



*"I do not know what I may appear to the world; but to myself I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding of a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me."* Sir Isaac Newton (1642-1727), physicist and mathematician.

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## Welcome, and full speed ahead

The start of 2012 has been a busy period for FET, as we get into full preparation mode for Horizon 2020 (H2020).

As we transition to the new research programme, FET is testing a new process. For example, we are pleased to announce that from September 12<sup>th</sup> 2012 our new *FET-Open Xtrack* will be operational. Xtrack is a pilot to analyse whether we can collapse administratively the different parts of the submission process, into a more fluid, more science-friendly format.

FET Flagships have also become a highly visible new element in H2020. The Commission has committed to launching two FET Flagships (from the six candidates) in 2013, over a ramp-up phase using the FP7 budget and then for the full operational phase through H2020, following its adoption which is foreseen next year.

FET had an artistic rendez-vous in April, in which we invited a number of prominent ICT researchers and artists to discuss crossovers and influences between the worlds of art and ICT. Updates on this event, and other news can be found within the covers of this, our August edition of *FET through the Keyhole*.

Finally, the Directorate General for Information Society and Media, where FET resides, has become the Directorate General for Communications Networks, Content and Technology, or DG CONNECT for short. But you can continue to interact with FET in the way you have always done, as individual emails and telephone numbers

have not changed. Also you can take the opportunity to meet us in person at the ICT Proposers' Day in Warsaw on September 26<sup>th</sup> and 27<sup>th</sup>!

Happy reading, and let us know what you think!

The FET Team

## New FET funding opportunities

The FET 2013 Work Programme supports the transition to H2020. In FP7, FET experienced a deep transformation, with a wider range of activities at different levels of scale, and with an additional focus on young researchers, high-tech SMEs and international partnerships. The success of these changes forms the basis for a new extended mandate for FET in H2020, with a substantially larger budget as well.

## New funding opportunities

### Open calls:

- **FET Open:** deadline **11 September 2012** (for short proposals)
  - Challenging Current Thinking (STREPs + CSAs) (34M€)
  - High-Tech Research Intensive SMEs in FET research (6M€)
  - FET Young Explorers (8M€)
- **FET Flagships:** deadline **23 October 2012**
  - CP-CSA proposals (108M€): Call restricted to the topics of the six preparatory actions.
- **FET Proactive:** deadline **15 January 2013**
  - Evolving Living Technologies (16M€)
  - Atomic and Molecular Scale Devices and Systems (16M€)
  - Coordinating communities, identifying new research topics for FET Proactive initiatives and fostering interdisciplinary dialogue (3M€)
  - Symbiosis between humans and computers (minimum 10M€)
  - Creative ICT (10M€)
- **FET Open:** deadline **12 March 2013**
  - Challenging Current Thinking (CSAs only) (3M€)
- **FET Open & Proactive:** deadline **12 March 2013**
  - International cooperation on FET research\* (2M€)
- **FET Flagships:** deadline **16 April 2013**
  - ERANET (2M€), coordination and support actions

### Coming calls:

- **FET-Open Xtrack** (launch date: 12/09/2012): deadline **29 January 2013** (15M€)

In 2013, FET-Open will maintain its by now familiar open tracks, but be careful: *FET-Open will no longer be accepting 5-page short proposals after 11 September 2012*. You only have just over a month left if you want to submit your proposal to the 'Challenging Current Thinking', 'High-Tech Research Intensive SMEs in FET Research' and 'Young Explorers' objectives.

A key novelty of WP2013 is FET-Open's brand new open track, **Xtrack**, to which you can submit a research proposal anytime from 12 September 2012 until 29 January 2013. Like any FET-Open call, Xtrack is looking for new and visionary ideas. What is different is that Xtrack pilots a new submission and evaluation process. Xtrack works with proposals of 10 pages max (excluding some text on ethical issues if there are any). If your proposal is selected, a project will be implemented 'end-to-end' based on the 10 pages submitted. Evaluation is in two steps, specifically designed to be fast without compromising on quality.

Xtrack is an experiment. If it works it will be used as the basis for implementing FET-Open in H2020 of which calls are expected to open in late 2013.

More info about FET-Open opportunities:  
[http://cordis.europa.eu/fp7/ict/fet-open/home\\_en.html](http://cordis.europa.eu/fp7/ict/fet-open/home_en.html)

## FET Proactive

FET-Proactive calls for 2 thematic R&D objectives, and for coordination and support actions.

**Evolving Living Technologies:** the objective is to create living technologies using the principles of biological evolution that co-organize information and matter in systems of physical entities. This includes the full range of possible methodologies, such as using living technologies built up with nano-mechatronics, biological information encoding principles, bio-inspired artificial systems or bio-hybrid systems.

**Atomic and Molecular Scale Devices and Systems:** this objective targets the physical access and greater understanding of the behaviour of a single atom or molecule, or small ensembles thereof, as elementary functional resources for future ICT systems. Aspects such as new forms of atomic scale constructs and fabrication processes, control, sensing and picometer interconnection precision of components are addressed in this objective.

**Coordination and Support Actions**, in order to:

- Organise consultations of multi-disciplinary communities to formulate novel FET research topics, focussing on new emerging research areas for H2020 related to ICT and beyond.
- Support the coordination and cooperation of the targeted research communities.
- Support and promote cooperation with non-EU research teams in foundational research on FET topics.
- Organise conferences and workshops which should foster dialogue between science, policy and society on the role and challenges of interdisciplinary long-term research, increasing Europe's creativity and innovation base and bridging diverse European research communities and disciplines.

FET-Proactive has 2 more objectives in WP2013 which will be jointly managed within the DG CONNECT by FET and "Robotics" or "Creativity" units:

- **Symbiosis between humans and computers** targets foundational research on symbiotic relations between humans and machines, aiming at the design of new interactive technologies based on new theories and models of human cognition and emotion, non-rational decision-making, social behaviour and spatial and temporal perception and processing. RTD will also investigate the influence of such technologies on human behaviour and methods to promote positive co-evolution and co-adaptation of symbiotic systems.

