



# University of Pavia, Italy

Italian Space Research showcase – Italian Space Agency – June 2020

*Fabio Dell'Acqua - Department of Electrical, Computer, Biomedical Engineering*



UNIVERSITÀ  
DI PAVIA

# University of Pavia

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- Public university, founded in year **1361**
- Among its rectors we may recall **Alessandro Volta**, the **inventor of the electric battery**, and **Camillo Golgi**, the earliest Italian **Nobel** laureate, for his studies on the histology of the human nerve system
- The town of Pavia forms a local «**knowledge network**» covering various scientific and also practical aspects:
  - Institute for Advances Studies (IUSS)
  - Polyclinic **hospital** «S. Matteo»
  - Research **foundations** (CNAO, Maugeri, Mondino, EUCENTRE, ...)
  - Research **institutes** (IGM, INFN, CHT, ...)
  - **Residential system**, including historical «colleges of merit» founded in the XVI century
  - Network of **museums** and **libraries**
  - **Technological incubator**

# University of Pavia and Space



□ Full member of the **Regional Aerospace Cluster**



□ The Department of Electrical, Biomedical, Computer Engineering is a member of the **Copernicus Academy**



□ Various courses explicitly address the joint **ESA-EU Copernicus** initiative

□ The graduate course in Electronic Engineering features a “**Space Communication and Sensing**” track

□ The University of Pavia will coordinate the didactic activities of the Italian semester of the **joint ASI-CONAE Master on Earth Observation for Emergency Management**



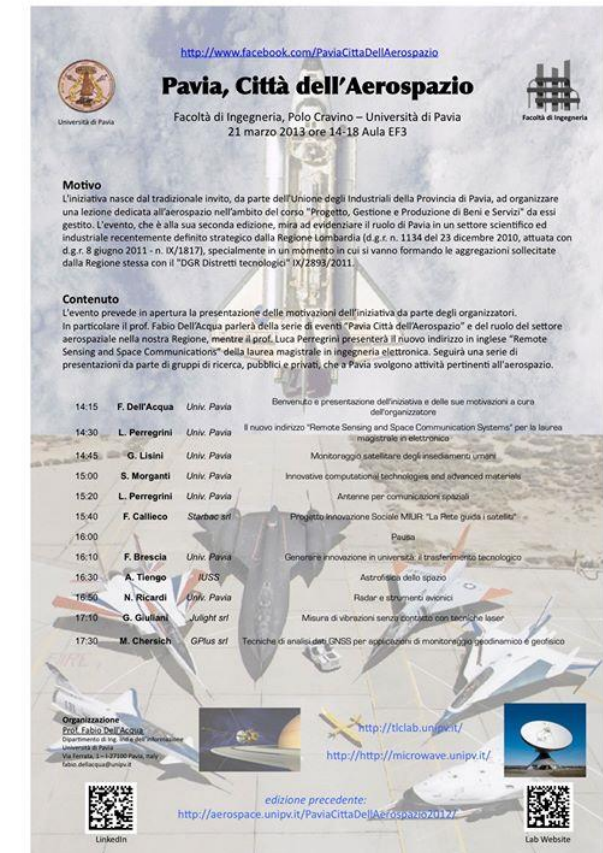
On 9th Nov. 2017, during celebrations for the 50° anniversary of the founding of the Faculty of Engineering, the astronaut Samantha Cristoforetti receives her **honoris causa degree** in Biomedical Engineering by the Rector prof. Fabio Rugge



# University of Pavia and Space Research

As highlighted by the periodic initiative «Pavia, the Aerospace City», several research lines relate with space, including:

- ❑ Satellite systems and **Earth observation** from space
- ❑ **Antennas** for space communications
- ❑ High-frequency **electronics** for space environment
- ❑ **Materials**: 3D printing, shape memory alloys
- ❑ Energy harvesting, on-board **wireless sensor networks**;
- ❑ Hi-performance computation and **deep learning**
- ❑ **Space medicine** and effects of micro-gravity on the human body



<http://www.facebook.com/PaviaCittàdellAerospazio>

**Pavia, Città dell'Aerospazio**  
Facoltà di Ingegneria, Polo Cravino – Università di Pavia  
21 marzo 2013 ore 14:18 Aula EF3

