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## HORIZON MANAGEMENT NEWS

### 02/2013

In this issue:

- The origins of the Universe
- Dexmart: the next generation of smart robots  
Interview with Prof. Bruno Siciliano
- News in research
- Events and workshops

## The origins of the Universe



What could be more inspiring than inquiring about the nature of the Universe, its beginnings and evolution? One of the research subjects that peaks the interest of not only scientists but also that of the general public is stars. These shiny objects don't only inspire poets and romantics but they also push the inquiring minds of scientists to ask about their history.

For instance, scientists are observing and studying the elusive "white dwarf" (WDs) stars, supposed to be amongst the oldest objects in the known universe, in order to shed some light on the origin and evolution of our galaxy. Stars have their own life cycles and since WDs are considered to be "fossil stars" they might hold the key to some of the most fascinating questions pondered by scientists. European researchers are trying to take advantage of recent technological developments in stellar observation and experimentation in hopes of detecting and classifying WDs. The FP7 funded project, Galfos, made this possible.

**Horizon Management offers project management services related to non-scientific tasks of EU-funded research projects. If you would like to contribute to one of our next newsletters with an article, please do not hesitate to contact us.**

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The location of a star in the galaxy is partially related to the star's age. Old stars are characterized by their low luminosities, which make them difficult to detect. But the project in question acquired images on the basis of which scientists were able to accurately measure the relative movements (called "proper motion") of all the stars identified. As a result of the research conducted by the Galfos team, numerous WDs containing information about the history of the Milky Way have been identified and analysed.

Another way of gaining insight into the growth and evolution of galaxies is to study the accumulation of stellar material on stars and black holes. This is one of the ways to observe the changes that the Universe went through. Scientists are studying a phenomenon called accretion, which is defined as the attraction and accumulation of gas and dust onto compact objects such as stars and planets. It is accompanied by various forms of high-energy jet bursts that can be observed as an increase in the object's luminosity. By studying these kinds of events and through experimentation and numerical modelling we can learn more about the origins and evolution of galaxies. For example, the EU-funded project, XRBGAL provided the scientific community with valuable observational and mathematical results vital to this understanding.

In the end these types of projects are a reminder of human ingenuity and curiosity. It can be very inspiring to search for answers relating to our very existence and having the vision to investigate the nature of the Universe also says a lot about our own nature.

By Cosmina Marian

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## Dexmart: the next generation of smart robots Interview with Prof. Bruno Siciliano

**Bruno Siciliano is Professor of Control and Robotics, and Director of the PRISMA Lab in the Department of Electrical Engineering and Information Technology at University of Naples Federico II. His research interests include force and visual control, human-robot interaction, aerial and service robotics.**

### **What are the practical uses for a highly dexterous robot?**

Dexterous robots have a great potential for European robot manufacturers, as typical assembly procedures in automotive industry require dual-arm manipulation of objects and tools similar to those generally used by production workers. They will be appealing to SMEs for manipulation of work pieces of different sizes, shapes and weights currently requiring different grasping tools and frequent changes. Yet, future robots, envisioned for domestic duties, will require higher levels of manipulation and autonomy; the adoption of high dexterity in robot hand designs could help make that happen.

### **What is the Dexmart anthropomorphic five-fingered robot hand able to do?**



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The Dexmart hand is capable of both powerful and delicate maneuvers. It can touch, grasp and lift diverse objects and place them gently in a new position. The anthropomorphic device incorporates an innovative actuator system in which strong polymer strings in the handling apparatus are twisted by high-speed motors located in the “forearm” onto which the hand is mounted. Sensors have been developed to measure joint angles, tendon forces and tactile interactions with objects. Within the tactile sensor, advanced computational analysis of the captured light intensity inside a number of sensitive elements makes it possible to calculate the forces exerted on the object by the fingers and also whether the object is slipping out of the robot’s grasp.

