Euro-BioImaging
European Research Infrastructure for Imaging Technologies in Biological and Biomedical Sciences

WP7 Access to Innovative Technologies-ALM

Task 7.1
Organization of meetings with experts to identify innovative light microscopy techniques and their demand for access

Deliverable 7.1
Report on first annual Euro-Bioimaging WP7 meeting on current/future developments in light microscopy technology and their demand for access

Task leader
EMBL, Weizmann, MPG, UMCU, Imperial

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1 General remarks

The Euro-BioImaging (EUBI) WP7 meeting was held on June 10th as a satellite meeting to the 11th ELMI meeting, taking place in Alexandroupolis, Greece, between June 7th and 10th. A significant number of delegates of the meeting were also speakers / participants of the ELMI meeting, which addresses latest developments in light microscopy and their applications to biological questions. Additionally, as a particular feature of the ELMI meeting industrial companies organize workshops, where meeting delegates will learn more about the latest commercial developments in light microscopy technology. The scientific program of the ELMI meeting is attached in *AnnexI* to this report.

The WP7 meeting delegates were invited by the workpackage leaders Benny Geiger and Rainer Pepperkok. The goal was to have all national coordinators of Euro-Bioimaging or their representatives present in order to identify and discuss emerging technologies and their need for access across Europe. The list of the meeting participants is attached in Annex II to this report.

2 Meeting agenda

a. Review of current and future innovative technologies in EUBI.
b. Identification of potential European facilities and infrastructures that could be able and would be willing to provide access to innovative technology.
c. WP7 proof-of-concept studies.

3 Discussion

a. Review of current and future innovative technologies in EUBI

One task of WP7 is the identification of innovative light microscopy technologies for which a significant need for access exists. Therefore, one point addressed at the meeting was the current and future list of innovative technologies that should be targeted by EUBI in WP7.

Current technologies indentified in WP7 are (defined already at the EUBI application level):

1. Super resolution microscopy.
2. Functional imaging (e.g. FRAP, FRET, FCS/FCCS).
3. Correlative microscopy.
4. High throughput microscopy for systems biology.

All four technologies were confirmed by the delegates to have high priority in WP7. Also, these four technologies were well covered by talks, poster presentations and discussions at the ELMI meeting (see AnnexI), indicating that several important aspects of these technologies are still under heavy development and that a significant demand for access exists.

Innovative technologies discussed at the EUBI 2010 stakeholder meeting are:

5. Light sheet based fluorescence microscopy.
6. Correlative light/MRI microscopy.
7. Differential polarization laser scanning microscopy.
8. Non-linear-microscopy techniques (e.g. CARS, SHG, THG and SRS).
9. Photothermal heterodyne imaging.
10. Single molecule imaging techniques.

The meeting delegates agreed to continue to explore these techniques further, in particular to test the need for providing access to them. They will be included to the list of technologies addressed by WP7, which will be displayed on the Euro-Bioimaging webpage for further discussion. The technologies have already been included in the ongoing Euro-Bioimaging survey to explore the need for providing access to the techniques across Europe and to identify the potential facilities, which which would be able and willing to provide access.

Additional technologies suggested during the WP7 meeting are:

11. Biomolecular imaging mass spectroscopy (BIMS)
12. Raman/ IR microscopy
13. In vivo super-resolution microscopy
14. Nano-antenna-based techniques

It was decided to include also these four additional techniques into the WP7 technology list.

All 14 technologies identified so far will be listed on the EUBI Web page to be openly discussed by the community.

Further innovative light microscopy technology, for which a demand for access exists, will be derived from the ongoing EUBI survey.

b. Identification of potential European facilities and infrastructures that could be able and would be willing to provide access to innovative technology.

It was agreed on to send an excel file (see Appendix III) listing the French light microscopy imaging facilities to the national and WP7 coordinators as a template to list national light microscopy imaging facilities and to indicate, which ones are in a position/interested to host proof-of-principle studies for WP7.

