

CHALLENGES AND OPPORTUNITIES FOR THE AEROSPACE FRONTIER RESEARCH OFFERED BY THE ERC AND THE MSCA PROGRAMME

The main instruments for the development and attraction of research talent to the European Union (EU) are the European Research Council (ERC) and the Marie Skłodowska-Curie Actions (MSCA). Over the last decade, the ERC and the MSCA funded wide and diverse areas of research relevant to the aerospace sector and gave many researchers the opportunity to develop their projects with highly competitive conditions.

In the first part of the course, EU scientific officers and experts will give an overview of the main characteristics and opportunities offered by the ERC and MSCA funding schemes. Particular attention will be given to the mission, funding, and evaluation process.

In the remaining part of the course, authors of successful ERC and MSCA-PF grant proposals on topics of aerospace relevance will present their own stories and projects and will give the audience their insight and advice on the application process. Details on lessons learned, proposal writing, preparation of the curriculum vitae, and stage-2 interview will be discussed along with eventual opportunities to join an ERC team.



Learning objectives: mission, funding, evaluation process, lessons learned, proposal writing, preparation of the curriculum vitae, stage-2 interview.

Target audience: PhD students, early-career and experienced researchers.

Dates and time: 25 March 2022, 8:45–16:00 CET

REGISTRATION AND CONTACTS

Course Code: 20220325

This course is part of the 2022 institutional activity for AIDAA members. The registration requires the **purchase** of one of the **packages** described at the following link <https://www.aidaa.it/package-list/>, and the completion of the **online form** available at the following link <https://www.aidaa.it/2022/03/08/challenges-and-opportunities-for-the-aerospace-frontier-research-offered-by-the-erc-and-the-msca-programme/>.

Course platform: Webex, a link will be sent via email as the registration is complete.

At the end of each course, **attendance certificates** will be sent to participants via email.

For further info, please, contact academy@aidaa.it

TIMETABLE

8.45 – 9.00	Welcome <i>E. Carrera, President of AIDAA</i>	
9.00 – 9.30	The European Research Council <i>G. Symeonidis, ERC Scientific Officer</i>	ERC and MSCA-PF programme
9.30 – 10.00	The Marie Skłodowska-Curie Actions Postdoctoral Fellowships <i>F. Mello, MSCA Project Adviser</i>	
Coffe Break		
10.30 – 11.00	BIC – Following Bubbles from Inception to Collapse <i>C.M. Casciola, ERC-AdV grantee, Sapienza Università di Roma</i>	ERC AdG & CoG
11.00 – 11.30	EXTREMA – Engineering Extremely Rare Events in Astrodynamics for Deep-Space Missions in Autonomy <i>F. Toppeto, ERC-CoG grantee, Politecnico di Milano</i>	
11.30 – 12.00	HyGate – Hydrophobic Gating in nanochannels: understanding single channel mechanisms for designing better nanoscale sensors <i>A. Giacomello, ERC-StG grantee, Sapienza Università di Roma</i>	ERC StG Pt I
12.00 – 12.30	COMPASS – Control for Orbit Manoeuvring through Perturbations for Application to Space Systems <i>C. Colombo, ERC-StG grantee, Politecnico di Milano</i>	
Lunch Break		
14.00 – 14.30	PRE-ECO – A new Paradigm to RE-Engineering printed COMposites <i>A. Pagani, ERC-StG grantee, Politecnico di Torino</i>	ERC StG Pt II
14.30 – 15.00	SURFACE – Towards Future Interfaces With Tuneable Adhesion By Dynamic Excitation <i>A. Papangelo, ERC-StG grantee, Politecnico di Bari</i>	
15.00 – 15.30	GRAINS – Gravitation of Rubble-pile Asteroid with Internal N-body Structure <i>F. Ferrari, MSCA-IF fellow, Politecnico di Milano</i>	MSCA-IF
15.30 – 16.00	ReMoVE – Rendezvous Modelling Visiting and Enhancing <i>G. Gaias, MSCA-IF fellow, Politecnico di Milano</i>	



SPEAKERS

Carlo Massimo Casciola is a full professor of Fluid Dynamics at the Department of Mechanical and Aerospace Engineering of the University of Rome La Sapienza, where he leads a research group of about 20 researchers, postdocs, and Ph.D. students working on the fluid dynamics of complex flows with a chiefly theoretical and numerical approach. His research is oriented to fundamental and numerical modeling, with substantial interactions with several neighbouring disciplines, such as engineering, physics, material science, chemistry, mathematics, biology, and medicine.