**Motivo**  
L'iniziativa nasce dal tradizionale invito, da parte dell'Unione degli Industriali della Provincia di Pavia, ad organizzare una lezione dedicata all'aerospazio nell'ambito del corso "Progetto, Gestione e Produzione di Beni e Servizi" da essi gestito. L'evento, che è alla sua seconda edizione, mira ad evidenziare il ruolo di Pavia in un settore scientifico ed industriale recentemente definito strategico dalla Regione Lombardia (d.g.r. n. 1134 del 23 dicembre 2010, attuata con d.g.r. 8 giugno 2011 - n. IX/1817), specialmente in un momento in cui si vanno formando le aggregazioni sollecitate dalla Regione stessa con il "DGR Distretti tecnologici" IX/2893/2011.



**Contenuto**  
L'evento prevede in apertura la presentazione delle motivazioni dell'iniziativa da parte degli organizzatori. In particolare il prof. Fabio Dell'Acqua parlerà della serie di eventi "Pavia Città dell'Aerospazio" e del ruolo del settore aerospaziale nella nostra Regione, mentre il prof. Luca Perregini presenterà il nuovo indirizzo in Ingegneria "Remote Sensing and Space Communications" della laurea magistrale in Ingegneria elettronica. Seguirà una serie di presentazioni da parte di gruppi di ricerca, pubblici e privati, che a Pavia svolgono attività pertinenti all'aerospazio.

14:15	F. Dell'Acqua	Univ. Pavia	Benvenuto e presentazione dell'iniziativa e delle sue motivazioni a cura dell'organizzatore
14:30	L. Perregini	Univ. Pavia	Il nuovo indirizzo "Remote Sensing and Space Communication Systems" per la laurea magistrale in elettronica
14:45	G. Lisini	Univ. Pavia	Monitoraggio satellitare degli insediamenti urbani
15:00	S. Morganti	Univ. Pavia	Innovative computational technologies and advanced materials
15:20	L. Perregini	Univ. Pavia	Antenne per comunicazioni spaziali
15:40	F. Callego	Stelae srl	Progetto Innovazione Sociale MILR "La Rete guida i satelliti"
16:00			Pavia
16:10	F. Brescia	Univ. Pavia	Generare innovazione in università: il trasferimento tecnologico
16:30	A. Tienpo	RUSC	Astrofisica dello spazio
16:50	N. Ricardi	Univ. Pavia	Radar e strumenti avionici
17:10	G. Giuliani	Julight srl	Misura di vibrazioni senza contatto con tecnica laser
17:30	M. Chersich	GPLus srl	Tecniche di analisi dei GNSS per applicazioni di monitoraggio geodinamico e geofisico

**Organizzazione**  
Prof. Fabio Dell'Acqua  
Insegnamento di Ing. Infrastr. per l'Aerospazio  
Università di Pavia  
Via Belzoni, 55 - 27100 Pavia (PV)  
fabio.dellacqua@unipv.it

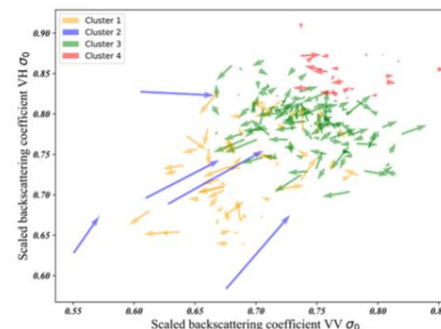
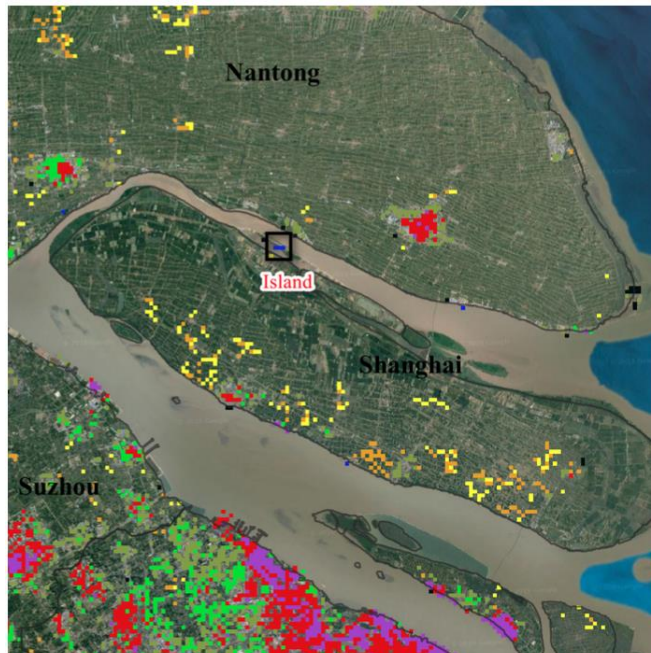
<http://ticlab.unipv.it/>  
<http://http://microwave.unipv.it/>

