Marco Dorigo

Subject: Robotics Host Institution: Université Libre de Bruxelles, Belgium Nationality: Italian

Swarms of interacting and autonomous robots come to life

Swarm intelligence is the discipline that deals with natural and artificial systems composed of many individuals that coordinate using decentralised control and self-organisation. In the E-SWARM project, Professor Dorigo focuses on the design and implementation of artificial swarm intelligence systems for the solution of complex problems. He is working on a heterogeneous robotics system composed of three different types of robots with complementary skills: foot-bots (specialised in locomotion and capable of transporting objects), hand-bots (capable of climbing vertically and manipulating small objects) and eye-bots (autonomous flying robots capable of attaching themselves to the ceiling, analysing the environment and gathering information inaccessible to the other two types of robots). The robot swarm acts autonomously and without the need of any external control: it relies on continuous interactions between the robots and their environment to produce collective self-organised behaviour. Concrete applications of this novel type of robotic artefact could one day include rescue operations after natural disasters or the exploration of hostile environments such as space or underwater. The current prototypes are able to navigate autonomously in office-like environments, connect to each others to overcome obstacles, and cooperate to find and retrieve objects.

ERC Project: Engineering Swarm Intelligence Systems (E-SWARM) ERC Call: Advanced Grant 2009 ERC Funding: €2.01 million for five years



To be noted:

Marco Dorigo will present his research results during the evening celebration on 29 February 2012 starting at 18:30.

Links:

http://www.e-swarm.org/ http://iridia.ulb.ac.be/~mdorigo/HomePageDorigo/

Stéphanie Lacour

Subject: Electronic skins Host Institution: École Polytechnique Fédérale de Lausanne, Switzerland Nationality: French

When stretchable electronic skins transform into high-tech wearables

Electronics are already everywhere and will one day be anywhere. Professor Lacour, who was awarded an ERC Starting grant in 2010, uses skin as a soft, elastic and multifunctional sensor network, to embed electronic devices capable of relaying information to the central nervous system. She has conceived a stretchable electronic skin, which can expand and relax elastically, yet reliably provide sensory functions. She aims at designing and manufacturing humansized, sensory electronic surfaces that can conform to the human body, feel like human skin, and ultimately communicate directly with the nervous system. Her research will help defining whether soft or compliant substrates can support routine electronic circuit fabrication. Her hope is to develop devices that are wearable like skin, and that can transmit real-time biological information to remote medical monitoring or a prosthetic limb. This requires expertise at the frontiers of engineering, material sciences, biotechnology and neuroscience. Future applications are promising for the health sector, as they could provide new options for on-body or on-organ diagnosis or help hand amputees recover the sense of touch thanks to an electronic skin fitted to their prosthetic limb.

ERC Project: Stretchable electronic skins (ESKIN) ERC Call: Starting Grant 2010 ERC Funding: €1.50 million for five years



• To be noted:

Stéphanie Lacour will present her research results during the evening celebration on 29 February 2012 starting at 18:30.

Links:

http://lsbi.epfl.ch/ http://www.youtube.com/watch?v= ZOJ2QSioTA0&feature=player_embedded

Maciej Konacki

Subject: Astronomy Host Institution: Nicolaus Copernicus Astronomical Centre of the Polish Academy of Sciences, Poland Nationality: Polish

Planets hunter on track for new discoveries

Inspired by the famous novel Solaris from Polish writer Stanislaw Lem, Professor Maciej Konacki wishes to detect planets that simultaneously orbit two stars rather than one. These are called circumbinary planets. To do so, the researcher's team will look for circumbinary planets in a sample of up to 350 eclipsing binary stars (i.e. star systems where each star rotate around the other, provoking eclipses as we see them from Earth) using state-of-the-art techniques such as eclipse timing and precision radial velocities. The project should help characterising the binary stars with an unprecedented precision and test the stellar structure and evolution models of stars. His ERC grant will be essential in establishing a network of four 0.5-meter robotic telescopes in Australia, Africa and South America to collect high precision and high cadence light curves of binary stars. This project will play a key role in unveiling the secrets of the formation and evolution of extrasolar planets. As one of the cutting edge domains in the universe sciences, this research could also lead to determine whether such planets could harbour life as is the case on Earth.

