LF217-18 Multicellular Systems

20/21

Department
Life Sciences
Level
Undergraduate Level 2
Module leader
Isabelle Carre
Credit value
18
Module duration
11 weeks
Assessment
100% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module bridges the gap between molecular biology and the functioning of whole organisms. Part 1 of the module provides an overview of plant development and of the mechanisms by which plants respond and adapt to their environment. Part 2 gives an overview of the field of Neurobiology. It includes an introduction to the physiology of the nervous system and to the cell and molecular biology underlying the development and function of the nervous system.

Module web page

Module aims

Students will understand the cellular and molecular mechanisms underlying key aspects of plant development and the function of the nervous system in animals..

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.

Part A
Lectures 1-5

Neuronal Development, Cell biology and Disease
The aim of this part of the module is to provide an understanding of basic principles of organization of a nervous system and development of the nervous system. It will also give us an opportunity to discuss some diseases.
Neuronal cell biology: specialities of neuronal cell biology – axonal transport, localised translational control of mRNA, inter-cellular mRNA exchange by nanotubes, myelination. Diseases caused by defects in these systems.
Axon guidance: the identification of the factors involved in wiring a nervous system , including axonal growth cone structure, attraction and repulsion, pioneer and follower neurons.
Synaptic refinement and activity dependence: the Chemospecificity hypothesis, the role of activity in synaptic refinement and its molecular basis.
Development of the CNS: the link between genes and function of neuronal cells with particular focus to the development of nervous system

Lectures 6-10
Fundamentals of Neurophysiology
These lectures will explore fundamental principles of signal transmission in the nervous system, including electrical signalling in the neurons and the role of various neurotransmitters and their receptors in the information processing in the brain. The brief overview of the most important neuro physiological experimental techniques will be given. Lecture topics include:
Basic electrophysiology: role for ion channels in the signalling in neurons other cells and techniques which are used to study them: patch-clamp, current clamp, voltage clamp, fluorescent imaging.Synaptic transmission and neurotransmitter receptors - basic classes of neurotransmitters
An appreciation of our knowledge at the cellular and molecular level of highly complex interactive processes
An understanding of how a reductionist approach can yield valuable insight into events affecting the whole organism and their receptors; release and turnover of neurotransmitters and their modes of action.
Integration in the CNS - how neural networks process information.

Lectures 11-15
Functional Properties of Neuronal Networks
The final part of the module aims to provide an understanding of the functional properties of neuronal circuits and explore the role of neuronal networks in physiological processes including respiration, sleep and memory. The lectures will cover the following topics:
Central Pattern Generators;
Neural Circuits;
Respiration;
Sleep;
Plasticity/modulation.

Part B

1-2. The Plant Cell I and II (LF)

1. `Establishment of the embryonic body plan (IC)`
2. Meristems and their maintenance (IC)

5-6. Plant hormones. Auxin and its role in shaping plant growth (IC)

1. Light responses and photomorphogenesis (IC)
2. Photoreceptors and downstream signalling pathways (IC)
3. The life cycle of higher plants. Plant gametes and fertilization (JFG-M)
4. Seed development. Role of maternal tissue (JFG-M)
5. Control of germination and seedling establishment (JFG-M)
6. Sensing and responding to the environment in roots (MLG)
7. Symbiotic nitrogen fixation (MLG)
8. How plants cope with a stressful and changing environment (MLG)
9. Plants under attack: defense against pathogens (MLG)

Learning outcomes

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

- Understand the structure and functioning of the Central Nervous system. Understand how neural networks process information and the techniques used to study such processes. Understand the development and formation of the CNS at a molecular level. Understand the role of the nervous system in other physiological functions in the organism. Understand the mechanisms of plant development from embryo formation to fertilisation and seed development. Understand how plant development is controlled in response to environmental signals. Understand the molecular mechanisms by which plants resist pathogen infection.

Indicative reading list

Plant Biology. Smith et al. (2009) Garland Science. ISBN 978-0-8153-4025-6
Plant Physiology. 4th edition. Taiz and Zeiger (2006) ISBN 0-87893-856-7
Day and Leyser, Mechanisms in Plant Development (Blackwell, 2002)
Salisbury and Ross, Plant Physiology, 4th edn. (Wadsworth, 1992)
Westhoff et al., Molecular Plant Development, from gene to plant
(Oxford University Press, 1998)
Agrios, G. Plant Pathology (Academic Press, 1997)
Purves, D. et al. (Eds.) Neuroscience, 4th edn. (Sinauer, 2008)
A Nicholls, J. G., Fuchs P.A., Martin, A. R. and Wallace, B. G., From Neuron to B
Bear M. F., Connors B.W. and Paradiso M. A. Neuroscience: Exploring the Brain, 3rd rev. ed.
(Williams and Wilkins, Baltimore, 2006)
Brain, 3rd edn. (Sinauer Associates, 2001) Alberts, B. et al., Molecular Biology of the Cell, 5th edn.
(Garland Press, 2008)

Subject specific skills

Understand the structure and functioning of the Central Nervous system.
Understand how neural networks process information and the techniques used to study such processes.

Understand the development and formation of the CNS at a molecular level.
Understand the role of the nervous system in other physiological functions in the organism.
Understand the mechanisms of plant development from embryo formation to fertilisation and seed development.
Understand how plant development is controlled in response to environmental signals.
Understand the molecular mechanisms by which plants resist pathogen infection.

Transferable skills

Self directed learning
Adult learning
Critical appraisal of source material

Study

Study time

Type	Required
Lectures	30 sessions of 1 hour (17%)
Practical classes	2 sessions of 1 hour (1%)
Private study	148 hours (82%)
Total	180 hours

Private study description

148 hrs of study (including lectures, SDL and revision) expected

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group B1

	Weighting	Study time
In-person Examination	100%	

The examination for LF217 will be a 1.5 hr 'short answers' paper in June.

	Weighting	Study time

- Answer book provided by department

Feedback on assessment

Pastoral meetings with personal tutors.

Past exam papers for LF217

Availability

There is currently no information about the courses for which this module is core or optional.