Further information on such facilities will be derived from the ongoing EUBI survey.

c. WP7 proof-of-concept studies

In order to test the demand for access and to determine the feasibility to provide access to the technologies identified it was stated as high priority to conduct proof of principle studies in WP7.

The four imaging techniques defined for proof-of-concept studies in WP7 so far are:

Technology	**Responsible**
Super resolution microscopy	S. Hell, Göttingen, Germany
Correlative microscopy	J. Klumperman (Univ. Utrecht, Netherlands)
High throughput microscopy	R. Pepperkok (EMBL, Germany) B. Geiger (Weizmann Inst., Israel)
Functional imaging	P. French (Imperial College, UK)

It was decided that two to three further proof-of-concept studies on technologies different from the ones already defined should be conducted.

National coordinators should nominate potential candidate facilities being able and willing to conduct such studies.

Technology-specific guidelines for these proof-of-concept studies will be generated until 31 October 2011 in addition to the general guidelines currently developed in WP6.

Annex I

Scientific programme of the 11th ELMI meeting in Alexandroupolis, Greece, June 7th-11th.

Tuesday, 7 June 2011

12.00 onwards	Arrival and check in at the hotel
14.00 onwards	Registration
19.00	Welcome Drinks
	Sponsored by Leica MICROSYSTEMS
19.30 - 20.00	Opening lecture
	Spyros Georgatos, Medical School, University of Ioannina, GR
20.15	Welcome Dinner
	Sponsored by Leica MICROSYSTEMS
Subsequently:	**After Dinner session**
	"History of Spinning Disk Confocal Microscopy"
	Sponsored by ANDOR TECHNOLOGY YOKOGAWA
Laureates:	Mojmír Petráň & Milan Hadravský, Plzeň, CZ
Speakers:	Tony Wilson, University of Oxford, UK
	"Spinning Disc Confocal Microscopy'"
	Milan Hadravský, Plzeň, CZ
	'How the spinning disc confocal microscope was born'
	Tanaami Takeo, Yokogawa, Tokyo, JP
	'Brief history of Yokogawa dual spinning disk confocal scanner'

Wednesday, 8th of June 2011

Session I	**Emerging applications / technologies, new imaging tools**
Chairs	Ernst Stelzer & Spyros Georgatos
09.00 - 09.30	Ernst Stelzer, Institute of Cell Biology and Neuroscience, Frankfurt, D
	EMBO Lecture EMBO European Molecular Biology Organization
	"From the Ultramikroskop to Theta Microscopy to

	Tetrahedral Microscopy to Light sheet-based fluorescence microscopy (LSFM)"
09.30 - 10.00	Tony Wilson, University of Oxford, UK
	'High speed focussing in optical microscopy'
10.00 - 10.15	Gracia-Parajo, Institute of Photonic Sciences, Barcelona, E
	'Nanoimaging and nanospectroscopy of living cells using near-field approaches'
10.15 - 10.30	Sunil Kumar, Imperial College London, UK
	'*An automated wide-field optically sectioning fluorescence lifetime multiwell plate reader for high content analysis of protein-protein interactions'*
10.30 - 10.45	Tim Grotjohann, MPI Göttingen, D
	'Reversibly switchable fluorescent proteins'
10.45 - 11.00	Coffee break
Session II	**Image analysis**
Chairs	Jason Swedlow & Stamatis Pagakis
11.00 - 11.30	Erik Meijering, University Medical Center Rotterdam, NL
	'Advances in tracking biological dynamics: From molecules to organisms'
11.30 - 12.00	Jason Swedlow, University of Dundee, UK
	"Using quantitative trajectory phenotyping to study the control of kinetochore dynamics during mitosis
12.00 - 12.15	Jerome Boulanger, Institut Curie, Paris, F
	'Novel opto-computational methods for the molecular analysis of the addressing, docking and fusion during vesicle plasma membrane recycling'
12.15 - 12.30	Christian Conrad, EMBL Heidelberg, D
	'Micropilot - Automation of F-Techniques for Systems Microscopy'
12.30 - 13.30	Lunch
Session III	**Correlative microscopy**
Chairs	Markus Grabenbauer
13.30 - 14.00	Markus Grabenbauer; MPI Dortmund; D
	'Novel developments in correlative light, electron and cryo-electron microscopy"
14.00 - 14.30	Christel Genoud; FMI Basel, CH
	'Serial block face scanning electron microscopy: a tool to explore the three dimensional ultrastructure
14.30 - 15.00	Graham Knott, EPFL Lausanne, CH
	'Focussed ion beam scanning electron microscopy for