ERC Project: Eclipsing binary stars as cutting edge laboratories for astrophysics of stellar structure, stellar evolution and planet formation (BLAST) **ERC Call:** Starting Grant 2010

ERC Funding: €1.5 million for five years



• To be noted:

Maciej Konacki will present his research results during the evening celebration on 29 February 2012 starting at 18:30.

Links:

http://www.projectsolaris.eu/news/1527.html http://www.naukawpolsce.pap.pl/palio/html. run?_Instance=cms_naukapl.pap.pl&_PageID=1&s=szablon.dep esza&dz=stronaGlowna&dep=387205&data=&lang=PL&_Check Sum=-1344312466

Joanna Dunkley

Subject: Astrophysics, cosmology Host Institution: University of Oxford, United Kingdom Nationality: British

Unravelling the secrets of the early Universe

Much of our knowledge of cosmology, which describes the origins and evolution of the Universe, has come from observations of the Cosmic Microwave Background (CMB). The CMB is relic light that has been travelling for almost 14 billion years since the Big Bang, carrying a picture of the Universe in its infancy. So far it has taught us, among other things, that only 5% of the Universe is made of normal matter, the rest being unknown components (72% Dark Energy and 23% Dark Matter). This ERC project focuses on gathering additional information encoded in the CMB to convincingly extract signals from the high energy Universe. Researchers are working to uncover evidence for the inflationary scenario, which refers to the idea of a rapid expansion of the Universe in the first trillionth of a second. They also intend to better determine the nature of the Dark Energy component, especially at early cosmic times. The research team is using data and looking at measurements with higher resolution and sensitivity than ever before; from the 6m-dish Atacama Cosmology Telescope in Chile, and from ESA's Planck Satellite mission, launched in 2009.

ERC Project: Fundamental Physics from the Cosmic Microwave Background (FPCMB) ERC Call: Starting Grant 2010 ERC Funding: €1.5 million for five years



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To be noted:

Joanna Dunkley will participate in scientific session 1 on Physical Sciences and Engineering on 1 March 2012 starting at 09:00.

Links:

http://www-astro.physics.ox.ac.uk/~Dunkley/Home.html http://www.scienceoxfordlive.com/watch-us-archive/ the-dark-universe-interview

Brian M. Chase

Subject: Paleoclimatology Host Institution: Centre National de la Recherche Scientifique, France Nationality: American

Animal urine provides a unique insight into long-term African climate change

Palaeoenvironmental knowledge of southern Africa has always been very fragmentary and very little is known about how environments in this sensitive region have responded to past climate change. Brian Chase's project is about opening up a whole new realm of research into how these environments have changed during the last 50,000 years, and eventually compare these data with simulations from those models that are being used to predict future climate change. This is done through studying hyrax middens (fossilised accumulations of urine and faecal pellets from small animals native from dry and rocky environments in southern Africa also called "rock rabbits"). Hyrax middens contain a wide range of palaeoenvironmental indicators, including stable isotope and pollen records, which are now helping to improve our knowledge of long-term climate and vegetation dynamics in arid regions where other records are not available. Results from the project thus far promise to shed light on climate change for millions of km² in the drylands of Africa, including Botswana, Namibia, South Africa, and the East African rift up to Ethiopia where hyrax can also be found.

ERC Project: Rock Hyrax Middens and Climate Change in Southern Africa during the last 50,000 years (HYRAX) ERC Call: Starting Grant 2010 ERC Funding: €1.48 million for five years



To be noted:

Brian M. Chase will participate in scientific session 1 on Physical Sciences and Engineering on 1 March 2012 starting at 09:00.

