FET
through the keyhole

Future and Emerging Technologies in Europe
January 2009

"If at first the idea is not absurd, then there is no hope for it." (A. Einstein)

In this issue

Welcome

Welcome to the January 2009 edition of *FET through the keyhole*. FET in FP7 is in full swing, with both the FET-Proactive and FET-Open schemes reporting a great deal of activity in recent months, as new projects get underway, current projects make progress towards their goals, and new ideas and proposals come in.

This time around, the main novelty with respect to funding opportunities for frontier research is the publication of the new FET Work Programme for 2009-2010, which provides new opportunities for the formation of research groups. The Proactive scheme addresses a number of new and promising initiatives in the areas of *computing systems*, *computing and communication paradigms*, *living with ICT* and *widening the horizon of ICT.* At the same time, FET-Open is continuing with its successful two-stage submission system for new research ideas. In addition, in the new Work Programme, both FET-Open and FET-Proactive have introduced common evaluation criteria that now place even greater emphasis on scientific excellence.

An important milestone ahead for the FET community is the first-ever FET conference, which will be held in Prague in April 2009. This event is designed to provide a much needed convergence of research policy and practice to help both scientists and policy makers to work together to herald in a new age of ICT.

Finally, this newsletter provides some highlights concerning project progress in the latest period. It also highlights a number of important prizes awarded

to researchers associated with the FET Programme. We extend our congratulations to the prize winners!

We wish you all happy reading, and successful breakthrough projects in 2009! We hope to see many of you in Prague in April!

The FET editorial team

----------------- *Conference Announcement* -----------------
Don´t miss FET09!

Be sure not to miss the first ever FET conference, FET09, which will be held from April 21-23 2009 in Prague. Conference registration will open in February 2009 so do not forget to book your place!

FET09 will convene over 3 days. The scientific programme will include plenary talks, round tables and parallel sessions. Several renowned keynote speakers are confirmed, including Albert-László Barabási (Northeastern University), Alain Berthoz (CNRS), Henrik Ehrsson (Karolinska Institute), Susan Greenfield (Oxford University), Henry Markram (EPFL), Viviane Reding (European Commission), Ehud Shapiro (Weizmann Institute), Jeannette M. Wing (NSF) and Anton Zeilinger (University of Vienna).

An interactive open-space and exhibition will feature demonstrations of the latest t(h)ink(er)ing in the labs, and provide an opportunity for spontaneous interactions and sessions. A stimulating evening programme is planned, to provide an entertaining and lively backdrop to our interdisciplinary conversations.

For more information and to consult the conference programme as it evolves, see: ec.europa.eu/fet09.

FET Funding Update

FET WORK PROGRAMME FOR 2009-10

The ICT Work Programme for 2009-2010 has now been officially published. The main directions for FET research in 2009-2010 are highlighted below.

FET-Proactive aims to spearhead transformative research, support community building, and enhance Europe's innovation potential around a number of fundamental long-term challenges in ICT that will be key to the long-term sustainability of a technological future in Europe. Focus areas for 2009-2010 are:

- *Computing Systems*: Radically new approaches to computing should draw inspiration from physics. In addition, alternative directions for architectures and individual devices will be pursued and power issues will be addressed.

- *Computing and Communication Paradigms*: New inspirations for architectures, communication and in particular the distributed nature of processing – locally or system wide– will be explored to address new requirements for optimisation of resources and mastering system complexity.

- *Living with ICT*: ICT will progress towards harnessing the inherent information processing skills of humans by combining them with the advantages of the ICT environment. The growing power of computing can be exploited based on radically new forms of acting and experiencing.

- *Widening the Horizon of ICT*: Opportunities for deploying ICT in new areas will be explored together with technological developments. These include new ways of reaching societal benefits and responding to industrial needs using ICT.