edizione precedente:  
<http://aerospazio.unipv.it/PaviaCittàdellAerospazio2012/>

LinkedIn  Lab Website 

# Earth observation

- Algorithms and methods for **large-scale analysis of satellite Earth Observation data**, including Machine Learning approaches. Focus on urban areas and on agricultural applications.
- Contact: prof. Paolo Gamba, prof. Fabio Dell'Acqua, prof. Francesco Zucca



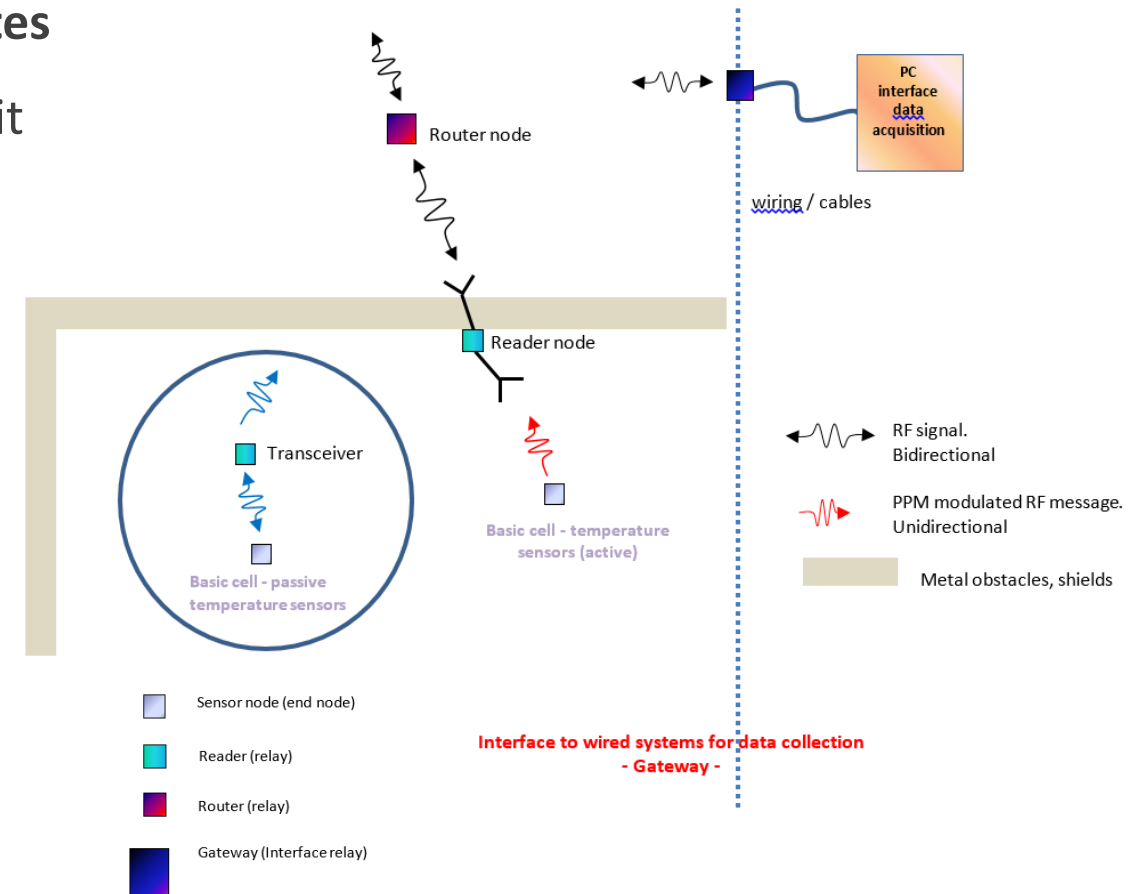
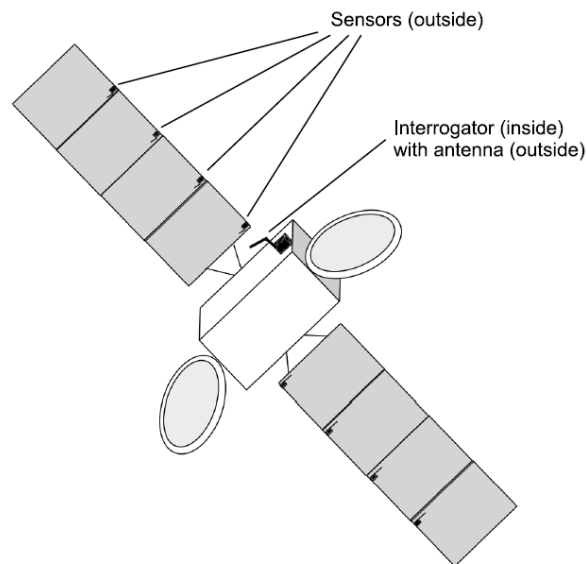
Change indicators

