

# LF108-15 Cell Biology of Neurons

**26/27**

**Department**

Life Sciences

**Level**

Undergraduate Level 1

**Module leader**

Bruno Frenguelli

**Credit value**

15

**Module duration**

10 weeks

**Assessment**

Multiple

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

This module will provide introductory understanding of the nervous system, concentrating on the physiology and cell biology of neurons.

### Module aims

This module will cover the cell biology of neurons and glial cells of the nervous system. It will provide insight into the basic structure and function of these cells and describe the cell biological process that give rise to them (neurogenesis), allow them to migrate to their correct location, to establish synaptic and other contacts (axon guidance), to satisfy metabolic needs at sites distant from the cell body (axonal transport, localised protein synthesis and receptor trafficking). The aim of the module is to introduce the students to how the wiring of the nervous system arises through an understanding of the differentiation and development of individual cell types. Such process can go awry and give rise to neurodevelopmental conditions such as autism. The module will provide valuable knowledge that will aid student learning throughout the Neuroscience degree.

### Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Overview of the nervous system: Basic review of the anatomy of the brain, spinal cord and cellular specialisations

Early brain development : Formation of the nervous system

Cellular anatomy and bioenergetics of the nervous system: Introduction to the cell types of the nervous system, their fuels and their genesis

Cellular migration in the nervous system: Origins and destinations

Construction of neural circuits: Neuronal polarization and site-specific protein synthesis as a prerequisite for circuit formation

Axon guidance and transport: Intrinsic and extrinsic signals determining axon elongation and development

Synapse formation: Activity-dependent formation, retraction and stabilisation of synapses

Critical periods in the development of the nervous system: Neural activity as determinant of brain development and maturation

Repair and regeneration in the nervous system: The damaged brain, repair and functional re-organisation

Neurogenesis and regenerative medicine: Evidence for neurogenesis and potential for stem cells in regenerative medicine

Escape behaviour

Olfaction

Taste

Temperature

Pain/touch

Magneto/electrosensing

Time & Space perception

Workshop: Microscopic analysis of histological sections of brain tissue: matching form to function.  
Measurement of electrical activity in the nervous system

## **Learning outcomes**

By the end of the module, students should be able to:

- Demonstrate understanding of cellular anatomy of the nervous system
- Demonstrate understanding of the differences in structure and function between different nervous system cell types
- Demonstrate understanding of neuronal cell differentiation
- Demonstrate understanding of neuronal cell migration

- Demonstrate understanding of axon guidance
- Demonstrate understanding of axonal transport
- Demonstrate understanding of localised proteins synthesis
- Demonstrate understanding of the establishment of synaptic contacts
- Demonstrate understanding of genetic mutations that disrupt these process and lead to clinical conditions
- Demonstrate an understanding of neurogenesis and the potential of stems cells in neurological disorders
- Demonstrate an understanding of sensory systems

## Indicative reading list

[Reading lists can be found in Talis](#)

## Subject specific skills

LO1 Demonstrate understanding of cellular anatomy of the nervous system

LO2 Demonstrate understanding of the differences in structure and function between different nervous system cell types

LO3 Demonstrate understanding of neuronal cell differentiation

LO4 Demonstrate understanding of neuronal cell migration

LO5 Demonstrate understanding of axon guidance

LO6 Demonstrate understanding of axonal transport

LO7 Demonstrate understanding of localised protein synthesis

LO8 Demonstrate understanding of the establishment of synaptic contacts

LO9 Demonstrate understanding of genetic mutations that disrupt these process and lead to clinical conditions

LO10 Demonstrate an understanding of neurogenesis and the potential of stems cells in neurological disorders

LO11 Demonstrate an understanding of sensory systems such as taste, olfaction, space and time perception

## Transferable skills

Self directed learning, adult learning, team based learning, technology enhanced learning

## Study

### Study time

Type	Required
Lectures	20 sessions of 1 hour (13%)
Total	150 hours

Type	Required
Practical classes	2 sessions of 3 hours (4%)
Private study	123 hours (82%)
Assessment	1 hour (1%)
Total	150 hours

## Private study description

Self directed learning and revision

## Costs

Category	Description	Funded by	Cost to student
Equipment and project costs	Students will require a lab coat for lab sessions but these are provided by the department.	Department	£0.00

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## Assessment

You do not need to pass all assessment components to pass the module.

### Assessment group D2

	Weighting	Study time	Eligible for self-certification
In-class assignment 1 Neuronal Structure lab-based assessment	20%		Yes (extension)
In-class assignment 2 Electrical activity in the nervous system	20%		Yes (extension)
Closed-book end-of-year examination In-person locally-timetabled closed-book end-of-year examination	60%	1 hour	No

### Assessment group R2

	Weighting	Study time	Eligible for self-certification
Closed-book examination In-person locally-timetabled closed-book examination	100%		No

## Feedback on assessment

Written feedback

[Past exam papers for LF108](#)

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## **Availability**

### **Courses**

This module is Core for:

- Year 1 of ULFA-B140 Undergraduate Neuroscience (BSc)
- Year 1 of ULFA-B142 Undergraduate Neuroscience (MBio)
- Year 1 of ULFA-B143 Undergraduate Neuroscience (with Industrial Placement) (MBio)
- Year 1 of ULFA-B141 Undergraduate Neuroscience (with Placement Year) (BSc)