In particular, the following research themes will be addressed in Proactive Initiatives: *Concurrent Tera-Device Computing, Quantum Information Foundations and Technologies, Bio-chemistry-based Information Technology, Human-Computer Confluence, Self-Awareness in Autonomic Systems, Towards Zero-Power ICT, Molecular-Scale Devices and Systems,* and *Brain-Inspired ICT*.

These themes will be complemented by calls for Coordination and Support Actions (CSA) to support the coordination of research projects in each Proactive initiative. In addition, short duration CSAs will be called for in order to help identify new trends and directions in FET research.

FET-Open will continue to target foundational breakthroughs that will open the way towards radically new forms and uses of information and information technologies. It will continue to explore new and alternative ideas, concepts or paradigms that, because of their radical, fragile or high-risk nature, may not be supported elsewhere in the ICT Work Programme.

Research under FET-Open is aimed at achieving a first proof-of-concept and at developing its supporting scientific foundation. *The novelty of this research comes from new ideas rather than from the refinement of current ICT approaches.*

In addition, FET-Open aims to attract Coordination and Support Actions (CSA) for high-risk and high-impact visionary research. Activities can be either thematically-oriented (for example, stimulating the emergence of new research communities), or may focus on horizontal issues in FET-like research (for example, stimulating the emergence of new visions and ideas, promoting new research modalities, attitudes and practices, or exploring new ways for achieving visibility and impact of research).

The FET Work Programme for 2009-2010 is available for download here:
ftp.cordis.europa.eu/pub/fp7/ict/docs/fet-open/fet-wp2009-10_en.pdf

MORE SCIENCE, MORE IMPACT

The set of evaluation criteria for proposals submitted to FET calls has been modified in the 2009-2010 Work Programme to better accommodate the evaluation process in light of the specific nature of FET research. This is mainly reflected in a higher relative weight given to the *"Scientific & technological quality"* and *"Impact"* criteria. Furthermore, the evaluation criteria have been harmonised between FET Open and FET Proactive.

In addition, for FET-Open proposals submitted at the short proposal stage a single criterion of Scientific and Technical Quality replaces the former three criteria (S/T Excellence, Implementation, Impact).

A detailed description of the new criteria is available in Appendix 5 of the ICT Work Programme here:
ftp.cordis.europa.eu/pub/fp7/docs/wp/cooperation/ict/c_wp_200902_en.pdf

FET-PROACTIVE: CALL FP7-ICT-2009-4 NOW OPEN

The first Proactive call under the 2009-2010 Work Programme is now open. It features 3 thematic R&D initiatives:

- *Concurrent Tera-Device Computing:* Integrated circuits and tightly-coupled systems will integrate up to 1000 billion devices by the year 2020. This will lead to better performances if architectures and software can deal with higher concurrency, heterogeneous architectures for specific applications, variability and failure of components and efficient power consumption. The objective is to obtain radically new methods and tools for architecture, design and programming of chips and systems beyond 2020. More info on: cordis.europa.eu/fp7/ict/fet-proactive/teracomp_en.html

- *Quantum Information Foundations and Technologies:* New perspectives in ICT that exploit the quantum nature of information offer modes of computing and communicating that are not mere down-scaling of silicon CMOS-based architectures. Thus they provide a 'beyond Moore' route to circumvent the bottlenecks associated

with the extrapolation of present-day information processing and technologies. The research work should advance the state-of-the-art of QIPC and contribute to the transition of the field from upstream research to application-oriented research. More info on: cordis.europa.eu/fp7/ict/fet-proactive/qift_en.html

- *Bio-chemistry-based IT:* Biological cells are highly sophisticated chemical information processing systems, capable of responding to changing conditions. The information processing capabilities of such systems could be exploited by future information technologies if this 'information chemistry' could be 'programmed'. The general objective is to develop the foundations for a radically new kind of information processing technology inspired by chemical processes in living systems. More info on: cordis.europa.eu/fp7/ict/fet-proactive/chemit_en.html