- **Creative ICT** targets progress towards formal understanding of creativity with a view to advancing the measurable capability of computers to produce results assessed by humans as useful, original and surprising. Proposals should contribute to technological and theoretical insights on creativity, incorporating progress in relevant areas (such as AI, psychology, sociology, neuroscience and cognitive science), and should demonstrate how the theoretical insights gained in the project will contribute to the understanding of human creativity.

More info about FET-Proactive objectives:  
[http://cordis.europa.eu/fp7/ict/fet-proactive/calls\\_en.html](http://cordis.europa.eu/fp7/ict/fet-proactive/calls_en.html)

## FET Flagships

FET Flagships address grand scientific and societal challenges which require a common European research effort and sustained funding for a period of up to 10 years. Flagships are science-driven, large-scale, multidisciplinary research initiatives oriented towards a unifying goal, and are expected to result in a transformational impact on science and technology, and substantial benefits for European competitiveness and society.

Another novelty of WP2013 is the first call to launch two full-fledged Flagships Initiatives. This is an opportunity for the research community to join one of the six candidates.

The call text contains a number of elements, as follows:

- first, it sets out the finally agreed criteria that will be used to evaluate flagship proposals, which will allow proposers to set out on their ultimate soul-searching as they now know exactly how their proposals will be assessed;
- second, it describes the initial ramp-up phase under FP7, linking up with national agencies and building up to a full-stem operational phase under H2020. A project must launch core research tasks based on a common research roadmap. It must also create a contractual framework that allows any other suitable initiative or project to collaborate and contribute in a coordinated way. This confirms that Flagships are not a closed shop – such a project has to reserve a substantial budget for creating opportunities for new partners to join;
- third, a budget has been put aside for an ERA-NET project between national/regional funding agencies aiming at supporting the FET Flagships.

This restricted call addresses the selection and launch of two FET Flagships for a 30 months ramp-up phase, each one to target a topic in line with the previously supported FET Flagship Preparatory Actions that are:

- understanding and managing complex, global, socially interactive systems, with a focus on sustainability and resilience - stemming from the work of FUTURICT;
- exploiting properties of graphene and related two-dimensional materials for the emergence of a graphene-based translational technology and innovative applications - stemming from the work of GRAPHENE;
- smart, energy-efficient devices for personal assistance based on zero-power sensing, computation and communication technologies - stemming from the work of Guardian Angels;
- building a European facility to simulate the working of the human brain by developing and using supercomputers and neuromorphic hardware, and involving the collection and integration of large amounts of medical and neurophysiological information - stemming from the work of HBP;
- building individual computational models of the biological processes that occur in every human for personalised healthcare - stemming from the work of ITFOM;
- unveiling the secrets underlying the embodied perception, cognition, and emotion of natural sentient systems and using this knowledge to build robot companions based on simplicity, morphological computation and sentience - stemming from the work of RoboCom.

The budget for WP2013 is €110 million. In November/December 2012, a number of world-leading experts will consider how best to spend these resources. But of course their task is much bigger, as they have to answer the question which proposal will bring the most to Europe over the next ten years, and what it will mean for citizens and industry in the long term.

Further details about the FET Flagship Pilots are available on their respective web sites:

- FutureICT – <http://www.futurict.eu>
- Graphene – <http://www.graphene-flagship.eu>
- Guardian Angels – <http://www.ga-project.eu>
- Human Brain Project – <http://www.humanbrainproject.eu>
- IT Future of Medicine – <http://www.itfom.eu>
- RoboCom – <http://www.robotcompanions.eu>

More info about FET Flagships call:

[http://cordis.europa.eu/fp7/ict/programme/fet/flagship/calls\\_en.html](http://cordis.europa.eu/fp7/ict/programme/fet/flagship/calls_en.html)

## Final Conference on FET Flagship Pilots



The FET Flagship Pilots Final Conference took place in Brussels on 9th July 2012. This conference attracted strong interest with the participation of more than 160 persons including representatives from the scientific community, the European Parliament, the European Commission, national Ministries, funding agencies and other key policy and decision makers.

Participants were welcomed by Vice-President Neelie Kroes who talked about the choices Europe needs to make to stay globally competitive, and how it links to find the smartest way to combine resources to achieve economies of scale in research funding. The conference continued

with speeches by the Italian Minister for Education, University and Research, Francesco Profumo, the Polish Vice-Minister for Science and Higher Education, Maria Elzbieta Orłowska, and a Member of European Parliament, António Fernando Correia de Campos.

The Conference was a showcase for the vision and goals of six Flagship Candidate Projects, two of which will be selected for full funding in 2013. Presentations were very forward looking, fascinating in their visionary aspects and impressive in terms of operational road-maps. It also provided an opportunity to get up to date about the European Commission's strategy for the future implementation of the FET Flagships within FP7 and H2020. The Conference offered a unique opportunity to look ahead to the next decade of ground-breaking research and innovation emerging from the Flagship initiatives and served as a forum to facilitate networking between project representatives, policy makers and funding bodies.

More on the conference:

[http://cordis.europa.eu/fp7/ict/programme/fet/flagship/conf-july2012\\_en.html](http://cordis.europa.eu/fp7/ict/programme/fet/flagship/conf-july2012_en.html)

## Concert Announcement

### Introducing a musical event inspired by the 6 FET Flagship candidates

A concert dedicated to the 6 FET Flagship candidates will take place at EPFL in Lausanne (Switzerland), on **6 December 2012**. At the event, each Flagship will be described in turn by Daniel Saraga (from Reflex Magazine), and then be set to music by the "Geneva Brass Quintet", an internationally renowned classical chamber music group. The music chosen for each project will reflect its scientific content. With the help of music, the major scientific projects of the 21st century will become concrete for the general public.

