



PhD in INGEGNERIA AEROSPAZIALE / AEROSPACE ENGINEERING - 38th cycle

**THEMATIC Research Field: GRANULAR DYNAMICS IN DEEP-SPACE WITH APPLICATIONS
TO ASTEROID-RELATED SCENARIOS**

Monthly net income of PhDscholarship (max 36 months)

€ 1400.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

Motivation and objectives of the research in this field

The research positions are issued in the context of the ERC project TRACES (Transitions in Rubble-pile Asteroid Chaotic Environment and granular Structures). The objective of TRACES is to characterize the response of granular media to mechanical solicitations in the deep-space environment (e.g., low/high-speed impacts, tidal forces). Applications are foreseen in the context of both planetary sciences, to investigate the origin and evolution of "rubble-pile" asteroids, and space engineering, to investigate the interaction between the rocky surface material and a moving lander/rover.

Methods and techniques that will be developed and used to carry out the research

The research activities are aimed at the study of granular mechanics in low-gravity and vacuum environments. The research foresees the use of data coming from DART (NASA) and Hera (ESA) space missions. In this context, the position will cover one of the following activities: - analytical/theoretical work: dynamic characterization using techniques of chaotic and nonlinear systems (e.g., chaotic indicators, phase space study, Poincaré maps). - computational work: usage and further development of the DEM code GRAINS to simulate both gravitational N-body and contact/collision interactions between irregular particles. - experimental work: design and execution of experiments on the ground and in micro-gravity environment (drop tower and parabolic flights).

Educational objectives



	The successful candidate will work within an interdisciplinary research team. The project foresees interactions with international collaborators, including the scientific teams of DART (NASA) and Hera (ESA) space missions. The TRACES team is part of a larger team composed of more than 20 researchers, active in a broad range of topics related to space exploration.
Job opportunities	Opportunities include research and academic jobs in the field of space engineering and planetary science, as well as positions in the space industry related to the development of simulation tools and/or devices for planetary surface interaction.
Composition of the research group	1 Full Professors 0 Associated Professors 1 Assistant Professors 15 PhD Students
Name of the research directors	Prof. Fabio Ferrari

Contacts
Dipartimento di Scienze e Tecnologie Aerospaziali - Politecnico di Milano - via La Masa 34, 20156 Milano - Italy - tel. +390223998320 - email: fabio1.ferrari@polimi.it - web site: https://dart.polimi.it/

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	2100.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
The Ph.D. candidate will receive a desk and a personal computer. Apart from the compulsory ones, the Ph.D. candidate will have the opportunity to follow additional courses, receive economic support to attend summer schools, and participate in conferences. There will be the possibility of paid teaching assistantship.



--