The aim is to support these R&D Proactive initiatives (as well as the currently running initiatives) through a call for 2 different types of coordination actions focusing on:

- *Coordinating Communities, Plans and Actions in FET Proactive Initiatives*
  Coordination actions of this kind should support targeted research communities by increasing their visibility to the scientific community, industry & public. They should aim to consolidate research agendas, coordinate EU-funded research with national, regional and international programmes and activities and encourage the establishment of new educational curricula. In addition they should involve national or regional research programme owners and develop actions dedicated specifically to networking of research activities at national or regional level. They should also prepare for and implement joint trans-national calls and prepare for an ERA-NET plus action (to be implemented in a subsequent phase). More info on: cordis.europa.eu/fp7/ict/fet-proactive/csafetip_en.html

- *Identifying new research topics, Assessing emerging global S&T trends in ICT for future FET Proactive initiatives*
  These types of coordination actions should focus efforts on the definition of future FET Proactive initiatives. They may for example *identify new research topics* (at Proactive initiative level) through developing a position paper in which the required actions, research challenges and impact (foreseen in science, technology and society) is described. Alternatively, they may target the assessment of emerging global S&T trends in ICT that could lead to the definition of research topics, help to overcome roadblocks and set the future scene. In addition they may assess the potential of recent breakthroughs in FET related research. Proposals should be prepared to provide their first inputs by Spring 2010.
  More info on: cordis.europa.eu/fp7/ict/fet-proactive/futfetip_en.html

The indicative total budget for the FET proactive objectives in call 4 is 39 M€.

Deadline for proposal submission: **1 April 2009**.

ICT PROPOSERS' DAY
22 January 2009 – Budapest, Hungary

The ICT Proposers' Day is a unique forum for current and future project participants to:

- familiarise themselves with the research challenges and objectives of the ICT 2009-10 Work Programme of the 7th Framework Programme for R&D
- get info about the rules and procedures for proposals
- liaise with stakeholders and EC project officers.

Representatives of both FET-Open and FET-Proactive will be available for discussions in Budapest. *Why not come to meet at the FET stands in the exhibition area, or in* **Room G** *from* **9.15-15.15**?

Visit the website and register now!
ec.europa.eu/information_society/events/budapest_2009/index_en.htm

FET CALL 4 TOPICAL WORKSHOPS
21January 2009 – Budapest

In the advent of the Proposers' day FET is organising **3 topical workshops** on **21 January** on the funding opportunities for FET research in call 4. The main goal is to initiate and stimulate community building around future research activities.

1 - QUANTUM INFORMATION FOUNDATIONS & TECHNOLOGIES (QI-FT)
<u>Focus:</u> elaborate on a shared understanding of visions and opportunities for research on e.g. 'quantum information theory & paradigms', 'entanglement-enabled quantum technologies', 'scalability of quantum processing systems' and 'long distance quantum communication'.
<u>Keynote speakers:</u> Evgeni Ilichev (Institute of Photonic Technology Jena), Jiri Vala (National University of Ireland), Ferdinand Schmidt-Kahler, and Tommaso Calarco (University of Ulm), and Ian Walmsley (Oxford University).

Contact: werner.steinhoegl@ec.europa.eu

2 - BIO-CHEMISTRY-BASED INFORMATION TECHNOLOGY (CHEM-IT)
<u>Focus:</u> visions and research opportunities that will enable the exploitation of the information processing capabilities of biological cells.
<u>Keynote speakers:</u> Steen Rasmussen (University of Southern Denmark), Martyn Amos (Manchester Metropolitan University), Jerzy Górecki (Polish Academy of Sciences), Klaus-Peter Zauner (University of Southampton)
Contact: wesley.van-dessel@ec.europa.eu

