

Applications of Unbiased Stereology & Artificial Intelligence to Biological Tissue

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Fall 2019 Workshop Program



Dates: Tuesday, November 26 to Thursday, November 28

Location: Charles University, Faculty of Medicine in Pilsen, Czech Republic

Info & Registration: <https://sites.google.com/view/mouton-stereology-workshop/>

Faculty:

Peter R. Mouton, Ph.D.

Visiting Professor (*Professor Hospitus*), Charles University, Czech Republic
Professor of Stereology, University of South Florida, Tampa, FL, USA
Chief Scientific Officer, SRC Biosciences.

Author of two best-selling stereology textbooks from The Johns Hopkins University Press:

- *Principles and Practices of Unbiased Stereology: An Introduction For Bioscientists*
- *Unbiased Stereology: A Concise Guide*

Hady A. Phoulady, Ph.D.

Assistant Professor of Computer Sciences & Engineering, California State University, Sacramento, CA, USA

Stefan Porubsky, M.D., Ph.D.

Professor of Pathology, University Medical Centre Mannheim, Medical Faculty Mannheim, University of Heidelberg, Mannheim, Germany.

Zbynek Tonar, M.D., Ph.D.

Assoc. Prof. of Histology & Embryology, Charles University, Faculty of Medicine in Pilsen, Czech Republic

Yaroslav Kolinko, Ph.D.

Department of Histology & Embryology, Charles University, Faculty of Medicine in Pilsen, Czech Republic

Major Topics Covered:

- Theory and practice of unbiased (design-based) stereology as applied to biological tissue.
- Applications of machine learning, deep learning and artificial intelligence to biological tissue.
- Hands-on exercises for object number & density, region volume, feature length and object volume (load).
- Optimization of data collection for maximum efficiency.
- Cross-discipline stereology examples in medicine and basic sciences.
- Introduction to manual and automatic (Self-Counting) stereology systems.



DAY 1: Tuesday, November 26

- 09.00–10.30 Introduction to Unbiased Stereology
 10.30–11.30 *Hypothesis Blitz*: 5-minute participant presentations about ongoing/planned research projects.
 11.30–13.00 **Lunch**
 13.00–14.00 Exercise: Total Volume by Cavalieri Method & Point Counting
 14.00–15.00 Exercise: Total Number & Density by Optical Disector & Optical Fractionator
 15.00–15.15 **Break**
 15.15–16.30 Exercise: Optimization of Volume and Number for Maximum Efficiency
 16.30–17.30 *Hypothesis Blitz II*: 5-minute presentations about ongoing/planned research projects.
End of Workshop Day 1

DAY 2: Wednesday, November 27, 2019

- 09.00–10.30 Overview of Artificial Intelligence & Machine Learning
 10.30–11.30 Introduction to Computer Vision
 11.30–13.00 **Lunch**
 13.00–14.00 Image Processing Algorithms and Pattern Recognition
 14.00–15.00 Applications Machine Learning to Histological Tissues
 15.00–15.15 **Break**
 15.15–16.00 Applications of Deep Learning to Unbiased Stereology (Deep Stereology)
 16.00–16.45 Special Guest Lecture, Dr. med. Stefan Porubsky, “*Deep Learning-Based Tool For Morphometric Analysis Of The Kidney Parenchyma*”
 16.45–17.00 A short walk to the Laboratory of Quantitative Histology
 17.00–17.30 Computerized Stereology Demonstration
End of Workshop Day 2

DAY 3: Thursday, November 28, 2019

- 09.00–10.00 Dr. Zbynek Tonar: *The Universality of Stereology: 7 Examples in Microscopic Anatomy*
 10.00–11.00 Exercise: Stereology of Mean Cell Volume
 11.00–11.30 Tissue Processing and Other Sources of Uncertainty
 11.30–13.00 **Lunch**
 13.00–14.00 Exercise: Stereology of Linear Features In Rodent Brains
 14.00–15.00 Dr. Yaroslav Kolinko: *Unbiased Stereology of Golgi-stained Brain Tissue*
 15.00–15.15 **Break**
 15.15–15.30 “How many animals, how many sections, how many probes?”
 15.30–17.00 *Hypothesis Blitz*: Participant projects with proposed solutions
End of Workshop Day 3

