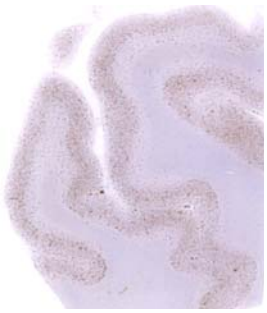
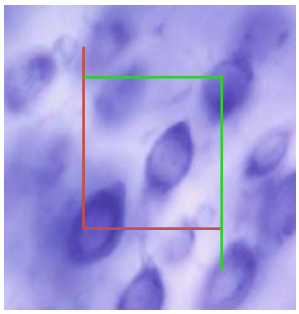
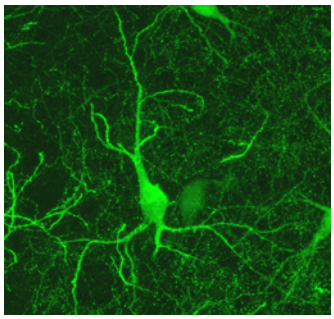
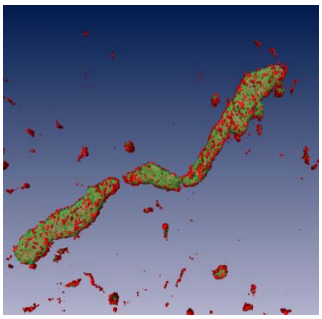
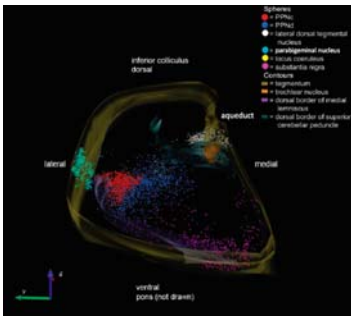
STEREOLOGY AND MORPHOMETRY IN NEUROSCIENCES

Course for graduate students and postdocs
Amsterdam, 20-23 June 2016

Venue: VU University Medical Center
OI2 gebouw, De Boelelaan 1108,
1081 HZ Amsterdam
The Netherlands.

Local organizing secretariat:
Mrs. Meiling Lam and mrs. Sandra van Geloven
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Scientific organizer:
Dr. Wilma D.J. van de Berg, Senior Neuroscientist
Dept. of Anatomy and Neurosciences,
Neuroscience Campus Amsterdam,
VU University Medical Center,
Amsterdam, the Netherlands.

Introduction

In the Stereology and Morphometry course, the principles of stereology in Neurosciences are introduced and the application of stereological methods and morphometric analysis is trained to be able to effectively and efficiently obtain rigorous quantitative data of objects in three-dimensions. In addition, advanced microscopy and methods are presented to quantify (sub)cellular structures in a design-based manner.

The aim of the Stereology and Morphometry course is to teach how to design, to perform and critically evaluate stereological and morphometric studies in human and experimental neurosciences.

The Stereology and Morphometry course covers the following topics:

1) Principles of Stereology in Neurosciences
2) Quantitative analysis of dendrites/axons/synapses using stereology
3) Principles of confocal laser scanning microscopy, dual/triple/multiple labelling, quantification of synapses
4) Super-resolution microscopy (STED/PALM-STORM)
5) Advanced electron microscopy: FIB/SEM, TEM, immunoEM
6) Morphometric analysis of 3D structures in 2D using MCID and ImageJ
7) Hands-on training in 3D reconstruction and quantification of neuronal structures using neurolucida/stereoinvestigator/CSLM

The course is **limited to 24 participants**. For selection purposes you are required to submit a CV and letter of motivation.

