BuildMoNa

UNIVERSITÄT LEIPZIG

SCIENTIFIC AND METHOD MODULES

Module name	**Hybrid systems**
Number	2012-T6
Aims	Strengthening the understanding of cell/substrate interfaces concerning complex neuronal organotypic tissues. Neurogenesis and synaptogenesis depenedent on substrate topology and cellular adherence will be the focus of the teaching program. Processes of directed axonal outgrowth dependent on guidance molecules in combination with subcellular changes and cytoskeleton architecture can be monitored in real time using microelectrode arrays. Therefore some basics of microelectrode configuration and surface topology will be presented in a tutorial. The principles field potential recording, impedance spectroscopy in correlation with high resolution microscopy in a nanoscale on various biochips will be trained in theory and practice. Finally some applications of miniaturized recording devices regarding injury and degenerative progress of neurons and their neuritis will be demonstrated.
Basics	basics trained in modules B1–B3 concerning, recombinant expression of proteins, surface topology and analysis, basics in biosensors, solid-state electronics, cell biology
Contents	1. Neuronal cell biology, guidance molecules and axonal out growth 2. Microarrays, various microelectrode configurations and electrode surface topologies 3. Brain slices and neurospheres on microarrays for impedance spectroscopy and field potential recording in combination with modeling & imaging microscopic anaylsis 4. Electrodes – the challenge in electrical characterization of biological material 5. Computer simulation of polymers in disordered media 6. Work stations for brain slice recording on a chip (demonstration / practical course)
Methods	Impedance spectroscopy, field potential recording, high resolution microscopy of cells and tissues, imaging of microscopic analysis.
Type	Two-day block course / yearly recurrence with modification
Date (month/year)	June 26th and 27th, 2012
Time	9.00 – 18.45
Work load	15 hours presence/ 45 hours self-study
Examination	Oral – July 03rd-04th, 2012
Credit points	2
Responsible scientists	Andrea Robitzki
International guest lecturers	Andrea Robitzki (BBZ Leipzig), Wolfhard Janke (ITP Leipzig), Heinz-Georg Jahnke (BBZ Leipzig), Uwe Pliquett (IBA Heiligenstadt), Ulf-Dieter Braumann (IZBI Leipzig)
Industrial partners	
Recommendations for literature, e-learning	s. http://www.uni-leipzig.de/~dmpt/lectures (pdf files of selected reviews and power point presentations)

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SCHEDULE Tuesday 26th, June – Wednesday, 27th June, 2012

Time	Lecturer	Program	Location
June 26th, 2012			
09:00–09:10	Andrea Robitzki, BBZ	Overview and Introduction – Road Map [**I**]	BBZ lecture hall
09:15-10:45	Andrea Robitzki, BBZ	Introduction in basics of biosensors	BBZ lecture hall
11:00-12:30	Andrea Robitzki, BBZ	Introduction in cell and tissue based microarrays	BBZ lecture hall
12:30-13:30	*Lunch break*		
13:45-15:15	Uwe Pliquett, IBA Heiligenstadt	Electrodes – the challenge in electrical characterization of biological material	BBZ lecture hall
15:45–17:15	Ulf Braumann, IZBI	Imaging of microscopic analysis in biomedical research	BBZ lecture hall
17:30-18:45	Heinz-Georg Jahnke, BBZ	Practical courses and trainee [**A**] in "microlaser technology and biosensorics: manipulation and monitoring of viable cells"	BBZ, Laboratories 4th floor
June 27th, 2012			
09:00-09:10	Andrea Robitzki, BBZ	Overview and Introduction-Road Map [**II**]	BBZ lecture hall
09:15-10:45	Andrea Robitzki, BBZ	Basics of neurogenesis, synaptogenesis and axonal outgrowth	BBZ lecture hall
11:00-12:30	Andrea Robitzki, BBZ	Recording of neurodegeneration on microarrays: the role of the microtubule binding protein Tau	BBZ lecture hall
12:30-13:30	*Lunch break*		
13:45-15:15	Heinz-Georg Jahnke, BBZ	Lift-off technique and soft photolithography – fabrication processes for microelectrode arrays	BBZ lecture hall
15:45-17:15	Wolfhard Janke, ITP	Computer simulations of polymers in disordered media	BBZ lecture hall
17:30–18:45	Heinz-Georg Jahnke, BBZ	Practical courses and trainee [**B**] in "biohybrid systems in neuroscience"	BBZ, Laboratories 4th floor

Didactic elements:
Lecture, discussions, practical training – lab demonstration

Expected performance:
Active participation in discussions during lab demonstration (selected work stations)