### **Does the robot hand move following the same principles as a human?**

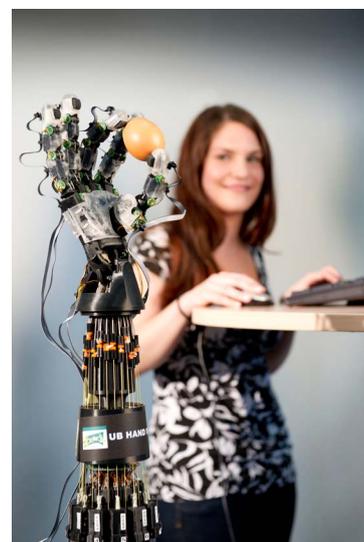
Research into human hand control and coordination has shown that we don’t control each joint separately; our brain controls all the joints at the same time in a coordinated fashion. Neuroscientists have demonstrated that human hand positions and movements can actually be simplified to just three so-called “postural synergies”. The control system takes input from optoelectronic sensors on the hand (which measure the grasp pressure), working out the synergies and actuating the finger movements. The grip precision that these three create permits extremely refined manipulations. The capability of the robot hand is so near to that of humans that the vision of robots as personal assistants in the household, in the operating room as well as in industrial settings, is becoming more realistic.

### **What are you and your team currently working on?**

We are currently involved in three European projects. The first two are on aerial robotics, i.e. the use of unmanned aerial vehicles (UAVs) for service robotics tasks. The goal of the AIRobots project is to develop a new generation of aerial service robots capable to support human

beings in all those activities which require the ability to interact actively and safely with environments not constrained on ground but, indeed, freely in air, i.e. the concept of a “flying hand”. On the other hand, the ARCAS project proposes the development and experimental validation of the first

cooperative free-flying robot system for assembly and structure construction. The building of platforms for the evacuation of people in rescue operations, the installation of platforms in uneven terrains for landing of manned and unmanned vertical-take-off-and-landing (VTOL) aircrafts, the cooperative inspection and maintenance and the construction of structures, are some examples of aerial robotics’ potential. The third project, SAPHARI, is related to human–robot interaction and a fundamental paradigm shift in robot development is adopted in the sense that the human is placed at the centre of the entire design. The project will take a big step further along the human-centered roadmap by addressing all essential aspects of safe, intuitive physical interaction between humans and complex, human-like robotic systems in a strongly interconnected manner. Further to the above projects, our team will be engaged in two new projects starting in 2013: SHERPA whose goal is to develop a mixed ground and aerial robotic platform to support search and rescue activities in a real-world hostile environment like the alpine scenario; RoDyMan<sup>1</sup> whose goal is the derivation of a unified framework for dynamic manipulation where the mobile nature of the robotic system and the manipulation of non-prehensile non-rigid or deformable objects is explicitly taken into account.



<sup>1</sup> is an ERC Advanced Grant for 2.5 million Euro



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## News in research

### FP7: EU funding of 3,000 scientists in 6 years

A symbolic milestone was reached recently with the 3,000th scientist to receive EU funding for a research project. Together with their team, the scientist will examine how the network of regions in the brain that is involved in action observation - the so-called vicarious motor network - integrates information.

[Details](#)

### Austrian physicist wins Wolf Prize and ERC grant



Peter Zoller and Spanish researcher Ignacio Cirac have been honoured with the prestigious Wolf Prize in Physics for pioneering theoretical contributions to quantum

information processing, quantum optics and the physics of quantum gases.

[Details](#)

### Developing global links in research

European researchers working outside Europe are considered to be an untapped resource and, in light of this, the European Commission has initiated the EURAXESS Links project. The goal of this project is to foster productive relations between Europe and European researchers working abroad and also to stimulate scientific cooperation between Europe and their host countries.

[Details](#)

### University research to benefit from EU grants of EUR 25 million



Scientists at Imperial College London have received funding of over EUR 25 million aimed at making a difference in scientific research. The Synergy grants awarded by the European Research Council (ERC) are

for projects aimed at enhancing collaboration between leading researchers. The grants will facilitate the sharing of skills, knowledge and resources.

[Details](#)



### Environment: Swedish researchers investigate climate change impact on Arctic mammals

Researchers have discovered that climate change could have a positive effect on mammals living in the Arctic and sub-Arctic land areas

in northern Europe - if they succeed in adjusting their geographic ranges.

[Details](#)

### WATBIO project puts drought-tolerant crops in the spotlight

Water is the most important component of a plant's growth, but researchers have discovered that some plants can survive with less. Researchers in Europe are now working on developing crops that can tolerate droughts, specifically for bioenergy and bio-products.

[Details](#)

### Towards a global harmonised system to monitor biodiversity



A recently published study advocates the need for a global, harmonised observation system for delivering regular and timely data on biodiversity change. It further tackles the basis for worldwide monitoring to support the implementation of agreed international biodiversity goals, i.e.

to reduce the rate of biodiversity loss and to prevent dangerous changes in biodiversity.