radar backscatter → # of buildings

Night time lights → economic activities

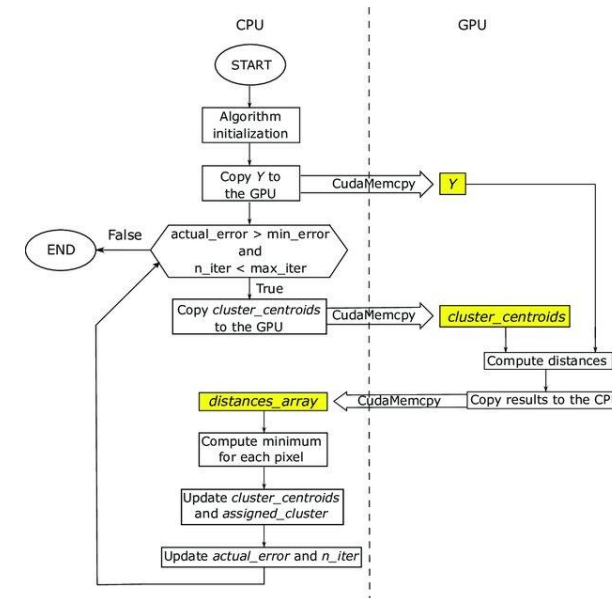
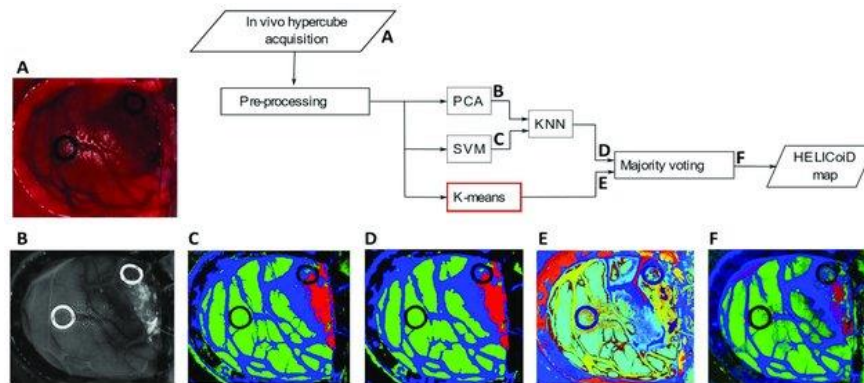
# On-board Wireless Sensor Networks

- Wireless networks of local sensors **onboard satellites**
- Contact: prof. Pietro Savazzi, [pietro.savazzi@unipv.it](mailto:pietro.savazzi@unipv.it)



# HPC for hyperspectral data processing

- Specialised systems and strategies for near-real time hyperspectral data processing
- Contact: prof. Francesco Leporati, francesco.leporati@unipv.it