3 - CONCURRENT TERA-DEVICE COMPUTING (TERACOMP)
<u>Focus:</u> research addressing the challenge of harnessing the power of upcoming multi-core chips.
<u>Keynote speakers:</u> Mateo Valero (Technical University of Catalonia), David Thomas (Imperial College London), Pier Paolucci (Istituto Nazionale di Fisica Nucleare & ATMEL) and Manuel Hermenegildo (Universidad Politécnica de Madrid).
Contact: jean-marie.auger@ec.europa.eu

More info on: cordis.europa.eu/fp7/ict/fet-proactive/ie-21jan09_en.html

Participation in the workshops is free, but Registration is required. Please send your name and affiliation to: Jill.Hughes@ec.europa.eu

FET-OPEN: THE IDEAS KEEP FLOWING

FET-Open has relaunched its continuous call for proposals in the period 2009-2010. We look forward to receiving your short proposals for scientifically excellent (STREP) research projects impacting on the future of ICT, and for coordination actions that help to catalyse a lasting and transformative effect on the communities and practices for high-risk and high-impact research.

The indicative budget is 61 M€ for those batches (from 5 to 8) with a cut-off date in 2009-2010. For more information:
cordis.europa.eu/fp7/dc/index.cfm?fuseaction=UserSite.CooperationDetailsCallPage&call_id=189

Project Highlights

FET is always looking for interesting stories from the world of FET research. Please get in touch if you would like us to consider any news item for publication.

CYBERWALK PROJECT LEADS TO SPIN-OFF

Procedural Inc. is a new high-tech SME that specialises in software for the efficient creation of 3D buildings and cities. Its flagship product, the CityEngine™, permits urban environments to be created 10 times faster than existing solutions. The underlying unique procedural modelling technology has been invented and developed at ETH Zurich, Switzerland's most renowned technical university which ranks among the Top-10 universities world-wide. Through ETH's participation in the FET-Open Cyberwalk project, major parts of the CityEngine were developed to allow arbitrary city-spaces to be generated efficiently with 'on demand' level of detail and realism.

Cyberwalk is a "motion platform" that gives the user the impression of "natural walking" in any direction. The motion platform is combined with a virtual reality headset to give the impression of walking or even running around large 3D worlds. The CityEngine was used, for example, to create a 3D model of Roman Pompeii that could be explored in all directions.

European collaborative research projects remain an important tool for a high-Tech SME like Procedural Inc to expand its know-how and visibility. The company now participates in the FP7 Project V-City.

More information: www.procedural.com

COAST – VIRTUAL PHYSIOLOGICAL HUMAN PROJECTS BUILD ON DEVELOPMENTS FROM FET PROJECT

The COAST project recently developed a modelling tool called 'Scale Separation Map' as a starting point to model and simulate multi-scale complex systems in a more formal way. This tool was successfully applied to organise the often scattered and disparate information available in biological literature. First test-driven in the process of modelling a specific coronary artery pathology called 'in-stent restenosis', this tool turned out to be extremely valuable for biologists.

Since then this approach has found applications well beyond this original target domain. Building on its success, this new methodology is taken up by a number of new projects that are being launched under the header of the Virtual Physiological Human (which aims to create multi-scale modelling of man).

It is currently being used to study e.g. the response of the native endothelium to shear stress, for time-scale analysis of the human limb, for the urothelium and for ovum transport and implantation.

More info: www.complex-automata.org

BRAIN STORM – CLOSE ENCOUNTERS BETWEEN NEURONS AND CHIPS

The FP7 BRAIN STORM consortium aims to develop an integrated system that enables on-chip intracellular electrical recordings from a relatively large cultured neuronal network, combined with chemical sensing and intracellular delivery of biologically active molecules.

The project has recently developed chips that expose micronail structures of different composition and geometrical configurations on both transparent (glass) and non-transparent (silicon) substrates. These micronails are structured to operate either as intracellular microelectrodes or as intracellular micro-syringes (i.e. hollow nails) allowing either the injection of chemicals or producing a negative pressure (suction) that can be applied in cell membrane penetration procedures.