Links:

http://www.isem.cnrs.fr/spip.php?rubrique549&lang=en http://news.nationalgeographic.com/news/ 2009/09/090904-saf-rock-rabbit-video-ap.html

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Anja-Verena Mudring

Subject: Physical and analytical chemical sciences Host Institution: Ruhr-Universitaet Bochum, Germany Nationality: German

Paving the way to more efficient and safer light sources

A significant amount of electricity could be saved if more energy-efficient light sources were used. Various countries have already banned or are currently planning to ban conventional incandescent lamps which suffer from poor luminous efficiency since most of the energy is converted to heat. Light sources with higher energy efficiency are compact fluorescent lamps (CFLs) used for instance in home illumination or light emitting diodes (LEDs), found in traffic lights. However, their current manufacturing process employs hazardous and rare materials, which could now be replaced by environmentally safer ones (such as noble gas xenon), therefore diminishing their impact on health and environment during production and end-of-life processes. In order to make such light bulbs competitive, novel smart materials - nano energy-conversion phosphors - will be coated on the respective device by a new technique relying on ionic liquids. Ionic liquids can be made in such a way that they are safer to use than conventional organic solvents; they help to eliminate toxic and difficult synthesis steps, reaction times and temperatures can be reduced, less chemicals are needed, smaller particles are obtained and, most importantly, it is possible to obtain high-quality phosphors from them.

ERC Project: Exceptional materials via ionic liquids (EMIL) ERC Call: Starting Grant 2007 & Proof of Concept 2011 ERC Funding: €999,848 for five years



• To be noted:

Anja-Verena Mudring will participate in scientific session 1 on Physical Sciences and Engineering on 1 March 2012 starting at 09:00.

Links:

http://www.anjamudring.de/



Søren Kragh Moestrup

Subject: Bioengineering Host Institution: Aarhus Universiteit, Denmark Nationality: Danish

A new drug delivery system

With more than 20 years experience in biomedicine (molecular biology, protein chemistry and cell biology studies on vitamins, drugs, enzymes and haemoglobin metabolism), Søren Kragh Moestrup's laboratory has identified the haemoglobin scavenger receptor, CD163, as a molecule with a profound role in the macrophage-type immune cells. With his ERC grant, the researcher's team aims at designing novel combinatory drugs consisting of a receptortargeting component (i.e. ligand or antibody) able to recognise the CD163 receptor of a disease-treating component (i.e. a drug molecule intended to treat inflammations, infections or malignancies). This ingenious approach would make possible the delivery of otherwise toxic or unstable drugs, such as steroids or antimicrobials' to the diseased cells. This combinatory drug will be investigated for instance in monocytes/macrophages as well as in selected animal models including transgenic animals. Another side of the project consists in working on combinatory drugs to target trypanosomes, which cause the more commonly called "sleeping sickness". This "Trojan horse" principle for targeting the relevant sites of disease may have major implications for human health as of the serious obstacles still exists in many current medical treatments where serious side-effects reduce the use of otherwise efficient drugs.

ERC Project: Targeting receptors of jointly assembled ligand-drug constructs (TROJA) ERC Call: Advanced Grant 2008 ERC Funding: €2.4 million for five years



To be noted:

Søren Kragh Moestrup will present his research results during the evening celebration on 29 February 2012 starting at 18:30.

Links:

http://www.au.dk/en/about/uni/rektorat/newsletter/2008/35



Monica Bettencourt Carvalho Dias

Subject: Cellular and developmental biology Host Institution: Fundacao Calouste Gulbenkian, Lisboa, Portugal Nationality: Portuguese

Understanding cell cycle to fight cancer and other diseases

This ERC-funded project aims to advance our knowledge of some cellular processes that are key for human disease. Its focus is on centrioles -cell structures found in most animal eukaryotic cells-, essential for the formation of several microtubule-organising structures such as centrosomes, cilia and flagella. These structures are involved in a variety of functions including sensory reception or cell motion and division. Centrosome defects are seen in many cancers, while abnormalities in cilia and flagella can lead to polycystic kidney disease, among others. Only recently biologists have started to unravel the molecular mechanisms regulating centriole biogenesis, opening new ways to answer a wide range of questions that have fascinated scientists for more than a century. The research team examines now how the centriole structure and number is established and regulated in the eukaryotic cell. They will use an integrated approach that combines studies in model organisms (such as the fruit fly Drosophila) and in human cells, with bioinformatics and mathematical modelling. The group is already collaborating with medical doctors in the study of centriole alterations in human disease (cancer and ciliopathies), and their results may be indispensable to generate diagnostic and prognostic markers, and to provide novel therapeutic targets.