More details about this event:

<http://culture.epfl.ch/ConcertScientifique>

## FET at the ICT Proposers' Day 2012 26&27 September

FET will be in Warsaw with its own networking booths in Hall 1.

We are also organising networking sessions (in Room "Excellence, Media & Data") on September 26th:

- FET-Open: from 11:00 to 12:30
- FET-Proactive: from 13:00 to 14:30
- FET-Flagships: from 14:45 to 16:15

More on the ICT Proposers' Day:

**Website and registration** (free of charge)

<http://ec.europa.eu/ictproposersday>

### Contacts

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 FET-Flagships: Wide.Hogenhout@ec.europa.eu



## FET in numbers

### FET Budget in FP7:

Total budget €798.5 M, of which:

- FET-Open: €284 M
- FET-Proactive: €394.5 M
- FET-Flagship: €120 M

### FET Projects Launched in FP7

- FET-Open: 97 CPs, 10 CSAs
- FET-Proactive: 65 CPs, 20 CSAs
- FET-Flagship Preparatory Actions: 7 CSAs

### Overview of the FET-Open Continuous Scheme

Project proposals received so far in FP7: 2,428

Success rates for batch 12

- Challenging Current Thinking (CP): 7 / 172\* (4.1%)
- Challenging Current Thinking (CSA): 1 / 6\* (16.7%)
- High-Tech Research Intensive SMEs (CP): 2 / 17\* (11.8%)
- Young Explorers (CP): 2 / 46\* (4.4%)
- International Cooperation (CP): 2 / 3\* (66.7%)

\* number of funded projects / number of submitted full proposals (number of submitted short proposals if applicable)

### Overview of the FET-Proactive Call 8

Unconventional Computation (CP): 7 / 25\*

Dynamics of Multi-Level Complex Systems (CP): 9 / 39\*


Minimising Energy Consumption of Computing to the Limit: 7 / 21\*

Coordinating communities and identifying new research topics for FET Proactive initiatives (CSA): 3 / 6\*

\* number of funded projects / number of submitted proposals

### FET eStatistics

 <http://twitter.com/#!/fetopen> - 156 tweets, 274 followers

 <http://twitter.com/FETFlagships> - 331 tweets, 205 followers

 <https://www.facebook.com/fetopen> - 274 likes

 <http://www.facebook.com/FETFlagships> - 354 likes

 <http://cafeteria.ning.com> - 652 members

[CP = Collaborative Research Project]

[CSA = Coordination & Support Project]

## Recent additions to the FET portfolio

### FET-Open Challenging Current Thinking

*The following projects were retained for funding under the FET-Open Challenging Current Thinking objective.*

**3DNeuroN** “*Biomimicking the brain - towards 3D neuronal network dynamics*”: The aim is to construct an in vitro model of a 3D neuronal network with layered biomaterial and multi-cell-type neural structure derived from human stem cells, while stimulating and closely monitoring the evolution of cells and their connections.

**GOSFEL** “*Graphene On Silicon Free Electron Laser*”: The aim is to demonstrate an entirely new type of compact laser source by exploiting the unique properties of graphene to construct a solid-state free electron laser.

**MANAQA** “*Magnetic Nano Actuators for Quantitative Analysis*”: is a multidisciplinary approach combining nanotechnology, biochemistry, and nanorobotics, to develop a new method for biological single-molecule

measurements by integrating micro-scale cantilevers with functionalized magnetic nanowires.

**MUSE** “*Machine Understanding for interactive Storytelling*”: The project will introduce a new way of exploring and understanding information by bringing text to life through 3D interactive storytelling. MUSE will translate natural language input into formal knowledge representing the actions, actors, plots and surrounding world, and then render these as virtual 3D worlds.

**NADINE** “*New tools and Algorithms for Directed Network Analysis*”: The aim is to develop new algorithms to facilitate classification and information retrieval from large directed networks, including PageRank and CheiRank with two-dimensional ranking by using newly developed methods based on Monte Carlo approach.

**PLANTOID** “*Innovative Robotic Artefacts Inspired by Plant Roots for Soil Monitoring*”: The aim is to design, prototype and validate a new generation of ICT hardware and software technologies inspired by plant root function.

**QUAINT [CSA]** “*Optimal Control Technologies in Quantum Information Processing*”: The aim is to bring together all major European centres in optimal control of quantum information processing.

**TERACOMB** “*Quantum Cascade Lasers Based TERAhertz Frequency COMB*”: The aim is to create a new technological platform enabling the generation of high power, broad bandwidth, THz frequency combs (FCs) with high frequency stability. The envisioned THz FCs will be based on THz quantum cascade lasers (QCLs), a novel, compact and powerful THz semiconductor laser source.

### High-Tech Research Intensive SMEs

*The following projects were retained for funding under the FET-Open High-Tech Research Intensive SMEs objective.*

**BoC** “*Body on a Chip*”: The aim is to develop a novel technological platform for pharmaceutical screening combining organotypic 3D spherical microtissues, microfluidics and highly sensitive mass spectrometry analysis.

BoC is coordinated by a young (2009) high-tech research-intensive SME - INSPHERO - a biotech spin-off from ETH Zurich. Through the project, INSPHERO aims to get closer to delivering and commercialising an integrated system and workflow, based on multiple 3D micro-tissue configuration on a single controllable microfluidic chip, for drug testing in closer-to-real physiological conditions like the human body.

More on INSPHERO: <http://www.insphero.com/>

**PLEASED** “*Plants Employed as Sensor Devices*”: The aim is to explore the use of plants as elements of a holistic environmental monitoring system. The research targets a breakthrough in sensor technologies, and the open issue of mapping plant electrophysiological signals to external stimuli.

The project includes 2 high-tech research intensive SMEs - W-Lab (the coordinator) - an Italian SME working in the area of wireless technology, pervasive and mobile computing, and AvanTIC - a Spanish SME working in the area of sensor networks and remote sensing.