	studying cell ultrastructure in three dimensions'"
Workshops	
15.00 - 16.30	Workshop 1
16.30 - 17.00	Coffee break
17.00 - 18.30	Workshop 2
18.30 - 20.00	Poster session I
20.30	Beach Party
	Sponsored by
	
Thursday, 9th of June 2011	
Session IV	**Super resolution fluorescence microscopy**
Chairs	Rainer Pepperkok & Bia Boleti
09.00 - 09.30	Alipasha Vaziri, IMP / MFPL Vienna, A
	Sculpting Light: Applications to 3D Super-Resolution Imaging and Optogenetic Control of Neuronal Circuits'
09.30 - 10.00	Alexander Egner, Laser Laboratories Göttingen, D
	'Developments in fluorescence nanoscopy'
10.00 - 10.30	Heinrich Leonhardt, LMU Biozentrum, Munich, D
	"Studying cellular structure and function with 3D structured illumination microscopy (3D-SIM) and fluorescent nanobodies"
10.30 - 10.45	Sebastian Munck, Flanders Institute for Biotech., Leuven, B
	'The fast track to super-resolution: Point-detection-Imaging-Microscopy through Photobleaching (PIMP)'
10.45 - 11.00	Markus Posch, University of Dundee, UK
	'Production line Super-Resolution Microscopy on the OMX microscopy platform'
11.00 - 11.15	Daniel Aquino, MPI Göttingen, D
	'4Pi GSDIM enables three-dimensional resolution in the ~10 nm range'
11.15 - 11.45	Coffee break
Session V	**Functional imaging**
Chairs	Anthony Squire & Mimika Thomaidou
11.45 - 12.15	Nektarios Tavernarakis, IMBB Crete, GR
	'Microscopic optical projection tomography in vivo'
12.15 - 12.45	Jacco Van Rheenen; Hubrecht Institute, Utrecht, NL
	'Intravital microscopy of tumor cell escape and

	metastatic outgrowth through imaging windows'"
12.45 - 13.15	Vasilis Ntziachristos; IBMI; Helmholz Center Munich; D
	'Illuminating biomedical discovery with advanced optical and opto-acoustic methods'
13.15 - 13.30	Martin J. Leahy, University of Limerick, IRL
	'Novel methods in 3D microcirculation imaging'
13.30 - 13.45	Arne Seitz, EPFL Lausanne, CH
	'2-photon imaging of entire rat brains
13.45 - 15.00	Lunch
Workshops	
15.00 - 16.30	Workshops 3
16.30 - 17.00	Coffee break
17.00 - 18.30	Workshops 4
18.30 - 20.00	Poster session II
18.30 - 20.00	Steering Committee Meeting
20.30	Gala dinner
Friday, 10th of June 2011	
Workshops	
09.00 - 10.30	Workshop 5
10.30 - 11.00	Coffee break
Session VI	**Advanced Light Microscopy Techniques & Applications I**
Chairs	Timo Zimmermann & Zoi Lygerou
11.00 - 11.30	Rainer Pepperkok, EMBL Heidelberg, D
	'High Throughput Microscopy for Systems Biology Analyses'
11.30 - 12.00	Valentin Nägerl, IINS Bordeaux, FR
	'Dual-color live-cell super resolution imaging of synapses using STED microscopy'
12.00 - 12.30	Ron Heeren, FOM Institute AMOLF, Amsterdam, NL
	'Visualizing complex molecular signals with multimodal imaging mass spectrometry'
12.30 - 12.45	Elisa Ferrando-May, University of Konstanz, D
	'Imaging of DNA damage-induced histone dynamics by dual wavelength multiphoton excitation'
12.45 - 13.00	Alberto Diaspro, Italian Institute of Technology, Genoa, Italy
	'Can Two-Photon Excitation Improve STED AND SPIM?'