ERC Project: Control of Centriole Structure and Number (CENTRIOLSTRUCTNUMBER) ERC Call: Starting Grant 2010 ERC Funding: €1.5 million for five years



• To be noted:

Monica Bettencourt Carvalho Dias will participate in scientific session 2 on Life Sciences on 1 March 2012 starting at 10:00.

Links:

http://sites.igc.gulbenkian.pt/ccr/ http://www.igc.gulbenkian.pt/research/unit/80

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Eiliv Lund

Subject: Cancer Epidemiology Host Institution: University of Tromsœ, Norway Nationality: Norwegian

Opening new avenues for research cancer in Europe

Breast cancer is the most common cancer in women worldwide. Professor Eiliv Lund's project aims at linking epidemiological information with biological data, based on a prospective study he conducted on diet, lifestyle and cancer amongst Norwegian women (NOWAC). The NOWAC study took into account the effects of different lifestyle factors on cancer incidence and mortality and provided information on a cohort of women from Northern Europe. Research activities covered topics such as fish consumption and mortality, hormonal therapies and breast cancer, smoking and ovarian cancer, whole grain consumption, exposure to sun and collection and analyses of blood samples. Building upon this valuable resource, Prof Lund now focuses on adding gene expression and proteomic analysis to this study, on a cohort of around 50,000 out of 172,000 women from the NOWAC study, which will constitute a postgenome biobank. Blood and tumour tissue will also be collected at time of diagnosis from breast cancer patients in the cohort and will constitute a unique set of data. The results of this research project should finally contribute to better understand the concept of causality in cancer research and models of carcinogenesis.

ERC Project: Transcriptomics in cancer epidemiology (TICE) ERC Call: Advanced Grant 2009 ERC Funding: € 2.3 million for five years



• To be noted:

Eiliv Lund will participate in scientific session 2 on Life Sciences on 1 March 2012 starting at 10:00.

Links:

http://www.ijmeg.org/IJMEG912004A.html http://epic.iarc.fr/centers/norway.php

Jacobs Howard Trevor

Subject: Biotechnology and health Host Institution: University of Tampere, Finland Nationality: British

Molecular by-pass therapy for mitochondrial dysfunction

Malfunction of the mitochondria, the cell's "power-plants", underlies a diverse range of human pathologies, including rare neuromuscular syndromes, many cases of common multifactorial diseases, neurodegenerative conditions such as Parkinson's disease (PD), and devastating metabolic disorders of infancy. They are also a major cause of tissue damage in heart attack and stroke, and are involved in cancer progression. ERC-funded project MITO BY-PASS is developing an innovative strategy for genetic therapy of this vast range of pathologies, using alternative respiratory chain enzymes from lower organisms as a way to by-pass inhibited steps in the regular mitochondrial energyproducing system. Arising from different genetic defects or toxic insults, the basic pathological consequences of these diseases are common: increased oxidative stress via the production of damaging oxygen radicals (ROS), interruption of basic pathways of metabolism, and redox imbalance, leading to the over-production of lactic acid and other potentially harmful by-products. All of these consequences could, in principle, be alleviated by introducing single genes for the alternative enzymes into failing mitochondria. Although the alternative enzymes do not restore full energy production, they reverse the other harmful effects of mitochondrial dysfunction. The concept works in simple model organisms; after receiving a Proof of Concept Grant the team will establish a business plan to start developing the technology into a viable therapy for human diseases.

ERC Project: Molecular by-pass therapy for mitochondrial dysfunction (MITO BY-PASS) ERC Call: Advanced Grant 2008 & Proof of Concept 2011 ERC Funding: € 2.43 million for five years



• To be noted:

Jacobs Howard Trevor will participate in scientific session 2 on Life Sciences on 1 March 2012 starting at 10:00.