More on W-Lab and AvanTIC: <http://www.w-lab.it/>  
<http://www.avantic.net/>

## Young Explorers

*The following projects were retained for funding under the FET-Open Young Explorers objective.*

**GREENEYES** "Networked energy-aware visual analysis": The aim is to develop a comprehensive set of new methodologies, algorithms and protocols, to empower wireless sensor networks with vision capabilities comparable to those achievable by power-eager smart camera systems.

**QUILMI** "Quantum Integrated Light Matter Interface": The goal is to create a highly integrated device, which permits to manipulate, store and control light on a single-photon level using tailored quantum matter.

## International Cooperation in FET\*

*The following ongoing FET projects have benefited from a funding extension to bring in complementary expertise from excellent partners outside EU, under the International Cooperation in FET Research objective:*

**PHORBITEC**: incorporates the quantum information group from the Universidade Federal do Rio De Janeiro, Brazil.

**SIEMPRE**: incorporates new partners from Virginia Tech Applied Research Corporation, Leland Stanford Junior University, Virginia Polytechnic Institute and State University (US) and Waseda University (Japan).

**SOLID**: incorporates two new partners from the US Universities of Santa Barbara and Colorado.

**TERAFLUX**: incorporates a dataflow-inspired computing group from the University of Delaware, US.

\*FET International Cooperation extensions are available to current FET projects with at least 18 months to run. For further information: [http://cordis.europa.eu/fp7/ict/fet-open/international-cooperation\\_en.html](http://cordis.europa.eu/fp7/ict/fet-open/international-cooperation_en.html)

## Call 8 FET Proactive projects

*The following projects retained from FET Proactive Call 8 are expected to be launched in the autumn of 2012.*

## Unconventional Computation (UCOMP)

**BIOMICS** "Biological and Mathematical Basis of Interaction Computing" aims to mimic the self-organising behaviour of cell metabolic and regulatory mechanisms and to use this as the basis of a model for computing.

**MICREAGENTS** "Microscale Chemically Reactive Electronic Agents" aims to fabricate and test hybrid electro-chemical microchips that will enable the integration of computation and chemical processing, leading to novel unconventional computing approaches enabling the synthesis of bioactive compounds and chemical reaction cascades.

**MOLARNET** "Molecular Architectures for QCA-inspired Boolean Networks" addresses quantum-dot cellular automata, a promising alternative to conventional computing offering miniaturization and energy saving. The focus of the proposed research is the integration of molecular quantum dots into computational units and the combination of such units into higher-order arrays.

**MULTI** "MULTI-valued and parallel molecular logic" aims to investigate physical models of multivalued information processing as an alternative to binary logic.

**NASCENCE** "NANoScale Engineering for Novel Computation using Evolution" will study nano-scale self-assembled components evolved through a form of evolutionary algorithm implemented on conventional computers for the ability to perform useful computation.

**PHYCHIP** "Physarum Chip: Growing Computers from Slime Mould" aims to design and fabricate a distributed biomorphic computing device based on the slime mould *Physarum polycephalum*.

**SYMONE** "SYnaptic MOlecular NEtworks for Bio-inspired Information Processing" proposal aims at the fabrication of nanoscale non-linear components for the formation of neuromorphic networks for information processing.

## Dynamics of Multi-Level Complex Systems (DyM-CS)

**CONGAS** "Dynamics and COevolution in Multi-Level Strategic INTERaction GAMES" will provide a coherent theoretical framework for understanding the emergence of structure and patterns in complex systems, accounting for interactions spanning various scales in time and space, and acting at different structural and aggregation levels.

**HIERATIC** "Hierarchical Analysis of Complex Dynamical Systems" aims at developing a new framework for understanding complex systems as a multi-level hierarchy of sub-systems using non-linear decompositions. The proposal includes theoretical work, software development and demonstrators.

**LASAGNE** "Hierarchical Analysis of Complex Dynamical Systems" aims to provide a novel and coherent theoretical framework for analyzing and modelling the dynamic and multi-layer networks in terms of multi-graphs embedded in space and time.

**MATHEMACS** "MATHEmatics of Multi-level Anticipatory Complex Systems" contends that the concepts of anticipation and prediction are particularly relevant for multi-level systems since they often involve different levels. The proposal includes the mathematical

representation and modelling of anticipation in its agenda for understanding complex multi-level systems.

**MULTIPLEX** "*Foundational Research on MULTILEvel complex networks and systems*" targets a substantial paradigm shift for the development of a mathematical, computational and algorithmic framework for multi-level complex networks. By combining mathematical analyses, modelling and use of massive heterogeneous data sets, it addresses several prominent aspects of multi-level complex networks including topology, dynamical organization and evolution.

**PLEXMATH** "*Mathematical framework for multiplex networks*" relies on formulating a brand new mathematical framework for the analysis of multi-level networks in terms of tensors, in particular rank-four tensors that represent with four indices the most general structure of possible connections.

**SOPHOCLES** "*Self-Organised information PrOcessing, Criticality and Emergence in multilevel Systems*" will develop the formalism in the context of criticality, emergence, and tipping points in multi level systems and apply it to real data.

**TOPDRIM** "*Topology driven methods for complex systems*" will provide methods driven by the topology of data for describing the dynamics of multi-level complex systems. To this end the proposal will develop new mathematical and computational formalisms accounting for topological effects.

**TOPOSYS** "*Topological Complex Systems*" proposes to use computational topology, which takes notions from algebraic topology and adapts and extends them into more algorithmic forms, to enrich the study of the dynamics of multi-scale complex systems.

### **Minimising Energy Consumption of Computing to the Limit (MINECC)**

**ENTRA** "*Whole-Systems Energy Transparency*" addresses the innovative concept of energy transparency at every stage of the software lifecycle, and aims at developing novel programme analysis and energy modelling techniques.

