

# SMART SOLUTIONS FROM THE PLANT KINGDOM: BEYOND THE ANIMAL MODELS *SECOND EDITION*

June 9, 2014 - Accademia dei Georgofili

Logge Uffizi Corti, Florence (Italy)

## Organizers

### Barbara Mazzolai

Director  
Center for Micro-BioRobotics  
Istituto Italiano di Tecnologia (IIT)  
Pontedera (Pisa) – Italy

### Stefano Mancuso

Associate Professor  
DIPSA - Polo Scientifico -  
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Sesto F.no (FI) - Italy

## Agenda of the Workshop

Time	Speaker	Affiliation	Topic
9.00-9.20	<b>Barbara Mazzolai</b> <b>Stefano Mancuso</b>	Centre for Micro-BioRobotics Pontedera, Italy Dpt. Plant, Soil & Environment University of Florence, Italy	Welcome
9.20-9.50	<b>Barbara Mazzolai</b>	Centre for Micro-BioRobotics Pontedera, Italy	Plant-Inspired Robotics
9.50-10.20	<b>Stefano Mancuso</b>	Dpt. Plant, Soil & Environment University of Florence, Italy	New Frontiers on Plant Communication
10.20-10.50	COFFEE BREAK		
10.50-11.25	<b>Nicola Pugno</b>	Department of Civil, Environmental and Mechanical Engineering, University of Trento, Italy	Smart materials inspired by plants and animals
11.25-12.00	<b>Giovanni Sena</b>	Imperial College London, UK	Self-repairing systems: from plant tissue regeneration to morphogenetic engineering
12.00-12.35	<b>Andrea Vitaletti</b>	SAPIENZA University of Rome; WLAB, Italy	The classification of signals generated by plants in reaction to external stimuli
12.35-14.00	LUNCH BREAK		

14.00-14.35	<b>Fabio Fiorani</b>	Jülich Plant Phenotyping Centre (JPPC), Jülich, Germany	Plant phenotyping for plant breeding and beyond: linking models and experiments
14.35-15.10	<b>Klaus Palme</b>	Institute of Biology (Botany), University of Freiburg, Germany	Towards understanding gene functions and regulatory interactions in the 3D context of cells, tissues and organs in Arabidopsis
15.10-16.10	<b>Virgilio Mattoli Lucia Beccai</b>	Centre for Micro-BioRobotics of IIT@SSSA, Pontedera, Italy	Plant inspired technologies for sensing and actuation
16.10-16.30	<i>Conclusions</i>		

## Motivation

The aim of the Workshop is to present and discuss the importance of investigating plants for learning from their structure and behaviour, and for mimicking their features to develop new technologies and systems.

Rarely plants have been considered as a model of inspiration for designing and developing new technology, probably due to their radically different operational principles compared to animals. Indeed plants are able to show a considerable plasticity in both morphology and physiology in response to environment variability. This results in movements that are characterized by energy efficiency and high density. Mimicking plants requires deep investigations on new materials, mechanisms, sensors, actuators, and control schemes, and can lead to strong technological breakthroughs. In this Workshop a selected group of top-scientists, worldwide expert and active in the field, will contribute to discuss the best approaches and strategic priorities, in addition to identify potential application areas, in order to push the relevant scientific and technological frontiers of this field.

Main topics that will be covered are:

- ✓ *Plant-inspired robotics*
- ✓ *Plant sensing and growth*
- ✓ *Fibre hierarchies in plants*
- ✓ *Plants inspired materials*
- ✓ *Communication in plants*
- ✓ *Plant-inspired evolutionary algorithms*
- ✓ *Plant phenotyping*
- ✓ *Plant-inspired adaptive structures*

Demos of plant-inspired artefacts will be also presented at the end of the Workshop.

## Objectives

The novelty of the area and the multidisciplinary approach will stimulate creativity and interactions among participants, with the potentiality of a strong impact in different fields, as biology, engineering, chemistry, computer science, and physics to conceive and develop advanced systems.

The objectives of the workshop are to share and discuss in a broad community the current state of the art concerning the research areas that look at plants as inspiration source to impact in future technologies in general, as well as to encourage collaborations and inspire the exploration of novel research lines or projects.