[Details](#)

### **Social:** Still a huge gap between the sexes

A Eurostat study reiterates the fact that there's still a lingering gap between the sexes when it comes to education and employment. Perhaps one of the most surprising facts to come to light was the news that one out of every six employees in the EU-27 was a low-wage earner in 2010. The survey also concluded that it was women who were more likely to be low-wage earners: 21% of female employees compared with 13.3% of male employees.

[Details](#)

### **Health:** Innovative rehabilitation for stroke victims

A pioneering rehabilitation system has been developed with the aim of improving the quality of life of those suffering from brain damage. The home rehabilitation system supports the patient from sitting to standing position and improves overall manoeuvrability. This improves patient autonomy, particularly for those suffering from stroke (cerebrovascular accident), which is the most common cause of adult disability in Europe. Around 75% of sufferers survive, but many people lose the ability to live independently in their own home.

[Details](#)

### **Science at the forefront of food safety**

Health and diet are important factors for many Europeans when doing their weekly shopping: safe, nutritious and affordable food is top of their list. Important food safety areas have been addressed over the last 10 years: the limitation of exposure to pesticides, the setting of safe levels of their residues and the evaluation of food and feed additives. As a result, European consumers can feel safe in the knowledge that the nutrition or health claims on their food labels have a sound scientific basis.

[Details](#)

### **ICT:** Game not over for retro games

Old school computer games haven't been forgotten and a partially EU-funded project provides the necessary tools to enable future generations and us to have access to these games long into the future. The KEEP project deals with the compatibility issue by resorting to emulators.

[Details](#)

### **Media:** Analysing the Star Wars Trilogy under Einstein's theory of relativity



One of the most iconic images of the Star Wars trilogy has been dissected and analysed using Einstein's theory of Special Relativity. A group of fourth-year

physics students from the University of Leicester has calculated that, although the Star Wars ship, Millennium Falcon, makes the 'jump to light speed', in reality Han, Luke and Leia would not have been able to see light from stars stretching past the ship, movie-style. The students' findings are published in the University of Leicester's yearly Journal of Physics Special Topics, which features original short papers written by students in the final year of their four-year Master of Physics degree.

[Details](#)



## Events and Workshops

'ICT for Sustainability Conference', 14-16 February, Zurich, Switzerland

The event will be an opportunity for attendees to discuss the transformational power of ICTs for making our world more sustainable: saving energy and material resources by creating more value from less input of limited natural resources, and increasing quality of life for all without compromising future generations' ability to meet their needs.

### Details

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'International Conference on the Utilization of Wetland Plants: Reed as a Renewable Resource', 14-16 February, Greifswald, Germany

The event will bring together stakeholders from research, governance and other actors who deal with the utilization of reed to network, analyse research demand and share experience and information.

### Details

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Agile and User Centred Design Integration - What Lies Beneath

and What Lies Ahead', 15-18 February, York, UK

The conference will be a forum for researchers, engineers and practitioners to discuss both applications and current research within the field of agents, multi-agent systems and software platforms.

### Details

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Second International Conference on Sensor Networks, 19-21 February, Barcelona, Spain

The event will bring together researchers and engineers to exchange views on innovative developments in hardware, wireless communication protocols, software, architectures, applications and uses.

### Details

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'International Conference on Photonics, Optics and Laser Technology', 20-21 February, Barcelona, Spain

The event will bring together researchers, engineers and practitioners interested in this field, covering both theoretical and practical aspects of the subject matter.

### Detail

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Fifth International Conference on Sustainable Construction and Design, 20-22 February, Ghent, Belgium

The conference covers different aspects related to the mechanical failure of structures and machine components, with a focus on tribology and fatigue in today's constructions. It will be a forum for various specialists to ensure that today's research meets the requirements of tomorrow's end users.

### Details

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12th Genoa Meeting on Hypertension Diabetes and Renal Diseases, 21-23 February, Genoa, Italy

The conference will aim to highlight the various aspects this disease and discuss the most recent developments.

### Details

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'Optimize 2013: antibody engineering and discovery', 25-27 February, Frankfurt, Germany

The event will bring together scientists and industry representatives working in this field to exchange on the products already on the market, advanced research on immunogenicity prediction, potential antibody therapeutics and new engineering methods. with a focus on new developments in genome bioinformatics and computational biology.

### Details