ECCell

Project no**. 222422**

Project acronym: **ECCell**

Project title: Electronic Chemical Cell

Instrument: STREP/FET OPEN

Thematic Priority: Theme 3 Information and Communication Technologies

Deliverable n. 7.1:

Report on ECLT Workshop and Training Activities.

Due date of deliverable: 15. 10. 2009

Actual submission date: 15. 10. 2009

Start date of project: **1.09.2008**   Duration: **3 years**

Organisation name of lead contractor for this deliverable:

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European Centre for Living Technology (ECLT)

1. Deliverable n. 7.1: Report on ECLT Workshop and Training Activities

1.1 Summary

During the first 12 months of the project, two workshops with 2-3 days of mixed presentations and discussions were held at the ECLT. The first workshop was also the kick-off meeting for the project. The second workshop focused on 'Module Development'. It was well represented by young scientists involved in the project and open to students interested in the field. The workshop established a high level of coherence between the different disciplines represented in the project and served as a basis for strengthening collaborations between the research groups in ECCell and informing students and new researchers about the overall objectives and methodology in the project. Importantly, novel results were presented and taken up in the revised research agendas of the various groups.

Agendas and abstracts for the two workshops are attached below. Individual presentations can be downloaded from the ECCell internal document server:

https://sibelius.biomip.rub.de/bmcmyp/Data/ECCell/ECCell_Year_1/ECCell_Workshops

1.2 ECCell kick-off meeting (Workshop 1)

Abstract

Electronic Chemical Cell - ECCell

As a result of the groundwork laid by the PACE project, the construction of one kind of artificial programmable cell is now an achievable objective in the coming three years. A project ECCell in FET-open has been approved starting September 2008.

The aim of the project is to establish a novel basis for future adaptive embedded information technology at the molecular level by constructing the first electronically programmable chemical cells (ECCell). These ECCells will function through an interplay of chemical microprocessors and information molecule chemistry. Chemical microprocessors act as coprocessors coupled to chemical information systems through a digital electronically programmable microelectrode MEMS interface, taking advantage of integrated electronics and microfluidics. Information processing in molecular systems is not in direct competition with silicon technology, but the long-term goal is to integrate information processing with self-contained molecular construction of information processing materials and components. ECCells will pro-vide a paradigmatic proof of principle that such technology is possible and already useful in nano- and microscale embedded system applications. The novel chemical microprocessor technology required to do this will also provide a programmable real-time interface to control other complex chemical information systems. This is naturally a high-risk, embryonic research project, but based on solid interdisciplinary research and aimed at a breakthrough which will lay the foundation of a new embedded IT for immersed micro- and nanoscale molecular information processing, with a paradigm shift to digitally programmable chemical systems.

Programme

ECLT VENICE, OCTOBER 20-21, 2008

Monday, October 20, 2008

| 9:00-9:30 | John McCaskill Overview of project |
| 9:30-11:00 | Presentations of current status of research activities relevant to ECCell |

- Patrick Wagler ECCell MEMS integration
- Carla Verhaelen Diblock DNA coploymer (scpDNA) for Micelle Formation
- Uwe Tangen Electronic feedback control of molecular reactions in microfluidic structures
- Volker Patzke/v. Kiedrowski Thiol-disulfide exchange reactions in oligonucleotide replication
- Minseok Kwak/Singh/Hermann Synthesis and Applications of DNA-Block- copolymers,
- Itamar Willner Redox chemistry and DNA control
- Steen Rasmussen Redox metabolism for LA Bug and simulation

11:00-11:20	Coffee Break
11:20-12:30	Discussion and coordination of work plan
12:30-13:30	Lunch
13:30-15:00	Discussion of specific proposals for coordinated research

             13:30 Replication: Electronic redox and pH control
             14:00 Gelation: Electronic redox, pH and DNA control
             14:30 ECCell Life Cycle: MEMS and chemistry

15:00-15:30	Coffee Break
15:30-16:30	Open Discussion of Synergies and Paths Forward
16:30-17:45	General Council Meeting

Tuesday, October 21, 2008

8:30-10:00	Discussion of key coordinated experiments in first year, including some short presentations on relevant technology from participants.
9:30-10:00	Coffee Break
10:30-11:30	Information Processing with ECCell

             10:30 DNA-based information processing
             10:50 Programmable-separation based IT
             11:10 Feedback-loop based processing & evolution

11:30-12:45	Concrete experimental and simulation planning & Planning of upcoming meetings and ECLT activities
12:45	Closing Discussion
13:00-14:00	Lunch

1.3 ECCell – Module Development (Workshop 2)

Abstract

ECCell: Module Development

The subject of this workshop is the development of modules for an electronic chemical cell. As outlined in the process flow diagram for ECCell, module development involves 6 interrelated activities : the three core aspects of an artificial cell (replication, containment and metabolism), the electronic-microfluidic interface and simulation and feedback control modules. Speakers at the workshop represented all aspects of this range of module development. Highlights of the meeting included the report by Willner on pH regulated ribozyme activity and the discussion of microfluidic replication mechanism.

Programme

ECLT VENICE, July 8-10, 2009

Wednesday, July 8
Group presentations with discussions
13:30-14:00   John McCaskill Overview of project
14:00-14:45   Günter von Kiedrowski,Volker Patzke Programmable Replication
14:45-15:30   Andreas Herrmann Programmable Containment
15:30-16:00   Coffee Break
16:00-16:45   Steen Rasmussen, Harold Fellermann ECCell Simulation and Programming
16:45-17:30   Itamar Willner Electrochemical Activation
17:30-18:00   Discussion
19:00   Common Dinner

Thursday, July 9
8:30-9:15   Patrick Wagler ECCell MEMS Integration,
9:15-10:00   Uwe Tangen, John McCaskill Functionality and ICT Applications,
10:00-12:30   Discussion on mechanisms of replication (incl. coffee break)
12:30-13:30   Lunch
Afternoon: Planning of Experiments and Papers in small groups

Friday, July 10
8:30-11:00   Preparation of Project Review
11:00-11:15   Coffee Break
11:15-12:30   General Council Meeting
12:30-13:30   Lunch