

PRESS RELEASE

ERC Advanced Grant 2026: Two Projects and One Partnership from Politecnico di Milano Among the Winners

The Andromeda research project will develop a system to study the impact of micro- and nanoplastics on the brain; ExtrA will test aircraft for the atmospheres of Mars, Venus and Titan; and MetaCARS will build on nanophotonics to create a molecular sensing platform

Milan, 23 June 2026 – **Three new ERC Advanced Grants awarded to Politecnico di Milano.** The university has secured funding from the European Research Council (ERC) for two projects for which it is the lead institution, **Andromeda** and **ExtrA**, as well as a partnership through one of its researchers in another winning project, **MetaCARS**. The funding falls under the European Union's Horizon Europe programme and has been awarded overall to **319 leading senior researchers across Europe, for a total value of €838 million**. The Advanced Grants enable them to develop ambitious, curiosity-driven projects that could lead to major advances in their respective fields. All projects are detailed here below:

ANDROMEDA

An interdisciplinary project led by **Carmen Giordano**, Professor in the **Department of Chemistry, Materials and Chemical Engineering “Giulio Natta”** at Politecnico di Milano, in collaboration with **Diego Albani**, Unit Head at the **Mario Negri Institute**, and **Andrea Arighi**, neurologist and Director of the SDD Neurology – Neurodegenerative Diseases Unit at **Policlinico of Milan**. The aim is to develop a microphysiological system representing, at the microscale, the vascular circulation of the human brain and its glymphatic system, namely the system responsible for “cleansing” it from toxic substances. In particular, **the project aims to study the impact of micro- and nanoplastics that accumulate in the brain**, impairing its functionality. The biochemical mechanisms involved are still unknown, and the Andromeda project's hypothesis suggests that their accumulation is due to specific chemical and geometrical characteristics of micro- and nanoplastics. To this end, **a microfabricated model of brain vascularization will be developed to investigate the mechanisms involved. Among the potential future impacts is shedding new light on the impact of micro- and nanoplastics on the brain**, with subsequent effects on bioengineering, microphysiological systems, microfabrication and polymer science, **while also contributing to expanding current knowledge on neurodegenerative brain diseases associated with accumulation processes.**

ExtrA – Extraterrestrial Aerodynamics: flight beyond Earth

The ExtrA project takes aeronautics beyond the boundaries of Earth. Led by **Alberto Guardone**, Professor in the **Department of Aerospace Science and Technology (DAER)** at Politecnico di Milano, who'll head a large team of university researchers, ExtrA opens a new field of research:

extraterrestrial aerodynamics. The flight of NASA's Ingenuity helicopter on Mars demonstrated that it is possible to explore other planets with aircraft, just as on Earth. The challenge now is to design more efficient aircraft, capable of covering greater distances and operating for longer periods in environments very different from terrestrial ones. **ExtraA will study the aerodynamics of wings, propellers, drones and probes in the atmospheres of Mars, Titan and Venus, combining advanced simulations with unique wind tunnel experiments designed, for the first time, for extraterrestrial environments. These facilities are all located within DAER,** where the tests will be conducted. The project will analyze the aerodynamics of aircraft in extreme conditions, from the thin, cold atmosphere of Mars to the dense, high-pressure atmosphere of Venus. The results will support the development of new aircraft for planetary exploration and provide new insights useful for understanding aerodynamics on planets beyond our solar system. The project will be carried out in collaboration with Professor **Teemu Turunen-Saaresti's** *Fluid Dynamics* group, and in particular with researcher **Marta Zocca** at **LUT University**, Finland.

MetaCARS

The MetaCARS project, **coordinated by the Fresnel Institute of CNRS in Marseille**, will involve **Michele Celebrano**, Professor in the **Department of Physics** at Politecnico di Milano, as a partner. The aim is to **develop an innovative technology capable of observing and identifying individual molecules at unprecedented speed.** At present, the most advanced fluorescence-free optical techniques are unable to detect and track individual molecules in less than a millisecond, a limitation that makes it difficult to study extremely rapid chemical processes and hinders applications such as high-speed molecular sequencing. MetaCARS aims to overcome this barrier **by combining nonlinear Raman spectroscopy and nanophotonics to create a new molecular sensing platform, capable of identifying and monitoring individual molecules within a few microseconds, thus increasing analysis speed by more than one thousand times compared with currently available technologies.** The potential applications are extremely broad and could affect numerous strategic fields, including drug discovery, the study of enzymatic processes, genomic screening and the development of increasingly advanced approaches to personalized medicine.

Politecnico di Milano's contribution will be particularly significant thanks to the expertise developed in the field of nanophotonics, the discipline that studies **the control of light at the nano scale.** Research activities will be coordinated by Celebrano, while researcher **Attilio Zilli** will lead the experimental work dedicated to the design, fabrication and characterization of special optical nanostructures and metasurfaces. These devices will be responsible for amplifying the optical signals underlying the sensing system developed by MetaCARS. This will be possible also thanks to research facilities available at the university, such as Polifab, Politecnico's centre for micro- and nanofabrication.

The ERC Advanced Grant is a funding scheme of the European Research Council (ERC) dedicated to established research leaders. It provides up to €2.5 million over 5 years for innovative, high-risk projects. The sole evaluation criterion is the scientific excellence of the Principal Investigator and their proposal. With these newly awarded ERC Advanced Grants, **Politecnico di Milano further strengthens its leading position**, confirming itself as the top Italian university in terms of funding received under the Horizon Europe programme, **with 441 projects worth a total of approximately**

€210 million. Within the Horizon Europe 2021–2027 framework programme, Politecnico di Milano has so far secured **47 ERC projects** for a total value of approximately **€49 million**.

BIOGRAPHIES – THE PROFESSORS:

Carmen Giordano

Carmen Giordano is Associate Professor of Bioengineering in the Department of Chemistry, Materials and Chemical Engineering “Giulio Natta” at Politecnico di Milano, where she has been teaching since 2002. She’s responsible for two biological laboratories at the university, “MINERVA” and “ATHENA”, collectively referred to as the “TechnoBiology labs”, where she leads an interdisciplinary team of researchers. Her research activity focuses on the development of innovative technological devices and biohybrid constructs for applications mainly related to the central nervous system. She has previously been awarded other ERC grants: the ERC Consolidator Grant “MINERVA”, the ERC Proof of Concept “DIANA”, and the ERC Proof of Concept “PROMETEO”.

Alberto Guardone

Alberto Guardone is Full Professor of Aerodynamics in the Department of Aerospace Science and Technology (DAER) at Politecnico di Milano. His research focuses on high-speed aerodynamics, ice accretion on aircraft, and dense vapour flows. He participates in numerous European and international projects, and Extra is his third ERC grant. He currently coordinates the European TRACES network, which brings together the leading European and American aerospace industries and research centres. Through research, teaching and industrial collaborations, he contributed to innovation in the aerospace sector for nearly thirty years.

Michele Celebrano

Michele Celebrano is Associate Professor of Experimental Physics of Matter in the Department of Physics at Politecnico di Milano, and Scientific Director of the Supra Nano-Optics Milano (sNOM) Laboratory. His research focuses on nanophotonics and plasmonics, with particular attention to enhancing light–matter interaction at the nanoscale for the study and application of nonlinear optical processes in nanoantennas and metasurfaces. Through his research, he has previously secured funding from Horizon Europe 2020 programme. He is the author of more than 150 scientific publications, with over 4,500 citations and an H-index of 36. These include several scientific papers authored by him and published in specialized journals belonging to the prestigious *Nature Springer* portfolio.

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