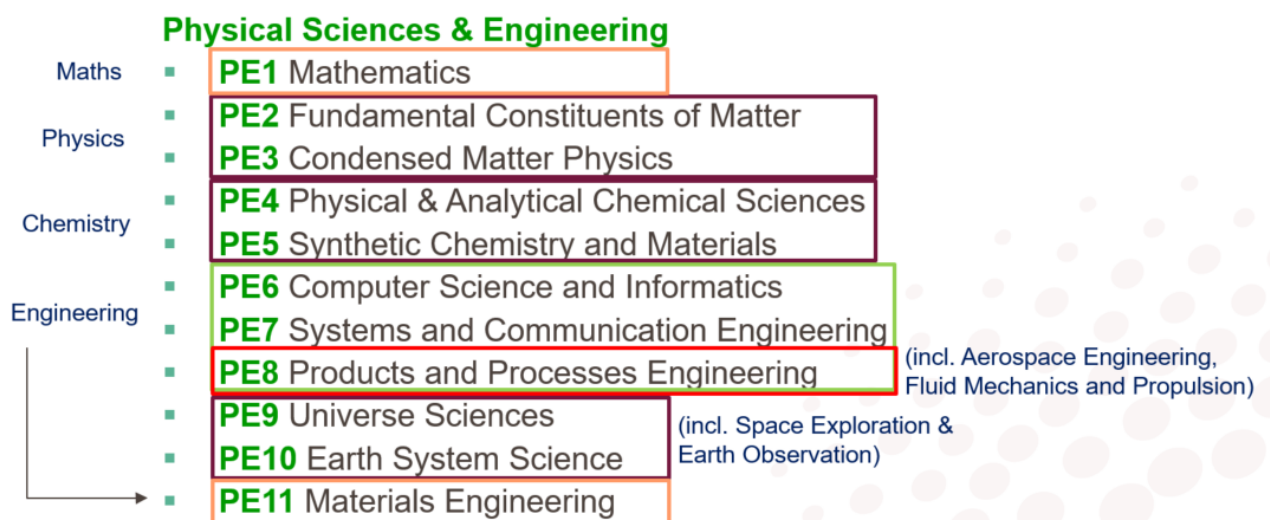


Figure 6 – ERC Panel Structure in the Physical Sciences and Engineering Domain

2.6 Evaluation of Proposals

For the individual main grant schemes (StG, CoG, AdG), although complete proposals are submitted in a single submission, the Description of Action (DoA) comprises two parts, which are assessed in two evaluation steps (Figure 7): Part B1 includes an extended synopsis of the proposed research and information on the PI's CV and track record; Part B2 includes more details on the proposed methodology and working arrangements. The allocated / requested budget and planned resources to execute the project are assessed together with Part B2 of the proposals in Step 2 of the evaluation. Excellence is the sole evaluation criterion of the ERC. In terms of the proposed research, pioneering research proposals addressing important challenges are sought, with ambitious objectives and a ground-breaking nature compared to the state-of-the-art as well as significant impact (scientific – knowledge gains) / breakthrough potential. At the same time, a sound and feasible scientific approach (and more detailed methodology and working arrangements in Part B2), bearing in mind the ground-breaking nature and ambition of the proposed research that may encompass high risk.