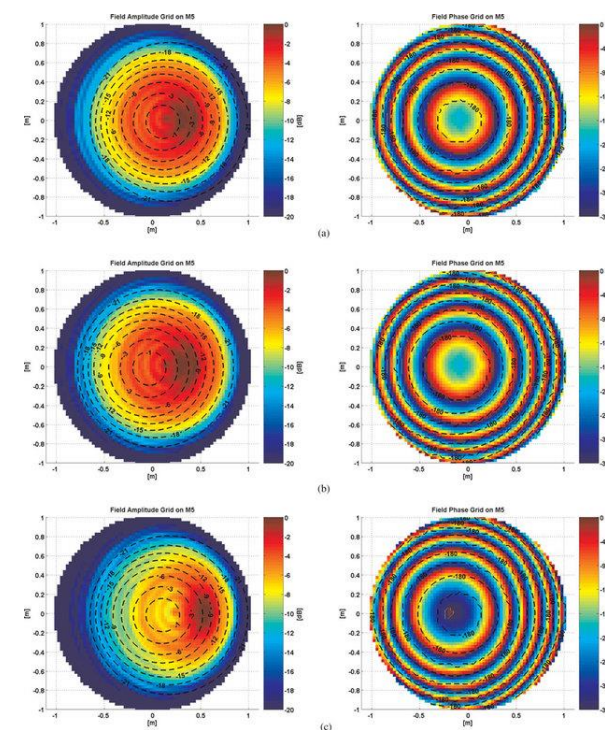
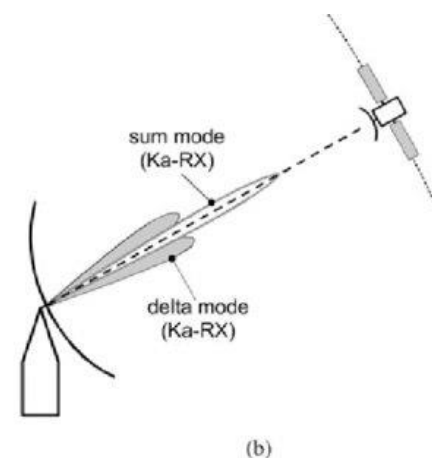
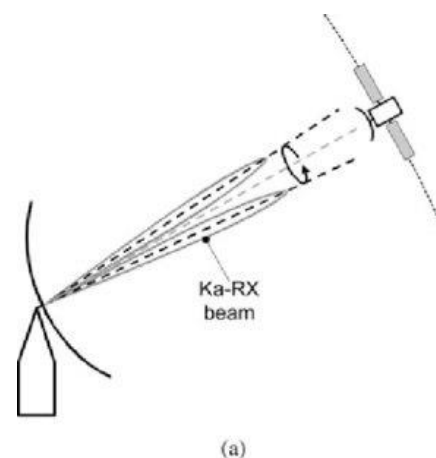
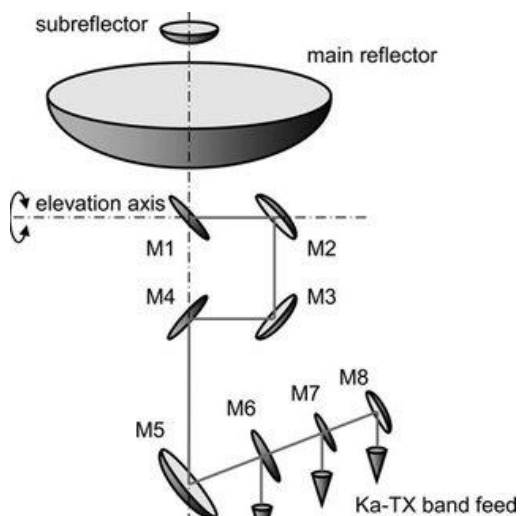