Links:

http://www.uta.fi/ibt/institute/research/jacobs/index.html

Cathy Craig

Subject: Perceptual information and movement Host Institution: Queen's University Belfast, UK Nationality: British

Improving movements' control through sensory information

Even the simplest of our movements needs to be carefully controlled by our brain to successfully perform an action (e.g. directing our eyes to read this text, drinking from a cup or catching a ball). This project aims at furthering our understanding of how the information we pick up through our senses influences the way we time our movements. It also explores the possibility of using different types of technology to create dynamic patterns of sensory information (visual and auditory) to help people improve the way they control their movements in a sporting or health related context (e.g. walking in people with Parkinson). By carrying out basic experimental research in psychology, the research team together with engineers, has created sensory guides that provide timing signals to increase movement performance in different groups of people. As an example, significant progress in functional balance in older adults (>65 years) has been achieved after four weeks of training with video games. To enhance movement performance in sports, for instance, researchers have also developed a golf putting device that presents patterns of moving lights and sounds as a template for how the person should move.

 ERC Project: Temporal Enhancement of Motor Performance Using Sensory Guides (TEMPUS_G)
ERC Call: Starting Grant 2007
ERC Funding: € 860,924 for five years



To be noted:

Cathy Craig will present her research results during the evening celebration on 29 February 2012 starting at 18:30.

Links:

http://www.qub.ac.uk/research-centres/ PerceptionActionResearchLab/ http://www.bbc.co.uk/news/uk-northern-ireland-14484516

Christian Robert Lange

Subject: Values and beliefs - Islam Host Institution: Universiteit Utrecht, The Netherlands Nationality: German

Writing the history of the Muslim paradise and hell

The relationship between this world and the hereafter is arguably as important in Islam as the mind/body dualism is to Occidental culture. However, there is a lack of analysis in modern Islamic Studies to reflect on this fundamental binarity of Islamic religious thought. For this reason, this research project focuses on the various ways in which Muslims past and present have defined the boundary separating this world from the next. Generally speaking, do Islamic traditions favour or reject a view of human existence as directed toward the otherworld? The notion of "original sin" seems largely absent in Islam. Has this given rise to a particularly close nexus between this world and the next in the Islamic imagination? To approach an answer to such questions, researchers in this project analyse not only the "high tradition" of Islamic theology and jurisprudence, but also mystical, philosophical, artistic and popular expressions. By examining a wide range of attitudes across the different intellectual traditions and through several centuries of Islamic religious thought and practice, the project ultimately seeks to write a comprehensive history of the Muslim paradise and hell.

ERC Project: The here and the hereafter in Islamic traditions (HHIT) ERC Call: Starting Grant 2010 ERC Funding: €978,368 for four years



To be noted:

Christian Robert Lange will participate in scientific session 3 on Social Sciences and Humanities on 1 March 2012 starting at 11:30.

Links:

http://www.uu.nl/impact/hhit/ http://www.christianrobertlange.de/index.html

Wolfgang Lutz

Subject: Population projections and climate change Host Institution: International Institute for Applied Systems Analysis, Austria Nationality: Austrian

Human capacity to adapt to climate change

If global warming continues as it is currently foreseen, societies will urgently have to adapt themselves. Little has been done so far to explore the drivers of adaptive capacities of future societies to hazardous climate changes on Earth. Professor Wolfgang Lutz aims to fill this gap and use demographic methods to develop a quantitative forecasting model for analysing the capabilities of populations to adapt to future climate change-related challenges. He will primarily focus on testing the hypothesis that broad-based education of the population (and in particular near universal junior secondary education of women) can help reducing vulnerability to and enhancing adaptive capacity of peoples to natural disasters and climate change. Using case studies on past natural disaster vulnerabilities (such as the Hurricane Mitch, the Asian Tsunami and the recent flooding in South- and Southeast Asia), he will compare better education to that of wealth and other possible factors. At the global level, the project will produce the first science-based projections for all countries till 2100 stratified by age, gender and level of highest educational attainment. Prof Lutz expects to draw up a new demographic theory of long-term socioeconomic change with predictive power.

ERC Project: Forecasting societies adaptive capacities to climate change (FUTURESOC) ERC Call: Advanced Grant 2008 ERC Funding: € 2.44 million for five years



• To be noted:

Wolfgang Lutz will participate in scientific session 3 on Social Sciences and Humanities on 1 March 2012 starting at 11:30.

Links:

http://www.iiasa.ac.at/Research/POP/Staff/lutz.html http://www.fwf.ac.at/en/public_relations/press/ pa20100614-en.html