**EXA2GREEN** "*Energy-Aware Sustainable Computing on Future Technology – Paving the Road to Exascale Computing*" intends to devise a new energy aware computing paradigm for exascale computing, developing an advanced power consumption monitoring and profiling and designing a smart, power-aware scheduling technology for high-performance computing.

**LANDAUER** "*Operating ICT basic switches below the Landauer limit*" aims at testing the fundamental limits in energy dissipation during the operation of physical switches, also known as Landauer limit, by introducing new conceptual devices and novel computing paradigms with radically improved power efficiency.

**PARADIME** "*Parallel Distributed Infrastructure for Minimization of Energy*" aims to address the power-wall problem by radical software-hardware techniques that are driven by future circuit and device characteristics on one

side, and by a programming model based on message passing on the other side.

**PHIDIAS** "*Ultra-Low-Power Holistic Design for Smart Biosignals Computing Platforms*" proposes the development of an ultra-low power bio-sensing wireless body sensor networks, making use of new signal processing models and methods to handle the data efficiently.

**SENSATION** "*Self Energy-Supporting Autonomous Computation*" aims at increasing the scale of self-supporting systems by balancing energy harvesting and consumption. It addresses the challenge of programming systems that reconfigure themselves in view of changing tasks, resources, errors and available energy.

**TOLOP** "*Towards Low Power ICT*" aims at the realization of novel low power devices (single electron transistors and single atom transistors), including the implementation theory and the corresponding design architectures.

### **Coordinating communities and identifying new research topics for FET Proactive initiatives**

**EXTRACT-IT** "*Defining FET research topics supporting the ICT challenges of mineral extraction under extreme geo-environmental conditions*" (SA) aims to identify FET-style research topics in the area of mining. This relates specifically to future technologies that enable the mining of European resources of strategic minerals, including visualization techniques and remotely controlled tele-mining.

**SOCIAL-IST** "*Social Collective Intelligence*" (SA) aims at catalysing collaborations and organising consultations of research communities on the theme of Social Collective Intelligence. The term denotes a class of socio-technical systems that combine the strengths of humans and groups with the capabilities of ICT.

**TRUCE** "*Training and Research in Unconventional Computation in Europe*" (CA) aims to help organize the international research community in the area of unconventional computation, which explores new ways of computing. This includes novel substrates (e.g., DNA or living cells) as well as new paradigms which, for example, support combined information processing and material production.

Further information on the current FET project portfolio can be found here:

[http://cordis.europa.eu/fp7/ict/fet-open/portfolio-2007-12-strep\\_en.html](http://cordis.europa.eu/fp7/ict/fet-open/portfolio-2007-12-strep_en.html)  
[http://cordis.europa.eu/fp7/ict/fet-proactive/areas\\_en.html](http://cordis.europa.eu/fp7/ict/fet-proactive/areas_en.html)



## Conferences, Workshops and Events

### The ICT Proposers' Day 2012 26-27 September, Warsaw, Poland



The ICT Proposers' Day is a unique networking opportunity to build partnerships and projects targeting the new Information and Communication

Technologies Work Programme for 2013. The event is an exceptional occasion to meet potential partners from academia, research institutes, business and industry, SMEs and government actors from all over Europe. More than 2000 participants are expected. Anyone interested in responding to calls for proposals for R&D projects in the field of ICT should attend. The event will provide:

- first-hand information on the ICT Work Programme 2013, which offers around € 1.5 billion of EU funding;
- answers to questions related to the upcoming calls for proposals;
- an opportunity to present and discuss project ideas during the networking sessions;
- a platform for exchanging ideas and finding right partners to form project consortia;
- guidance on how to present a successful proposal.

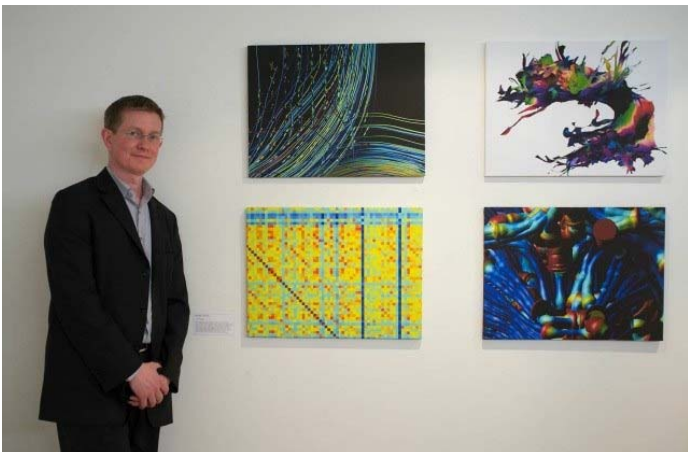
More info (see also on page 3):

[http://ec.europa.eu/information\\_society/events/ictproposersday/2012/index\\_en.htm](http://ec.europa.eu/information_society/events/ictproposersday/2012/index_en.htm)

### Engaging Dialogues in Art and IT Brussels, 26-27 April 2012

This 2-day workshop convened to discuss why it could make a difference to connect art and ICT, and what could be done to facilitate such a connection.

At the workshop, scientists and artists from across Europe attempted to formulate questions that arise when art and ICT connect and then find potential answers to these questions. They discussed their own work and experience of connecting art and ICT, and their motivations and expectations for doing so.



Derek Jones (CONNECT Project) with some artistic impressions of brain activity

The event started with presentations that take stock of ongoing collaborations, presentations from artists

outlining their motivations, and from institutions that have already made dialogues between art and science part of their agenda. Following this, a number of *art-stormings* - fluid working groups to discuss opportunities for future interaction and collaboration between artists and researchers in ICT – sought to identify new themes and directions.

An evening exhibition showcased artefacts and artworks that are the result of ongoing collaborations between art and ICT.