# Antennas

□ Analysis, design and simulation of **space communication antennas**

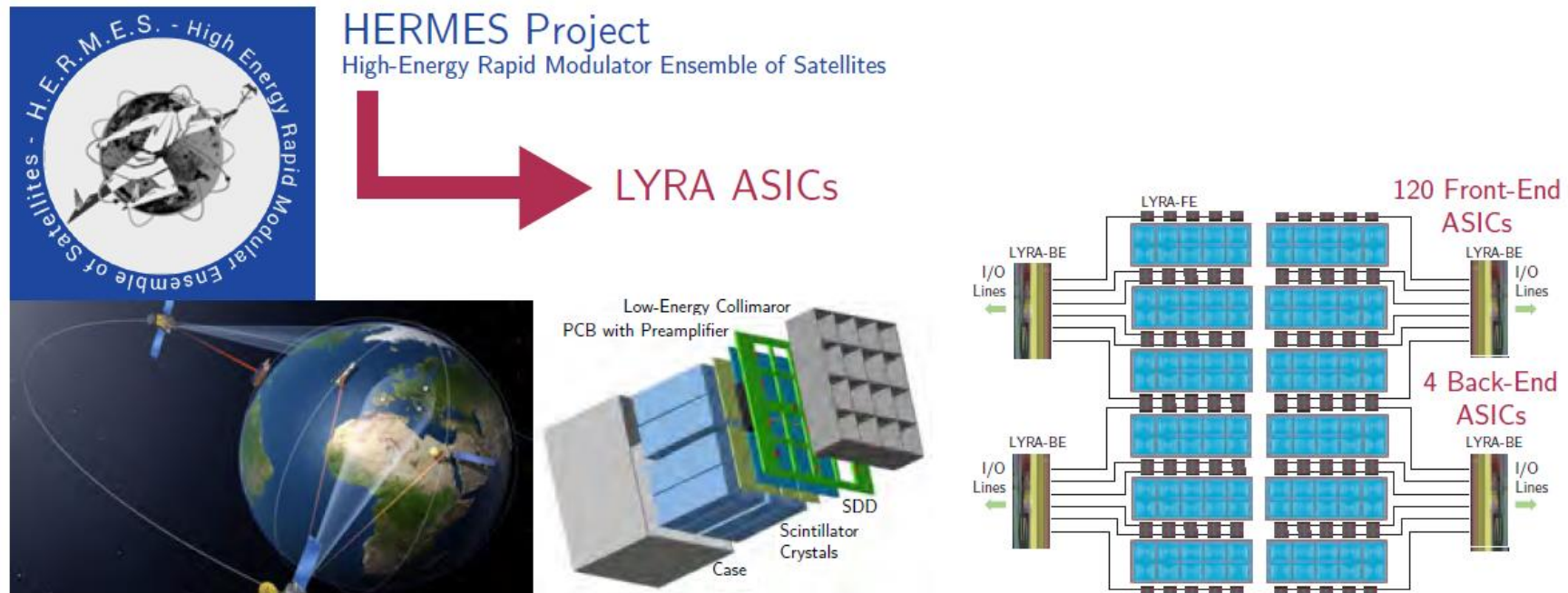
□ Contact: Prof. Luca Perregrini, [luca.perregrini@unipv.it](mailto:luca.perregrini@unipv.it)