Teaching Staff invited

Wilma D.J. van de Berg, PhD	Dept. of Anatomy & Neurosciences, VUmc
Harry B.M. Uylings, PhD	Dept. of Anatomy & Neurosciences, VUmc
Evelien Timmermans, Msc	Dept. of Anatomy & Neurosciences, VUmc
P. Voorn, PhD	Dept. of Anatomy & Neurosciences, VUmc
Floris G. Wouterlood, PhD	Dept. of Anatomy & Neurosciences, VUmc
René J.P. Musters, PhD	Dept. of Physiology, VUmc
Jeroen Kole, Msc	Dept. of Physiology, VUmc
Sarah Sharamoradian, PhD	Dept. Biology and Chemistry, Paul Scherrer Institute, Villingen

PROGRAM

Monday June 20th, 2016. Room 02 W04

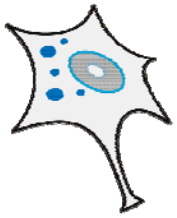
08:45 – 09:00 **Welcome at reception of OI2 Human Life Sciences Building**
09:00 – 09:30 **Introduction to the course (Wilma)**
09:30 – 10:00 **Principles of Stereology: 3D thinking, Sampling design (Wilma)**
10:00 – 10:30 *Coffee Break*
10:30 – 11:15 **Unbiased estimation of volume in human and rat tissue (Harry)**
Theory: Cavalieri's principle; systematic random sampling;
11:15 – 12:30 **Unbiased estimation of the total number of cells in human and rat tissue (Wilma):** over- and underprojection; dissector and fractionator method
12:30 – 13:30 *Lunch break*
13:30 – 14:15 **The nucleator principle (Harry)**
14:15 – 15:00 **Methods for quantification of blood vessels, dendrites, synapses (Wilma)**
15:00 – 15:30 *Coffee Break*
15:30 – 17:00 **Demonstration Part I: A) Neurolucida and Stereoinvestigator (Harry & Evelien);** B**) Confocal laser scanning microscopy-STED (Jeroen); C) Densitometry (Pieter)**

Tuesday June 21th, 2016. Room O1 W08

09:00 – 09:45 **Neuroanatomical and viral tracing and morphometry (Floris)**
09:45 – 10:30 **Confocal Microscopy and 3D object recognition (Floris)**
10:30 – 11:00 *Coffee Break*
11:00 – 11:45 **3D reconstruction from multichannel confocal laser scanning images (Floris)**
11:45 – 12:30 **Stereology and confocal laserscanning microscopy (Wilma)**
12:30 – 13:30 *Lunch break*
13:30 – 14:15 **Introduction to superresolution microscopy (PALM-STORM, STED) (Rene)**
14:15 – 15:00 **Superresolution microscopy (STED) (Jeroen) – theory and examples**
15:00 – 15:30 *Coffee Break*
15:30 – 17:00 **Demonstration Part II: A) Neurolucida and Stereoinvestigator (Evelien); B) Practical exercises Workstations (Wilma); C) Confocal laser scanning microscopy-STED (Jeroen); D) Densitometry (Pieter)**

Wednesday June 22nd, 2016. Room O1 W08

09:00 – 09:45 **Microscopic imaging and densitometry - theory (Pieter)**
09:45 – 10:30 **Microscopic imaging and densitometry – examples (Pieter)**
10:30 – 11:00 *Coffee Break*
11.00 – 11:45 **What a single cell can tell us about the cerebral cortex (Wilma)**
11:45 – 12:30 **Brain Mapping using microscopic imaging techniques (Wilma)**
12:30 – 13:30 *Lunch break*
13:30 – 14:15 **Advanced electron microscopy - FIB/SEM, TEM, ImmunoEM (Sarah)**
14:15 –15:00 **Ultrastructure and 3D reconstruction of subcellular structures in human and mouse brain tissue (Sarah)**
15:00 – 15:30 *Coffee Break*
15:30 – 17:00 **Demonstration Part III: A) Neurolucida and Stereoinvestigator (Evelien); B) Practical exercises Workstations (Wilma); C) Confocal laser scanning microscopy-STED (Jeroen); D) Densitometry (Pieter)**



PROGRAM

Thursday June 23rd, 2016. Room 02 W04

09:00 – 09:45	**Estimation of precision and how to deal with biological variability (Harry)**
09:45 – 10:30	**Applying morphometrics in Neurosciences - discussion (Wilma)**
10:30 – 11:00	*Coffee Break*
11:00 –12:30	**Hands-on training at workstations (Stereoinvestigator, CSLM SP8, CSLM SP2, MCID, AMIRA) and consultancy with experts**
12:30 – 13:30	*Lunch break*
13:30 – 15:00	**General discussions on stereological probes, image analysis software**
15:00 – 16:00	**Reception**