13.00 - 13.15	Ilan Tsarfaty, Sackler School of Medicine, Tel Aviv, Israel *'Confocal microscopy based molecular imaging as a tool for studying met-induced cell motility as a first step of metastasis'*
13.15 - 14.30	Lunch
14.30 - 15.30	EURO-BIOIMAGING - Status Quo session
15.30	Coffee break
Session VII	**Advanced Light Microscopy Techniques & Applications II**
Chairs	Nektarios Tavernarakis & Vasso Kostourou
16.00 - 16.15	Gábor Csúcs, ETH Zurich, CH *'HCIP – Workflow-based Framework for Biological Image Processing using the KNIME platform'*
16.15 – 16.30	Zoi Lygerou, University of Patras, GR *A stochastic hybrid model of single molecule movement within cells permits insight into DNA replication licensing'*
16.30 – 16.45	Vladimir Ulman, Masaryk University Brno, CZ *"Tool for generation of synthetic image datasets for time-lapse fluorescence microscopy"*
16.45 – 17.00	Katrin Heinze, IMP Vienna, A *'Color coded optical nano-sectioning (cocos) reveals focal adhesion dynamics'*
17.00 – 17.15	Konstantinos Lymperopoulos, BioQuant Heidelberg, D *'Chiron: Chemically improved resolution for optical nanoscopy by stochastic switching of spectroscopic states'*
17.15 – 17.30	Sebastian Malkusch, Theodor-Boveri-Institute, Würzburg *'Concepts to analyze multi-color localization microscopy data'*
17.30 – 17.45	Juan Varela, Centre for BioNano Interactions, Belfast, IRL *Tracking cell organelles and nanoparticles inside living cells with spinning-disk confocal microscopy'*
17.45 – 18.00	Jürgen Mayer, Centre for Genomic Regulation, Barcelona, E '3D secondary lymphoid organ structure examined using selective plane illumination microscopy'
18.00 – 18.15	László Dudás, Dept. Optics & Quantum Electronics, University Szeged, H

	'Line-Scanning Optical Tomographic microscope'
18.15	Closing Remarks
16.00 - 20.00	**EUBI Satellite meetings for appointed national delegates Venue: Nefeli Hotel**
20.30	Tavern dinner

Annex II

List of participants in the first Euro-Bioimaging WP7 meeting, taking place in Alexandoupolis, Greece, June 10th.

Name (country represented)

Anthony Squire (FI) / on behalf of John Eriksson
Oddmund Bakke (NO)
Grzegorz Wilczynski (PL)
Elisa May (DE)
Roland Nitschke (DE)
Jason Swedlow (UK)
Alexander Schulz (DK)
Martin Leahy (IE)
Hugh Byrne (IE)
Valentin Nägerl (Bordeaux) On behalf of Daniel Choquet
Jean Salamero (FR)
Timo Zimmermann (ES)
Alberto Diaspro on behalf of Pier Paolo Di Fiore (IT)
Margy Koffa (GR)
Babis Savakis (GR)
Pavel Hozak (CZ)
Gerald Donnert (DE, WP7) on behalf of Stefan Hell
Sunil Kumar (UK, WP7) on behalf of Paul French
György Vamosi (HU)
Jan Ellenberg (Euro-BioImaging)
Antje Keppler (Euro-BioImaging)
Jason Swedlow (UK, WP6 Chair)
Rainer Pepperkok (DE, WP7 Chair)
Patrick Schwarb (CH, Industry Board) On behalf of Susan Gasser
Sinan Yuruker (TR)
Maria Garcia-Parajo (ES, WP7)
Igor Weber (HR)
Alipasha Vasiri (AT)
Stefan Terjung (DE, Industry Board, WP7)