

## HIGHLIGHTS

### Opportunities for research at DIMA

There will be another important event at DIMA in the next weeks for the promotion of opportunities for research project at national and international level.

For this initiative, there will be the presence of DIMA expert, Andrea Rubini, in the photo above, water engineer who has more than thirty years of professional experience in the development and implementation of policies, projects and programs for the innovation and growth of SMEs and large companies, public bodies, institutions, associations and international organizations, in Italy, Europe, Africa and Asia.

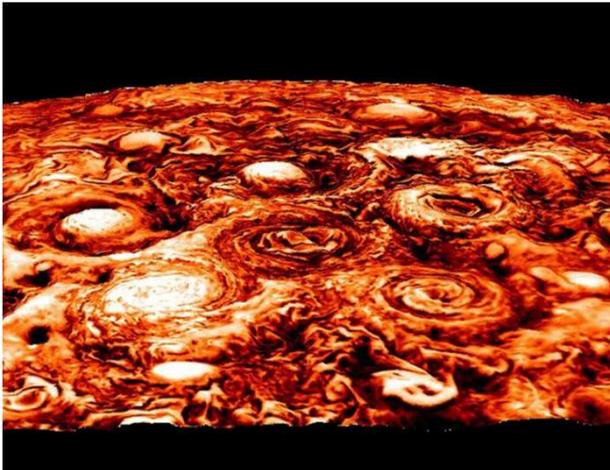
The goal is to carry out a preliminary scouting of funding opportunities forthcoming in the European context.





## NEWS FROM DIMA

### NASA mission discovers Jupiter's inner secrets



NASA spacecraft Juno has collected new data on its mission to Jupiter revealing some of the swirling inner mysteries of the giant gas-planet. The surface of Jupiter, the fifth planet from the sun and the largest in the solar system, consists of alternating bright and dark bands of gas and winds flowing in opposite directions at massive speed. Previously there have been extensive studies of the helium-and-hydrogen planet's surface, but now gravity measurements collected by Juno indicate that this turbulent outer layer extends to a depth of 1,900 miles (3,000 kilometers). Scientists hope the ongoing mission's findings, which have been published in four papers in Nature, will improve understanding of Jupiter's interior structure, core mass and, eventually, its origin. Among the mission's discoveries is that massive cyclones that surround Jupiter's north and south poles are enduring atmospheric features and unlike anything else encountered in the solar system, the NASA report said.

"Juno's measurement of Jupiter's gravity field indicates a north-south asymmetry, similar to the asymmetry observed in its zones and belts," said Luciano Iess, Juno co-investigator from Sapienza University of Rome, and lead author on a Nature paper on Jupiter's gravity field. "On a gas planet, such an asymmetry can only come from flows deep within the planet; and on Jupiter, the visible eastward and westward jet streams are likewise asymmetric north and south.

"The deeper the jets, the more mass they contain, leading to a stronger signal expressed in the gravity field. Thus, the magnitude of the asymmetry in gravity determines how deep the jet streams extend."

The mission also found that the planet's interior rotates as a solid body, despite its fluid nature.

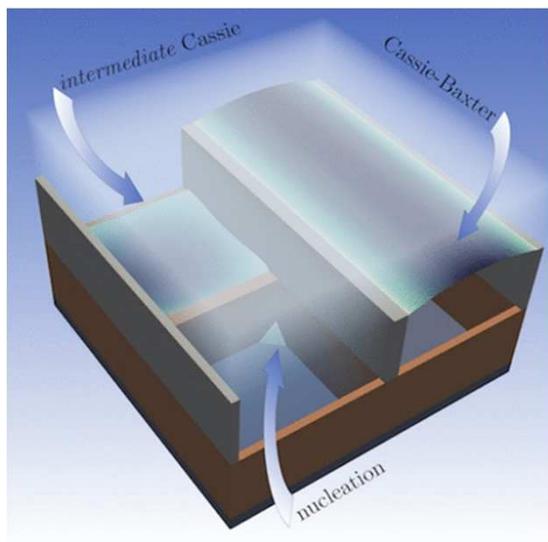
"This is really an amazing result, and future measurements by Juno will help us understand how the transition works between the weather layer and the rigid body below," said Tristan Guillot, a Juno co-investigator from the Université Côte d'Azur, Nice, France, and lead author of the paper on Jupiter's deep interior. "Juno's discovery has implications for other worlds in our solar system and beyond."





## NEWS FROM DIMA

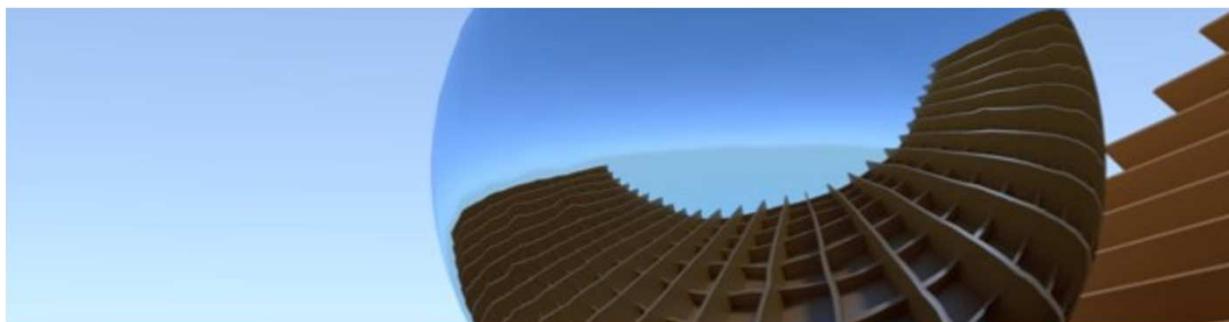
### Self-Recovery Superhydrophobic Surfaces