More info:

[http://cordis.europa.eu/fp7/ict/fet-open/docs/ict\\_and\\_art/ict-and-art.pdf](http://cordis.europa.eu/fp7/ict/fet-open/docs/ict_and_art/ict-and-art.pdf)

Contact: [Matteo.Mascagni@ec.europa.eu](mailto:Matteo.Mascagni@ec.europa.eu)

Photos of the event:

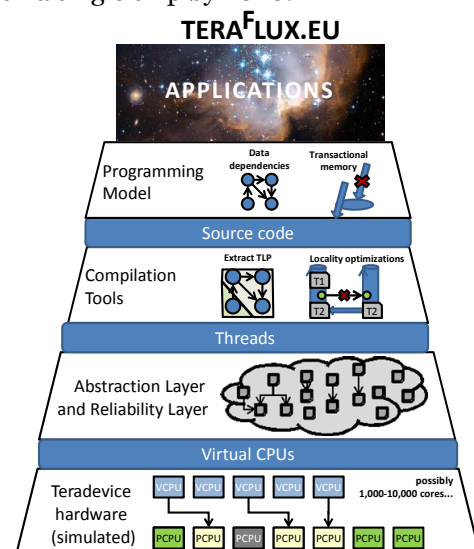
<https://www.facebook.com/media/set/?set=a.319269804812998.74347.108784775861503&type=1&l=21f26c2c79>

## La vie des projets

### TERAFLUX – Do we need faster computers? And even if we get them, will they work?

Arguably, many of the most significant discoveries of the last century would not have been possible without fast computing power, and this despite the fact that we are well aware of the many limitations of current computer systems.

The TERAFLUX project is investigating a well-known but very powerful and simple approach, called “dataflow”. According to Jack Dennis - the father of dataflow – this is “a scheme of computation in which an activity is initiated by presence of the data it needs to perform its function”. By exploiting this simple principle at all levels of the system, TERAFLUX aims to overcome many limitations of current and future systems that will likely contain 1 Tera devices on a single chip by 2020.



*TERAFLUX focus is on developing an infrastructure for programming future many core systems.*

The project team do not want to redesign a new architecture from scratch, but to demonstrate the concept

of dataflow on an x86\_64 cluster-on-a-chip, augmented with just the basic features necessary to permit the dataflow computation to take place. The result will be evaluated with partner HP-Labs powerful COTSon simulator.

Such an approach allows for fragmentation of complex programs in finer grain computations that can be executed on thousands or several thousands of cores for a greater parallelism and relying on dataflow and transactional memory principles to reduce the synchronization overhead. Building on data-flow principles, these computations could be repeated even after a failed execution and without side-effects, thus enabling more resilient systems as necessary in future Teradevice systems.

Within the project, partners Barcelona Supercomputing Center (BSC) and THALES are working to demonstrate several world class applications which can be enabled through such an approach.

The TERAFLUX project, coordinated by the "Dept. Ingegneria dell'Informazione" of the University of Siena (Italy), is funded under FET Proactive Call 4 "Concurrent Tera-Device Computing" and will run until 31/12/2013. More information: <http://teraflux.eu>

The HPLabs COTSon simulator is provided as open-source tool on <http://cotson.sourceforge.net>

## HIVE - Could computers someday interact directly with the human brain?

The vision of **HIVE** is to explore the potential of non-invasive brain stimulation to realize the concept of "hyperinteraction" – technology-mediated brain-to-brain communication, or the transmission of information via brain monitoring of the sender (BCI) and non-invasive, transcranial current stimulation (tCS) of the receiver. While recent research has delivered important breakthroughs in BCI, little has been achieved in the other direction – computer-controlled brain stimulation (CBI).

The project has addressed three main challenges. **The first challenge was to improve our understanding of the effects of stimulation at the neuron and at the neuronal ensemble level.** For this purpose, the project developed tools for accurate simulation of the flow of multichannel transcranial currents in the human brain and, more importantly, their manifestation as electric fields.

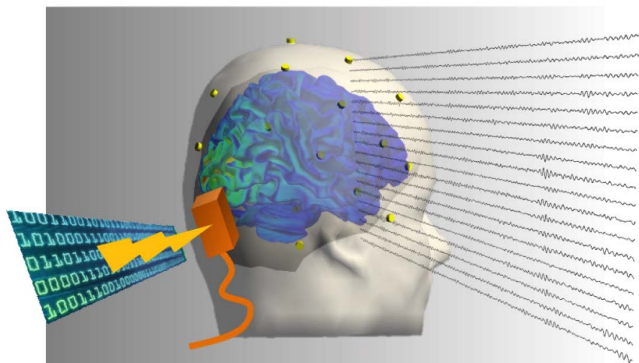
A magnetic resonance (MR)-based realistic head model for the calculation of the electric field in the brain during tCS, developed within the project, has been used to demonstrate the significant impact of tissue geometry and heterogeneity on the electric field of the brain, and to investigate the advantages of multi-electrode stimulation over traditional bipolar montage.

Another important aim has been to provide neurophysiological models describing the local effect of stimulation fields on the cerebral cortex and the global effect on brain neurodynamics (as reflected in scalp EEG signals). These weak electric fields, it turns out, couple rather efficiently with neurons, affecting population dynamics and, in turn, give rise to plastic phenomena. In the project an end-to-end numerical model of electrical stimulation to electric fields to neuronal dynamics and measurable EEG has for the first time been implemented. This model is capable of accurately replicating actual evoked potentials obtained by stimulation of the rabbit's whiskers and, in addition, it reproduces some of the effects of tCS. As far as the impact of tCS at global level is concerned, the project scaled the local model to reproduce global EEG signals as recorded in human subjects. In a first step, the consortium focused on alpha EEG activity recorded during rest and provided some testable predictions of the effects of tCS in EEG. These are currently under scrutiny.

