

ELECTRAIN

Extended Methods Course in Electrophysiology

May 2-13, 2022



GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN
International Max Planck Research School
Neurosciences

GGNB

Göttingen Graduate Center for
Neurosciences, Biophysics, and Molecular Biosciences



Federation of
European
Neuroscience
Societies



Faculty:

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Electrophysiology Training (ELECTRAIN)

Date: 02.05.2022 - 13.05.2022

Location: European Neuroscience Institute (ENI-G), Grisebachstr. 5, 37077 Göttingen

Participants: 16 for practical course (lectures are open for all PhD students)
(4 groups of 4 participants max. each, groups switch topics after 1st week, participation for both weeks mandatory, topics will be assigned during the course)

TOPIC 1: Oocyte recordings with recombinant channels

(PARDO)

TOPIC 2: Invertebrate recordings

(FERBER)

TOPIC 3: Slice electrophysiology

(CARTER)

TOPIC 4: Channelrhodopsin photocurrent measurements and optogenetic stimulation of rat hippocampal neurons

(MAGER)

Practical Part

Week 1/2 Monday – Thursday from 13:30-18:00h ENI teaching labs

Week 1 02-06 May 2022 (Pardo)

Topic: Expression and electrophysiological characterization of different ion-channels in the *Xenopus* oocyte expression system

Techniques: cDNA expression techniques in *Xenopus* oocytes, Two-electrode voltage clamp configuration and measurements, Quantitative evaluation and statistical analysis of different ion channels/conductances

Week 1 02-06 May 2022 (Ferber)

Topic: In-vivo electrophysiology of identified neurons in *Hirudo medicinalis*

Techniques: Single and double intracellular recording techniques, Characterization of spontaneous and stimulus-evoked electrical activity patterns in identified neurons, Analysis of synaptic connectivity and network properties, Pharmacological characterization of different electrical conductances.

Week 1/2 02-06 May 2022 & 09-13 May 2022 (Carter)

Topic: Measurement of synaptic parameters in mouse hippocampal slices

Techniques: Miniature EPSC recording of CA1 pyramidal cells, evoked AMPA receptor and NMDA receptor mediated synaptic transmission of Schaffer collateral CA1 pyramidal cell synapses, lentiviral-mediated molecular manipulation of CA1 pyramidal cells

Week 2 09-13 May 2022 (Mager)

Topic: Channelrhodopsin photocurrent measurements and optogenetic stimulation of rat hippocampal neurons

Techniques: Optogenetics, Patch-Clamp technique, Cell culture work, Data analysis, Adeno-associated virus mediated transduction, Photostimulation of rat hippocampal neurons

Presentation of results & Cleaning-up: Friday, ENI Lecture Hall & ENI Teaching Labs

E 03 - GGNB Extended Methods Course 2022

Lectures

Week 1/2 Monday – Friday from 9:30h ENI lecture hall

(open to all GGNB students)

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| Mon, 2 May 2022 | 09:30-11:00 | Introduction to electrophysiological methods (Pardo) |
| Mon, 2 May 2022 | 11:00-12:30 | Heterologous expression and study of ion channels in oocytes (Pardo) |
| Tue, 3 May 2022 | 11:00-12:30 | Invertebrate model systems in neuroscience (Ferber) |
| Wed, 4 May 2022 | 09:30-11:00 | Basic electronics (Schliephacke) |
| Wed, 4 May 2022 | 11:00-12:30 | Sensory processing in leech (Kretzberg) |
| Thu, 5 May 2022 | 09:30-11:00 | Electrophysiological instrumentation (Schliephacke) |
| Thu, 5 May 2022 | 11:00-12:30 | Voltage gated ion channels (Pardo) |
| Fri, 6 May 2022 | 09:30-11:00 | Calcium imaging techniques (Milosevic, <i>online</i>) |
| Fri, 6 May 2022 | 11:00-12:30 | Ligand-gated channels (Nicke) |
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| Mon, 9 May 2022 | 09:30-11:00 | Introduction to slice electrophysiology (Carter) |
| Mon, 9 May 2022 | 11:00-12:30 | Introduction to optogenetic techniques (Mager) |
| Tue, 10 May 2022 | 09:30-11:00 | Electrophysiology and imaging methods monitoring hair cell synapse (Pangrsic) |
| Wed, 11 May 2022 | 09:30-11:15 | Lipids, Fusion and Membrane Properties (Woodbury) |
| | 11:15-13:00 | Data acquisition, noise, and the FFT (Woodbury) |
| Thu, 12 May 2022 | 09:30-11:00 | Chronic implants and wireless electrophysiology in freely moving animals (Gail) |
| Thu, 12 May 2022 | 11:00-12:30 | Ion channels and perception (Draeger) |
| Fri, 13 May 2022 | 09:30-11:00 | fMRI guided in vivo electrophysiology (Schwiedrzik) |