After appropriate packaging, the chips have been functionalized with synthetic peptides that induce the engulfment of the nails by the cellular membrane of neurons, which is important for an efficient coupling of signals between the cell and the recording element. Different types of neuronal preparations (Aplysia Californica, mouse hippocampal neurons) were subjected to testing with the chips.
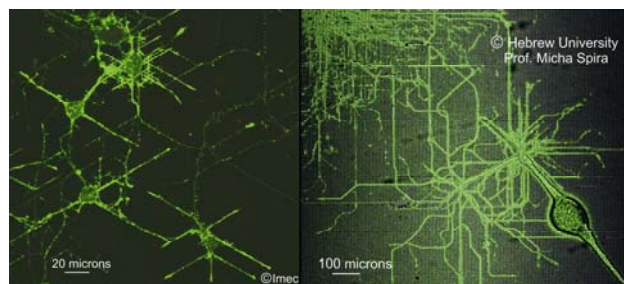

Figure: Mouse hippocampal neurons 7 DIV on chip (left) - Aplysia Californica neurons on chip (right).

This figure illustrates how the micronail structured chip surfaces exhibit a strong guidance effect for the neurite development and how the micronails are tightly engulfed by the cellular membrane.

More info: www.imec.be/brainstorm

TYPES – GOODBYE TO FAULTY SOFTWARE?

Will it ever be possible to buy software guaranteed to be free from bugs? A team of European researchers think so. Their work on the mathematical foundations of programming could one day revolutionise the software industry (ScienceDaily, July 19, 2008). www.sciencedaily.com/releases/2008/07/080716154355.htm

-------------------- Call for Participation --------------------

VISMASTER – DO YOU WANT TO BE INVOLVED IN DESIGNING THE FUTURE OF VISUAL ANALYTICS?

Visual Analytics is an emerging research discipline aiming to make the best possible use of huge information loads in a wide variety of applications by appropriately combining the strengths of intelligent automatic data analysis with the visual perception and analysis capabilities of the human user. The goal of the Coordination Action VisMaster is to join together European academic and industrial R&D excellence from several disciplines, forming a strong Visual Analytics research community. Several thematic working groups will be set up in the fields of data management, data mining, spatial-temporal data, human visual perception research, and the wider visualisation research community.

VisMaster is calling for new community partners, who want to become involved in designing the future of Visual Analytics. Readers interested in learning more about VisMaster and Visual Analytics are asked to visit the project website at http://www.vismaster.eu.

Awards & prizes

Congratulations to:

- Andrea Ferrari (Viacarbon) - 2008 Marie Curie Prize.
  www.eng.cam.ac.uk/news/stories/2008/Marie_Curie/

- Maciej Lewenstein (QUROPE) – 2008 Humboldt Foundation Award.
  www.icfo.es/index.php?section=news1&lang=english&op=show_announcement&announcement_id=607

- Fedor Jelzko (EQUIND) - Walther Schottky Preis 2008.
  www.dpg-physik.de/dpg/preise/preistraeger2008.html

In Brief

OVERHEARD IN THE CAFETERIA

"A major issue with FET is the question of whether FET should be rather technology-driven or human-centred. To avoid the classical scenario of "solutions in search of a problem", one needs to first identify problems. Since, by definition, the most relevant problems are those that have a direct (immediate or future) impact on our lives, at least the stage of problem definition must be human centred"...Professor Erhardt Barth, Lübeck, 8th December 2008...

Why not join the ongoing discussion on caFETeria – the new networking site for FET researchers and scientists?