**The second challenge tackled by HIVE is technological.** To date, only rather coarse, unfocused current stimulation technologies are available. The project has now developed a groundbreaking multisite transcranial current stimulation and monitoring system for finer control of current flows in the brain and for subsequent exploration of related applications. The system will soon be released as a product called [StarStim](#) by [Neuroelectronics](#), a newly founded spin-off of the project coordinator, Starlab. StarStim is a unique wireless device for transcranial stimulation research and clinical practice, capable of EEG recording and current stimulation using arbitrary current programmable waveforms from 8 independent channels.

Finally, **the project continues to explore new stimulation paradigms to communicate and interact with neural ensembles and the human brain.** Animal studies have been conducted illuminating the fundamental mechanisms of tDCS plasticity (the after effects of stimulation), and provided a new model to study the effects of stimulation in learning. In addition, the concept of "hyperinteraction", that is, the direct generation of perceptions and, hence, transmission of information, by transcranial stimulation of the cortex, has been demonstrated in the rabbit. In humans, the project combined tCS with brain monitoring (EEG and MRI) to further our understanding of the neural bases of functions such as object manipulation and mental rotation. By combining the skills of several partners the consortium augmented its scientific knowledge in ways that will eventually translate into strategies for aiding people with neurological disorders.

Researchers worldwide have by now shown that tCS has significant potential for treatment of chronic neuropathic pain, major depression and for stroke rehabilitation. The HIVE project investigated the effects of tCS in

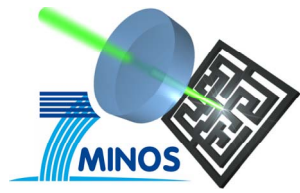




patients diagnosed with Persistent Vegetative State (PVS) or Minimal Consciousness State (MCS) and in patients with Cervical Dystonia (CD). The first study provides encouraging results for patients who have been in MCS for less than a year and the second gives promising outcomes for the tCS as a possible therapeutic tool for CD in the future. With regards to sleep applications, the partners found that if stimulation is applied shortly before sleep onset or during the first hour of sleep, there appear to be effects on sleep and memory functions – confirming earlier reports. These will be investigated further with StarStim. Finally, in the next few months, the project's final experiments on hyperinteraction will be completed.

The HIVE project, funded under the FET-Open objective Challenging Current Thinking, will run until October 2012. More information: <http://hive-eu.org/>

## MINOS – Keeping the FET spirit



The **MINOS** project laid out a high-risk programme targeted at fundamental questions of micro- and nano-optomechanical systems (MOMS/NOMS).

As the world's first consortium on MOMS/NOMS research, the project set itself the ambitious objectives of establishing MONS/NOMS as a new technology for ICT and QIPC and opening the door to future applications. During its lifetime, MINOS substantially contributed to the current boom of MOMS/NOMS technology in several fields of research, both in the classical and quantum domain, and was seen as a strong trendsetter and definer of promising directions for future research.

### Publish yes, but influence too

The work of the MINOS consortium has attracted new researchers to the field from all over the world. Since the forming of MINOS, the number of research groups working in Europe alone has increased by more than a factor of 5 and a similar trend can be seen all around the world.

### MINOS results in numbers

52 scientific papers, 23 of which in high-impact journals, including 5 in Nature, 4 in Nature Journals (Physics/Communications), 9 Physical Review Letters

230 invited talks all around the world (that's almost 1 for every 3 working days!)

### Numerous awards and prizes, including:

The Bessel Prize of the Alexander-von Humboldt Foundation  
A Feodor-Lynen Fellowship of the Alexander-von Humboldt Foundation (Germany)

An APART Fellowship from the Austrian Academy of Science

3 Marie Curie Individual Fellowships

A NWO VICI Award (The Netherlands)

One PhD Thesis prize by EPS (European Physical Society)

The BMWF "Award of Excellence" (Austria)

"Recognition Award for Science" of Lower Austria

1 movie clip on Optomechanics to introduce the scientific background and objectives of the project to a broad public audience.

<http://www.youtube.com/user/TheQubitLab/videos>

1 introductory book on Cavity Optomechanics, in preparation with Springer.

The success of MINOS as a collaboration and information exchanging network of top researchers has also been one clear driving factor for the funding of other collaborative research efforts in this domain outside Europe. In particular in the US and in Australia, since MINOS, dedicated multi-million dollar projects have been launched to enhance MOMS/NOMS research.

A further big achievement of the MINOS consortium has been to identify the challenges for future MOMS/NOMS devices to both become an indispensable element of ICT and QIPC technology and exploit their potential as novel tools for probing the foundations of physics. MINOS partners continue to explore a number of promising new fields as a direct result of this collaboration, including optomechanical arrays, quantum optomechanical sensing; nonlinear optomechanics, coherent mechanical frequency conversion, mechanical hybrid quantum systems, optomechanical technologies and fundamental tests of physics.

The MINOS project (2009-2011) was funded under the FET-Open Objective Challenging Current Thinking. More information: <http://www.minos-fp7.eu/>

## The Plantoids are coming! Europe's technological roots

The **PLANTOID** project, which has just started, is aiming to design and develop inspired by plants, called "Plantoids". Combining a new generation of hardware and software technologies, the goal is to imitate the real-life behaviour of plant roots.

The team - comprising engineers, plant biologists and computer scientists - believes it is on to something new and important. The project plans to start by carrying out advanced studies on the behaviour of root apices, and on their chemical-physical and mechanical characteristics, before moving on to tackle the difficult challenge of providing models and first prototypes of robotic roots imitating real-life root systems, focusing on their penetrative, explorative and adaptive capacities.



Picture, courtesy CMBR-Istituto Italiano di Tecnologia

Imitating the real life of plants is not as simple as it may first appear. The root hardware will rely on a prototype robotic root, with a number of physical sensors integrated into the root apices, and actuators permitting penetration and orientation of the roots. The partners plan to study in depth the phenomenon of tropism - the response of real-life roots to external stimuli such as nourishment and

"Robots inspired by plants is, if you will pardon the expression, a green field for research" Barbara Mazzolai, the project's scientific leader.

gravity. So, rather than just penetrating and taking root, Plantoids will actively mimic the goal seeking behaviours of root systems found in nature.