Most of the topics are characterized by the coupling of macroscopic flows with a microstructure. After being awarded the ERC Advanced Grant 2013, BIC: Following Bubbles from Inception to Collapse, a significant part of the research work has been focused on different aspects of cavitation, e.g., heterogeneous nucleation, wettability, bubble collapse modeling, bubble-wall interactions. The tools employed span from Direct and Large Eddy Simulation to Phase Field Models, Free Energy Methods, and Molecular Dynamics techniques specialized for Rare Events. Significant contributions concerns technics and models for wettability and heterogeneous nucleation on complex surfaces; phase-field methods for (nano-)bubble dynamics and cavitation; direct numerical simulations of polymer drag reducing flows; scaling laws and energy fluxes in inhomogeneous turbulent flows; particle transport in turbulent flows in the two-way coping regime. Recently, the research interests extended to experimental aspects of bubble dynamics, cavitation, and microfluidics for application in biology and medicine. In this context he was awarded the ERC-2017-PoC, INVICTUS - In vitro cavitation through ultrasound to develop a microfluidic platform exploiting cavitation to enhance the permeability of the endothelium for targeted drug delivery.

Camilla Colombo is Associate Professor at Politecnico di Milano since 2016 where she is the PI of several projects funded by the European Space Agency and an ERC Starting Grant on the project COMPASS "Control for Orbit Manoeuvring through Perturbations for Application to Space Systems" (www.compass.polimi.it). She leads a team of 11 Postdoc and PhD researchers working on the study of natural and artificial perturbations and their use for application to space debris modelling and mitigation, trajectory design, and mission analysis of missions involving a constellation of satellites and formation flying and mission to near-Earth asteroids. After her PhD (2010) at the University of Glasgow (UK), she has served as Research Fellow at the University of Strathclyde (UK), then at the University of Southampton (UK) as Lecturer and then Associate Professor. In 2012 she was awarded a Marie Skłodowska-Curie Action for a research stay at Politecnico di Milano on "Space Debris Evolution, Collision risk, and Mitigation". Since 2017 she serves as a delegate for the Italian Space Agency at the Inter-Agency Space Debris Coordination Committee and at the COPUOS Science and Technical Subcommittee Space Mission Planning Advisory Group. Her research is published in over 100 journal and conference publications.

Fabio Ferrari is a Senior Research Associate at the University of Bern. His research interests are in the field of astrodynamics and planetary science, with applications to small celestial bodies of the Solar System, such as asteroids and comets. After earning his PhD in Aerospace Engineering from Politecnico di Milano in 2017, he was a Postdoctoral Fellow at NASA JPL and visiting researcher at the Observatoire de la Côte d'Azur, Nice. In 2018 he was awarded an MSCA IF - Global Fellowship to study the dynamics and evolution of rubble-pile asteroids. He is a co-investigator of projects related to small-body exploration and is a member of the scientific teams of ESA's Hera and NASA's DART mission. He is currently the PI of an Ambizione Grant funded by the Swiss National Science Foundation. To date, he has been awarded over 1M€ of research grants as PI, he is the author of 25 indexed publications and about 50 works in total. He serves as a reviewer for several international journals in the field of space engineering and planetary science.

Gabriella Gaias is an experienced Research Fellow at Politecnico di Milano recipient of the EU Horizon2020 Marie Skłodowska-Curie Individual Fellowship ReMoVe "Rendezvous Modelling Visiting and Enhancing". Since 2009 she holds a Research Engineer position at the German Space Operations Center of DLR (German Aerospace Center) - currently on leave. She has been involved and provided key contributions to two formation-flying missions flown since 2010. She acted as Principal Investigator of the AVANTI experiment - an in-orbit demonstration that realized the first fully autonomous vision-based rendezvous to a passive target spacecraft in low Earth orbit relying exclusively on angles-only observations. Within the PRISMA formation-flying mission, she worked as GNC Engineer in the control room and as an experiment developer of the ARGON in-orbit demonstration. Her research/work interests comprise the development of guidance navigation and control algorithms, simulation systems, and flight software for formation-flying and proximity operations. Her theoretical and applied activities have been disseminated through 50+ technical papers, of which 15+ peer-reviewed international journal publications.