More at cafeteria.ning.com

YOUNG RESEARCHERS IN FET

A lively networking session for young FET researchers was held at the ICT 2008 conference in Lyon. Some of the questions discussed were:

- *how can young researchers get involved in and coordinate European research projects?*
- *how can FET better support young researchers?*
- *which are the challenges for young researchers in building successful European research careers?*

The session is over but it is not too late to get involved! If you would like to discuss these and other questions related to young researchers, you can join our young researchers' discussion group on caFETeria, or send an email to Anders Hedman - anders.hedman@ec.europa.eu

Forthcoming Events

Upcoming FET-Proactive Cluster Reviews

Bio-ICT convergence – 23-27 Feb – Brussels (BE)

Presence – 2-6 March – Barcelona (ES)

QIPC – 3-6 March – Gothenburg (SE)

Nano-ICT – 23-27 March – Grenoble (FR)

ACA – 23-27 March – Paris (FR)

Perada – 1-3 April – Barcelona (ES)

2ND ANNUAL WORKSHOP ON REALISTIC ACTION IN VIRTUAL ENVIRONMENTS - RAVE09
4 March 2009 – Barcelona (ES)
rave09.peachbit.org/

NEUROMATH WORKSHOP LEUVEN
12-13 March 2009 – Leuven (BE)
www.esat.kuleuven.be/scd/neuromath/

ADVANCED SCHOOL FOR NEUROELECTRONIC HYBRIDS
15-20 March 2009 – Jerusalem (IL)
www.as.huji.ac.il/schools/neh/

ADAPTIVE & EMERGENT BEHAVIOUR & COMPLEX SYSTEMS (AISB) 2009
6-9 April 2009 – Edinburgh (UK)
www.aisb.org.uk/convention/aisb09/

including 2nd PERADA workshop (at AISB2009)
www.perada.eu/documents/AISB-flyer.pdf

SCIENCE BEYOND FICTION – THE EUROPEAN FUTURE TECHNOLOGIES CONFERENCE - FET09
21-23 April 2009 – Prague (CZ)
Co-organised by the Future and Emerging Technologies Units of the European Commission, the Czech Academy of Sciences and the Czech Technical University. FET09 is organised under the auspices of the Czech Presidency of the European Union.
ec.europa.eu/fet09

EUROPEAN SYMPOSIUM ON ARTIFICIAL NEURAL NETWORKS -ADVANCES IN COMPUTATIONAL INTELLIGENCE AND LEARNING
22-24 April 2009 – Bruges (BE)
www.dice.ucl.ac.be/esann/

IEEE CONGRES ON COMPUTATIONAL EVOLUTION
18-21 May 2009 – Trondheim (NO)
www.cec-2009.org

including: Special session on 'Adaptation strategies for pervasive adaptation (PERADA)'
www.cec-2009.org/sessions.shtml#perAda

including: Special session on a 'Pervasive reconfigurable platform for modelling complex systems (PERPLEXUS)'
www.cec-2009.org/sessions.shtml#perplexus

IFIP INTERNATIONAL CONFERENCE ON FORMAL TECHNIQUES FOR DISTRIBUTED SYSTEMS (FMOODS/FORTE 2009)
9-11 June 2009 – Lisbon (PT)
discotec09.di.fc.ul.pt/index.php?title=FMOODS_FORTE/CFP

9TH INTERNATIONAL CONFERENCE ON WEB ENGINEERING (ICWE 2009)
24-26 June 2009 – San Sebastian (ES)
icwe2009.webengineering.org/

2009 INTERNATIONAL SUMMER SCHOOL ON PERVASIVE ADAPTATION
June 2009 – Edinburgh (UK)
www.perada.eu/summer-school/33-international-summer-school-pervasive-adaptation-2009

14TH INTERNATIONAL WORKSHOP ON FORMAL METHODS FOR INDUSTRIAL CRITICAL SYSTEMS (FMICS 2009)
2-3 November 2009 – Eindhoven (NL)
www.dsic.upv.es/workshops/fmics2009/

About this Newsletter

FET through the keyhole is published periodically by the FET-Proactive and FET-Open units at the **European Commission, Directorate General Information Society and Media** in Brussels, Belgium.

We are always looking for interesting stories from the world of FET research. Please contact the editors if you would like us to consider any news item for publication.

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