One research group at the University of Florence will carry out studies on chemical-physical communication among roots, which in the real plant world is vital for coordinated growth. Another, IBEC in Barcelona, will focus on the chemical sensors that root apices rely on to recognize different substances in the soil. The research group at EPFL in Lausanne is working on developing the software architecture necessary to control the robotic structure and its sensors.

The ultimate aim of the project is to develop a network of sensorized robotic roots able to reproduce the capabilities of exploration, environmental adaptation and coordination typical of the plant kingdom, and to mimic the plant world's remarkable capacity for energy efficiency and sustainability.

Plantoid is coordinated by the Center for Micro-BioRobotics at the "Istituto Italiano di Tecnologia (IIT) (Genova, Italy), and is funded under the FET Objective Challenging Current Thinking. The project will run until the end of April 2015. More information: <http://www.plantoid-project.eu/>

### Other project news

MODAP

[http://www.modap.org/sites/all/themes/modap/vol\\_3\\_issue\\_7.pdf](http://www.modap.org/sites/all/themes/modap/vol_3_issue_7.pdf)

BACTOCOM

[http://www.bactocom.eu/public\\_docs/BACTOCOM\\_Newsletter\\_M24.pdf](http://www.bactocom.eu/public_docs/BACTOCOM_Newsletter_M24.pdf)

NANOPOWER

[http://www.nanopwr.eu/sites/www.nanopwr.eu/files/NANOENERGY\\_Letters\\_3.pdf](http://www.nanopwr.eu/sites/www.nanopwr.eu/files/NANOENERGY_Letters_3.pdf)

### Last minute

#### Global System Dynamics and Policies

The **Global System Dynamics** project has produced a small booklet which provides an overview of the work undertaken so far under the project, and the challenges ahead.

Global Systems Dynamics and Policies, a CSA funded under the FET Objective Challenging Current Thinking, runs until September 2013.

The booklet can be viewed here:

[http://www.globalsystemdynamics.eu/index.php?eID=tx\\_naws\\_ecuredl&u=0&file=fileadmin/gsd/1\\_Home/1\\_Welcome/gsd\\_booklet.pdf&t=1345038849&hash=a8db15d6d433f55b86b860bb8fd5a488](http://www.globalsystemdynamics.eu/index.php?eID=tx_naws_ecuredl&u=0&file=fileadmin/gsd/1_Home/1_Welcome/gsd_booklet.pdf&t=1345038849&hash=a8db15d6d433f55b86b860bb8fd5a488)

#### Swarmanoid: Hollywood here we come!

On July 14, 2012, the film "Swarmanoid, The Movie" based on the work of the FET **Swarmanoid** project, was awarded the "Most Innovative Technology" award at the

"Robot Film Festival" in New York. Congratulations to the winners!

<http://robotfilmfestival.com/2012films>

#### FET at the Olympics!

Two versions of the app of the FET **Socionical** project have just been approved by Apple for the iPhone. The City of London Police app will be used by visitors during the two busiest days of the Olympics. Its main application however, will be to provide information to the businesses and residents in the Square Mile (the financial district), with a special feature that will be activated if and when there is an incident, so that the Police can send geographically targeted advice to users. The 'What's On' app will be used throughout the Olympics and Paralympics within the City of Westminster.

More info about the project: <http://www.socionical.eu/>

### Forthcoming events

A selection of upcoming conferences and workshops is provided below.

USIPCO, Bucharest, Romania

20th European Signal Processing Conference

August 27-31, 2012

<http://www.eusipco2012.org/home.php>

UCNC, Orléans, France

11th International Conference on Unconventional Computation & Natural Computation

September 3-7, 2012

<http://www.univ-orleans.fr/lifo/events/UCNC2012/index.php>

CoSMoS Workshop 2012, Orléans, France

5th workshop on Complex Systems Modelling and Simulation

September 3, 2012

<http://www.cosmos-research.org/workshops/cosmos-workshop-2012/>

COBRA Workshop, Orléans, France

Second workshop on Biological and Chemical Information Technologies (BioChemIT2012),

September 6, 2012

<http://www.cobra-project.eu/biochemit2012.html>

IPCN 2012, Orléans, France

First International Workshop on Information Physics and Computing in Nano-scale Photonics and Materials

September 7, 2012

<http://ipcn.i-photonics.jp/>

Foun.QI 2, Orléans, France  
2nd Workshop on Foundations of Quantum Information:  
September 7-8, 2012  
<http://membres-liglab.imag.fr/nesme/founqi2/>

TNT 2012, Madrid, Spain  
13th edition of Trends in Nanotechnology International  
Conference  
September 10-14, 2012  
<http://www.tntconf.org/2012/index.php?conf=12>

1st COBRA Summer School on Biological and Chemical  
Information Technologies, San Candido, Italy  
September 9-21, 2012  
<http://www.cobra-project.eu/summerschool.html>

AtMol conference series 2012, Berlin, Germany  
Imaging and manipulating molecular orbitals International  
Workshop  
September 24-25, 2012  
[http://atmol.phantomsnet.net/Berlin2012\\_index.php?project=7](http://atmol.phantomsnet.net/Berlin2012_index.php?project=7)

WIFS'12, Tenerife, Spain  
IEEE International Workshop on Information Forensics and  
Security  
December 2-5, 2012  
<http://www.wifs12.org/>

AtMol Winter School, Les Houches, France  
Quantum resources for single molecule-machines  
January 27- February 01, 2013  
<http://atmol.phantomsnet.net/events.php?project=7>

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#### **About this newsletter:**

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Please contact the editors below if you would like to consider any FET or project related news for publication in the FET newsletter.

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