Alberto Giacomello is Associate Professor of Fluid Dynamics at the Department of Mechanical and Aerospace Engineering of Sapienza University and principal investigator of the ERC-StG project HyGate. His research is in theoretical and computational fluid mechanics of interfaces at the micro- and nanoscale. Research is focused on understanding the origin of metastability in problems of engineering and multidisciplinary interest, including ion channel gating, superhydrophobicity, contact angle hysteresis, nanobubbles, and cavitation inception. In 2010, Alberto obtained a double MS degree in Mechanical Engineering from Sapienza University of Rome and the Polytechnic Institute of New York University. He holds a PhD in Theoretical and Applied Mechanics from Sapienza. In 2014 he moved to Germany to work as a postdoc at the Max Planck Institute for Intelligent Systems of Stuttgart with which the collaboration is ongoing. Since 2019 he is a member of the Sapienza School for Advanced Studies (SSAS).

Fabio Mellone has an Aerospace Engineering background (MSc at Federico II; USAF Test Pilot School graduate; Master in Satellite at La Sapienza) and is Project Officer at REA working in the MSCA (post-Doc) Engineering Panel. As an experimental flight test engineer, his background is in flight dynamics. He had been working for 10 years at the ITAF Flight Test Centre in Pratica di Mare. He managed for 7 years space dual-use and military programmes at the Italian National Armament Directorate. Most recently he worked in OCCAR as a Mission System Manager for the European MALE RPAS during the Definition Phase of the programme. He has teaching experience in aerodynamics/ flight testing.

Alfonso Pagani serves as an associate professor at the Department of Mechanical and Aerospace Engineering, Politecnico di Torino. He earned a Ph.D. in Aerospace Engineering at the City University of London in 2016 and, earlier, a Ph.D. in Fluid-dynamics at Politecnico di Torino under the supervision of Prof. E. Carrera. Recently, Dr Pagani has been awarded an EU-H2020 ERC starting grant for an exploratory study into a new approach to the problem of design, manufacturing, and analysis of variable stiffness composite materials (www.pre-eco.eu). In 2018, Alfonso joined the California Institute of Technology as visiting associate to work on acoustics of meta-materials. Also, he spent research periods at Purdue University in 2016, where he worked on micro-mechanics of fibre-reinforced composites with Prof. W. Yu; RMIT Melbourne in 2014; and at Universidade do Porto in 2013. Alfonso is the co-author of some 120 publications. He acts as a reviewer for more than 20 International journals and is an associate editor for Advances in Aircraft and Spacecraft Structures, an Int'l Journal edited by Techno-Press, and International Journal of Dynamics and Control, Springer Nature.

Antonio Papangelo is Research Fellow at Politecnico di Bari (PoliBa) in the Department of Mechanics Mathematics and Management since 2019. He obtained his PhD in Mechanical Engineering at PoliBa in 2017 and he has been visiting scientist at Sandia National Laboratories (USA), Imperial College London (UK), and a Research Fellow at the Hamburg University of Technology (TUHH) in the Dynamics Group. His research interests are tribology, adhesion between soft components, friction, the transition from static to dynamic friction, rough contact, viscoelasticity, vibrations of nonlinear mechanical systems, vibration localization. Antonio has received funding for his research from the Regione Puglia, the German Research Foundation and he is the PI of the project "SURFACE" funded under the call ERC - Starting Grant for an amount of 1.5 M€. SURFACE aims to design patterned interfaces with tuneable macroscopic adhesive properties by appropriate dynamic excitations.





Educational Series & Academy

George Symeonidis has an Aerospace Engineering background (B.Sc. – Ph.D. Univ. Bristol; Diploma & Ph.D. work von Karman Institute, VKI) and is Scientific Officer at the ERC working with the PE7 Systems and Communication Engineering and PE8 Products and Processes Engineering Panels. He has previous research experience in aerothermodynamics and hypersonics (VKI & ESTEC), industrial experience in aircraft and aero-engine maintenance/repair/overhaul (Hellenic Aerospace Industry), and teaching experience in aerodynamics/gas dynamics/flight mechanics (Univs. Thessaly & Patras).

Francesco Topputo is an Associate Professor of Aerospace Systems at Politecnico di Milano, Italy, and holds a position as Visiting Researcher at TU Delft, The Netherlands. His core research activities involve spacecraft flight dynamics and control, interplanetary CubeSat mission and system design, autonomous guidance, and navigation. Prof. Topputo is an ERC laureate (CoG 2019) and has been PI in 10 research projects, with over EUR 3.5M research grants allocated to work under his direction. He leads a research group composed of 16 Post-Doctoral fellows and PhD students. He has authored 50 peer-reviewed articles published in international journals, 8 book chapters, and over 200 works in total.