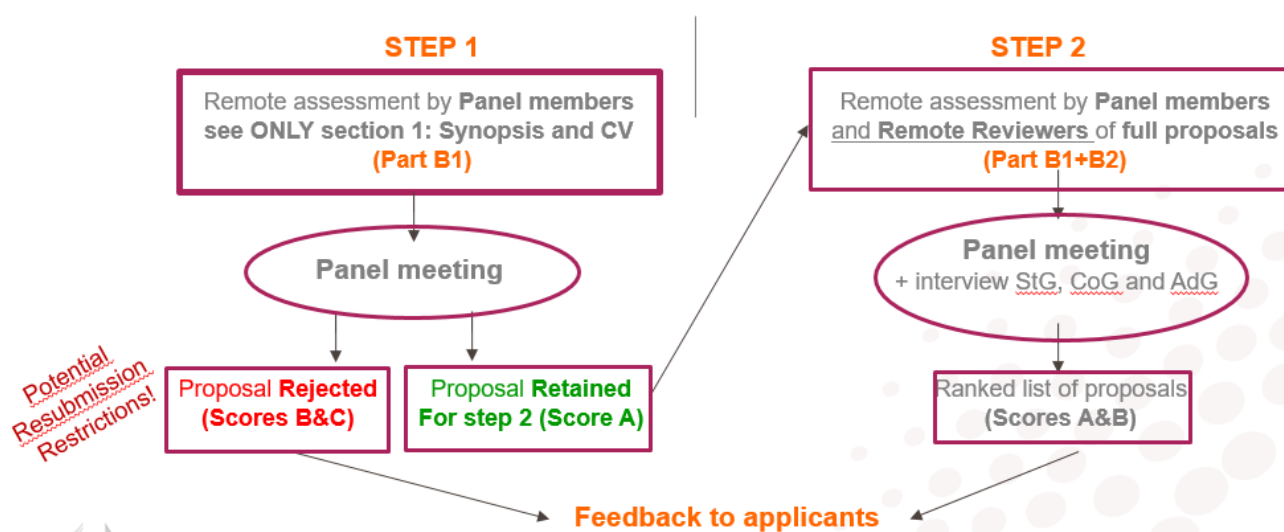


Figure 7 – Evaluation Process for Main Individual Grant Schemes
(Synergy Grant proposals are assessed in a 3-step evaluation process)

On the side of the applicant, the intellectual capacity, creativity, and commitment of the PI(s) are assessed, with a focus on the extent to which the PI(s) has(ve) the required scientific expertise and capacity to successfully execute the project. As from the ERC Work Programme 2024, the Scientific Council has furthermore decided to explicitly give more emphasis to the project proposal than the past achievements of the applicant during the evaluation: the evaluation should be primarily focused on the ground-breaking nature, ambition, and feasibility of the proposed research project. At the same time, the panels will evaluate the intellectual capacity, creativity, and commitment of the PI, with a focus on the extent to which the PI has the required scientific expertise and capacity to successfully execute the project. Aspects like the HI or the past/current institutions of the PI do not constitute evaluation criteria, and ERC grantees are offered the possibility to change HI (within HI eligibility conditions) during the course of the grant (i.e. grant portability is possible).

The ERC Work Programme 2024 has also introduced a cap to the maximum number of proposals per panel that are admitted to Step 2 of the evaluation for the StG, CoG and AdG calls: up to 44 proposals per panel may pass to Step 2, which are scored A_invited in the Step 1 evaluation. Additionally, in case an evaluation panel finds in Step 1 a larger number of high-quality proposals that merit an A score, the panel decides which A-proposals will be invited to Step 2 and which remain beyond the threshold of 44; the latter are scored A_not invited. Contrary to the rejected B and C-proposals that may face resubmission restrictions (for the next one or two calls, respectively), PIs of proposals scored A_not invited may resubmit a proposal to the following year's call.

3. Representative Project Highlights

The present presentation of the ERC and offered funding opportunities is complemented by the ICAS-2024 talks/papers of ERC grantees Chiara Bisagni, Marios Kotsonis, Aimee Morgans and Tobias Schneider on their ERC-funded research addressing, respectively, multi-stable panels for an adaptive wing, metamaterials for control of fluid flows, thermoacoustic instability in aero-engine combustors, and the use of periodic orbits to quantitatively describe and control 3D fluid turbulence [10-13].

Some further indicative ERC-funded projects / grantees working in (similar) research areas of direct relevance to the field of Aeronautics include, for example:

- Thomas Pardoën is working in his ERC Advanced grant [14] on the enhancement of the fracture resistance of critical metallic structural components envisaging major gains in structural weight.
- Thierry Poinso has been working in his current ERC Advanced grant [15] on hydrogen enriched combustion and its effect on flame stability under the point of view of thermoacoustics. In his new ERC grant [16] that is due to start in a few months, this PI intends to explore in a holistic manner the fundamentals of combustion safety for hydrogen.
- Abdulla Ghani is an ERC Starting grant holder [17] working on design principles to tackle combustion instabilities.
- Ricardo Vinuesa, a Consolidator grant holder [18], is pursuing novel control strategies for turbulent wings through deep reinforcement learning aiming to improve aviation sustainability.

In addition, representative projects in the field of Aerospace have been previously highlighted in an ERC brochure [19] featuring research on bird and formation flight, combustion instabilities, material mechanics across spatial and time scales, clusters of nano and picosatellites (cubesats), space orbit perturbations, and aerospace communications.

Projects funded by the ERC that may be of broader interest to the audience of the Congress cover, for example, areas like:

- Multiphysics/multiscale modelling, e.g. [20, 21]
- Drone developments and applications, e.g. [22-24]
- Atmospheric/climate monitoring, e.g. [25, 26]

ERC-funded projects, of course, span a very broad range across the physical sciences and engineering, life sciences and the social sciences and humanities disciplines. Interesting information on the large variety of disciplines/topics/projects supported by ERC grants can be explored on the ERC website [27] where, for example, one can find supported research on space robotics [e.g. 28, 29] or a collection of funded space science projects [30].

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