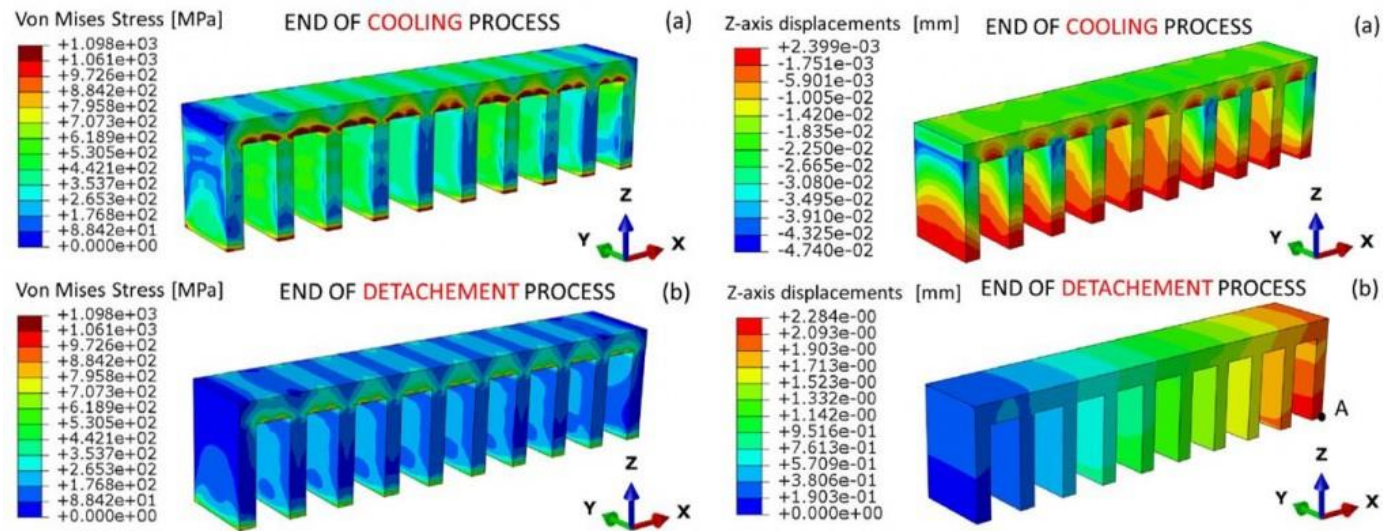
# Electronics

- ❑ **Mixed Signal ASICs** for Space Applications (in Cooperation with Polytechnic of Milan)
- ❑ Contact: prof. Piero Malcovati, [piero.malcovati@unipv.it](mailto:piero.malcovati@unipv.it)



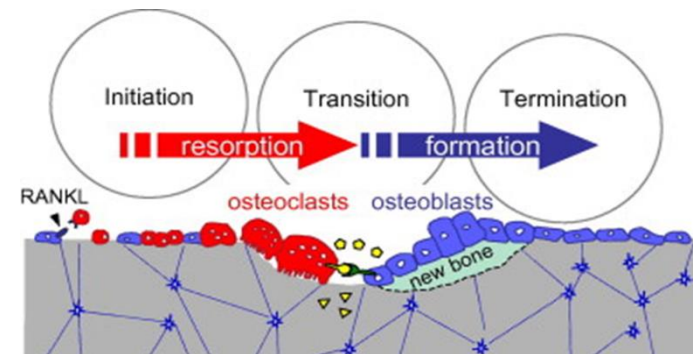
# Materials

- 3D printing, including **metal 3D printing** – modelling and simulation
- Contact: prof. Ferdinando Auricchio, [ferdinando.auricchio@unipv.it](mailto:ferdinando.auricchio@unipv.it)



# Human spaceflight

- ❑ Treatment of **microgravity-induced osteoporosis**
- ❑ Prof. Livia Visai, [livia.visai@unipv.it](mailto:livia.visai@unipv.it)



# Thank you!

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[FABIO.DELLACQUA@UNIPV.IT](mailto:FABIO.DELLACQUA@UNIPV.IT)

[HTTP://TLCRS.UNIPV.IT/](http://tlcrs.unipv.it/)



# University of Pavia

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- Among its rectors we may recall **Alessandro Volta**, the inventor of the electric battery, and **Camillo Golgi**, Nobel laureate for his studies on the histology of the human nerve system
- Its teaching body included famous Italian historical figures such as the mathematicians **Eugenio Beltrami**, **Felice Casorati** and **Luigi Berzolari**, the poets **Vincenzo Monti** e **Ugo Foscolo**, the medical doctor **Carlo Forlanini**
- It is part of the «Coimbra group» and features **a high degree of internationalization** (1° CENSIS rank in 2017) thanks also to specific programmes like the «Boston project»
- **Earliest university in Italy** to activate courses taught in English
- Currently offering 84 degree courses, 22 PhD courses, 29 specialized courses, and counting about 25,000 students

# Faculty of Engineering



Facoltà di Ingegneria  
Università degli Studi di Pavia



Founded in 1967, it now counts:

- 3 departments:
  - Electrical, Computer and Biomedical Engineering
  - Civil and Architectural Engineering
  - Mathematics
- 4 undergraduate courses
- 4 graduate courses in Italian
- 4 graduate courses in English,
- more than 3,000 students, increasing trend



On 9th Nov. 2017, on the occasion of the celebration of the 50° anniversary of the founding of the Faculty, the astronaut Samantha Cristoforetti receives her honoris causa degree in Biomedical Engineering by the Rector prof. Fabio Rugge