Abstract ACS Nano, 2018, 12 (1), pp 359–367

Superhydrophobicity, the enhanced hydrophobicity of surfaces decorated with textures of suitable size, is associated with a layer of gas trapped within surface roughness. The reduced liquid/solid contact makes superhydrophobicity attractive for many technological applications. This gas layer, however, can break down with the liquid completely wetting the surface. Experiments have shown that the recovery of the “suspended” superhydrophobic state from the wet one is difficult. Self-recovery—the spontaneous restoring of the gas layer at ambient conditions—is one of the dreams of research in superhydrophobicity as it would allow to overcome the fragility of superhydrophobicity. In this work we have performed a theoretical investigation of the wetting and recovery processes on a set of surfaces characterized by textures of different dimensions and morphology in order to elucidate the optimal parameters for avoiding wetting and achieving self-recovery.

Results show that texture size in the nanometer range is a necessary but not sufficient condition for self-recovery: the geometry plays a crucial role, nanopillars prevent self-recovery, while surfaces with square pores exhibit self-recovery even at large positive pressures. However, the optimal morphology for self-recovery, the square pore, is suboptimal for the functional properties of the surface, for example, high slippage. Our calculations show that these two properties are related to regions of the texture separated in space: self-recovery is controlled by the characteristics of the bottom surface, while wetting and slip are controlled by the cavity mouth. We thus propose a modular design strategy which combines self-recovery and good functional properties: Square pores surmounted by ridges achieve self-recovery even at 2 MPa and have a very small liquid/solid contact area. The macroscopic calculations, which allowed us to efficiently devise design criteria, have been validated by atomistic simulations, with the optimal texture showing self-recovery on atomic time scales,  $\tau \sim 2$  ns.





SAPIENZA  
UNIVERSITÀ DI ROMA

# DIMA DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

Newsletter - March 2018



## NEWS FROM DIMA

### Meeting with President of Italian Space Agency

On 28 February at DIMA there was an important meeting with a special guest, Prof. Roberto Battiston, currently President at Italian Space Agency. During the day it was possible to visit DIMA laboratories, with some professors and young researchers of the department. There was also a briefing with full professors in which the DIMA development plan and the main research lines were presented. After the transfer to the main campus, the ASI President visited the Additive Manufacturing Laboratory. The visit was concluded with a meeting with our Rector, prof. Gaudio.



## NEWS FROM DIMA

### Smart Structures Solutions

First industrail contract for Smart Structures Solutions, our Sapienza spin-off company that offers solutions for the monitoring of structural integrity of infrastructures thanks to space tecnologies and assets! The company has deployed a network of sensors devices for the monitoring of ice forming on electrical distribution lines. Ice forming has been the origin of several collapses of electrical distribution lines in Europe (e.g. in Slovenia) creating major consequences. An early detection of the phenomenon will not only improve safety but also contribute to save money and implement on condition maintenance. the contract has followed several experimental campaign for different potential clients.



## NEWS FROM DIMA

### Roma Moto Days 2018

From 8 to 11 March 2018, at Fiera di Roma there will take place the 2018 edition of Roma Moto days. Directly from the Facebook fan page of Sapienza Corse Racing Team «Not one but two Gajarda's on show here at the Motodays! Only a few hours left to come and see how the work of Sapienza Corse evolved over the past few years. Come and take a look in Hall 3! Big thanks to RS Components and RC Racing for coming today: part of Gajarda AWD was made thanks to their contribution!»



## OPPORTUNITIES FOR RESEARCH, NETWORKING AND INTERNATIONALIZATION



- **Extraordinary Recruitment Plan for Researchers 2018** announced by the Italian Ministry of Education, University and Research (MIUR). Expected by the law for 2018, the Plan includes 1,305 position of type B researchers for universities and 308 permanent positions for research institutions supervised by MIUR. The University decree provides for 12 million appropriations for 2018 and another 76.5 from 2019 for the recruitment of type B researchers and for their consolidation at the end of the three-year contract, after the national scientific qualification. For further information follow this link: <http://www.miur.gov.it/web/guest/-/piano-straordinario-2018-per-il-reclutamento-ricercatori-di-cui-all-articolo-24-comma-3-lettera-b-della-legge-240-2010>



- According to «PON Ricerca e Innovazione 2014-2020» the Italian Ministry of Education, University and Research (MIUR) has created a specific funding opportunity called "Fondo di fondi" of national relevance for research and innovation. All investment will be able to finance industrial research and experimental development in line with the selection criteria of the PON and promote **Key Enabling Technologies (KETs)** for thematic areas related to National Strategy of Intelligent Specialization. For further information follow this link: [http://www.ponricerca.gov.it/media/391294/avviso\\_372.22-02-2018.pdf](http://www.ponricerca.gov.it/media/391294/avviso_372.22-02-2018.pdf)



- Published in «Gazzetta Ufficiale» of 6 March 2018, the implementation decree of «**National Fund for Energy Efficiency**». This Fund supports energy efficiency measures realized by companies and the Public Administration on buildings and production processes. At the beginning, the Fund will be financed by the Italian Ministry of Economic Development with 150 million EUR and with 100 million EUR in the period 2018-2020. The management of this Fund will be entrusted to INVITALIA. Further information are available at this link (only italian version): <http://www.sviluppoeconomico.gov.it/index.php/it/energia/efficienza-energetica/fondo-nazionale-efficienza-energetica>