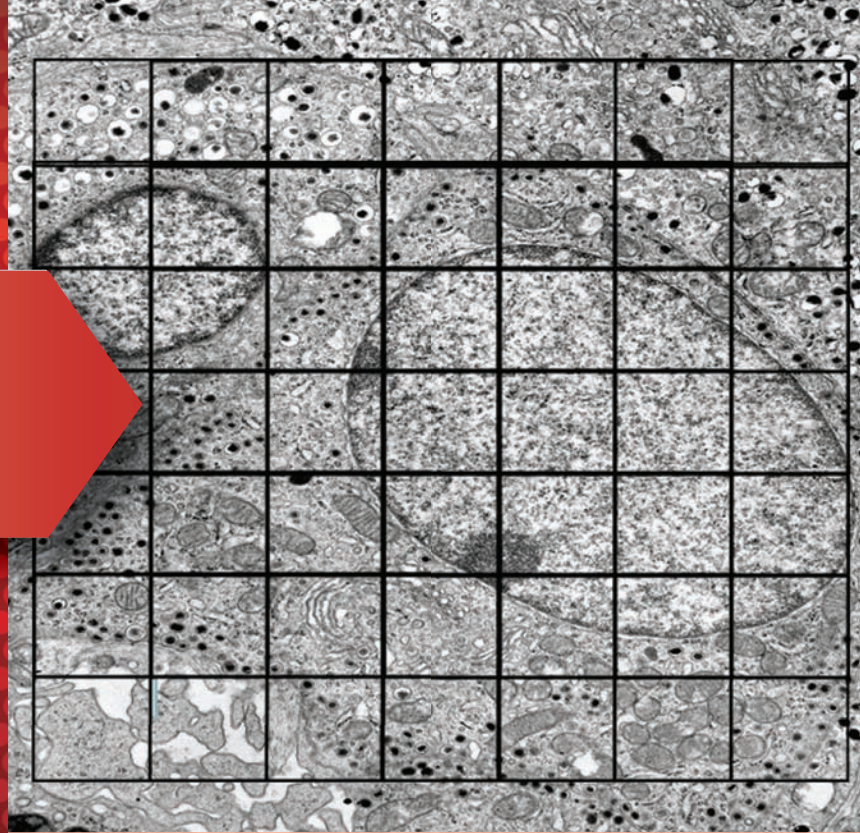# NUI Galway
OÉ Gaillimh

Stereology

Why study this module?

Unbiased stereology provides an important contribution to the advancement in biological research by improving the consistency and dependability of quantitative analytical results produced in the laboratory and reported in scientific publications.

Module content

The word "Stereology" was invented to describe the set of methods that allow a 3 dimensional interpretation of structures based on observations made on 2 dimensional sections. For example, it allows the researcher obtain information from 2D images that is not available through any other means. A modern interpretation of stereology is that it is a spatial version of sampling theory. The Stereological approach is providing a spatial framework upon which to lay the new physiological and molecular information

Who is the target audience?

Stereology is the science that relates three-dimensional structure to the 2D images that can be measured. The most common field of application is in microscopy, both of man-made materials (metals, ceramics, composites, etc.) and of biological tissue samples. Those wishing to accurately quantify the interactions between medical devices and the human body should find this module of particular interest.

Learning outcomes

On completion of this module you will have:

- Improved skill in experimental design
- Improved skill in critical analysis of quantitative morphometry
- Ability to explain sampling theory
- Ability to summarise the application of modern design-based (unbiased) stereological techniques to biological tissue

Module facts

Course level: Level 9

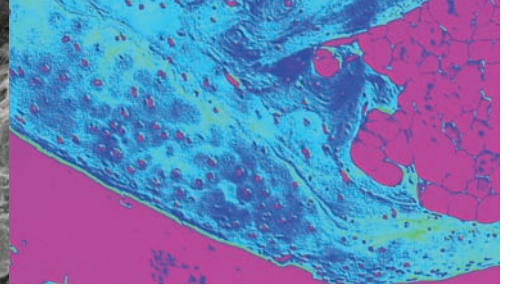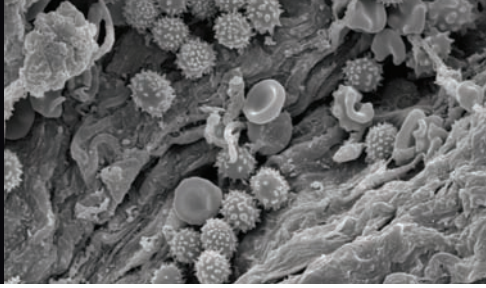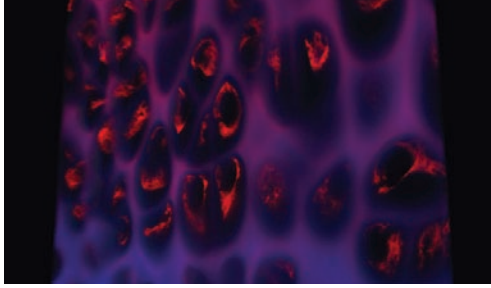Module credit: 5 ECTS. Gain transcript or use towards PG Cert/PG Dip/MSc qualification in Biomedical Science

Duration: Over one semester

Entry Requirements: Please refer to the application section of the programme brochure

Fees: €1,000

Applying: www.nuigalway.ie/apply

Closing date: 2 – 8 weeks prior to module start date

www.nuigalway.ie/biomedical-science

Module topics

Introduction to Sampling
- The Stereological Approach
- Sampling
- Methods of Sampling

Systematic Sampling
- Tissue Preparation
- Random Sampling
- Systematic Sampling

Geomatric Probes and Volume Estimation
- Stereological Estimators
- Volume Estimation
- The Cavalieri Principle
- Relative Parameters

Estimation of Lengths and Surfaces
- Boundary Length
- Surface Density & Surface Area
- Length Density & Length

Estimating Number in 3D
- The Disector Principle
- The Disector
- The Fractionator

Particle Volume Estimation
- Volume-weight mean Volume
- The Point Sampled Intercept
- Particle Volume
- The Selector
- The Nucleator
- The Star Volume

Student testimonial

Dermot Hughes

Current position:
Project Manager, Creganna Tactx Medical, Galway.
Position held while completing module:
Senior Development Engineer, Boston Scientific, Galway.

"I am currently a project manager within a medical device company. At the time of completing this module I was an Engineer II within a similar organisation.

My engineering background is in electrical engineering. However, I felt that in order to progress within the medical device field, it would be prudent to improve my knowledge of human biology. The Masters course in Biomedical Science appeared to provide this interface between medical devices and human biology.

Stereology was one module that I found particularly interesting and stimulating. I have an interest in statistics, and one way to describe stereology is that it is a spatial version of sampling theory. The course explored various techniques for examining three-dimensional biological structures using observations made on two-dimensional samples. I found the module particularly interesting since it did not solely rely on text book information, but was practical in nature. The module provided a further link as to how mathematical techniques could be applied in the biological world."
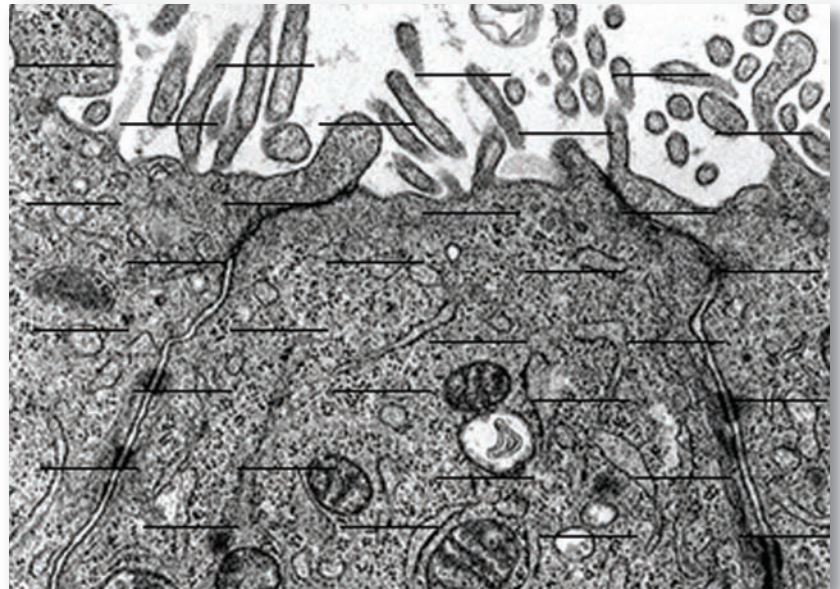
Module Director

Prof. Peter Dockery

This module is delivered by Prof. Peter Dockery, who received a BSc in Biology from the University of Strathclyde in 1981. He obtained a PhD in Anatomy (1986) from the University of Aberdeen. Postdoctoral work was undertaken on the human endometrium at the Harris Birthright Centre for Reproductive Medicine, Department of Anatomy and Cell Biology, University of Sheffield. In 1988 he was appointed Lecturer in the Department of Biomedical Science, University of Sheffield. In 1990 was appointed Lecturer at the Department of Anatomy, University of Hong Kong. In 1995 was appointed Lecturer in the Department of Anatomy, University College Cork, then Statutory Lecturer in the Department of Anatomy, University College, Cork in 2001. He joined the BioScience Institute when it opened in September 2002. He was appointed as director of the Advanced Microscopy Research Facility in the Neuroscience/Anatomy Section of the BSI. In July 2005 took up post as Professor of Anatomy at NUI Galway. Prof. Dockery currently has over 113 Papers/chapters and over 200 abstracts at scientific meetings.

Contact details
Email : peter.dockery@nuigalway.ie