Module Definition Form (MDF)

Module code: MOD009627	**Version:** 1 **Date Amended:** 24/Jan/2024

1. Module Title
Current Topics in Evolution and Biodiversity

2a. Module Leader
Jason Hodgson

2b. School
School of Life Sciences

2c. Faculty
Faculty of Science and Engineering

3a. Level
6

3b. Module Type
Standard (fine graded)

4a. Credits
15

4b. Study Hours
150

5. Restrictions

Type	Module Code	Module Name	Condition
Pre-requisites:	None		
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:	None		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

The studies of biological evolution and biodiversity have been revolutionised by new advances in the methods for studying both the organisms themselves, as well the environments that they live in. On the biological side, the advent of population genomics, paleogenomics, phylogenomics, metagenomics, and environmental DNA, have allowed us to understand biological evolution both within, and between populations, with a scale and precision not before possible. Similarly, advances in satellite and drone imagery, and better modelling of past and present climates, have improved our understanding of the environments that drove evolutionary change. During this module you will 1) gain the theoretical background needed to understand these scientific advances, 2) survey the recent primary literature to provide an overview of the current state of evolutionary biological knowledge, and 3) receive hands on instruction and training in the bioinformatics and computational genomics software and techniques necessary for leading edge evolutionary research. We will consider evolution across the biological spectrum, but with a particular focus on human and primate evolution as highly studied exemplars.

During the first half of the module we will focus on evolutionary theory as it applies within species (population genetics, population biology), between species (phylogenetics), and among environments (biodiversity). This will provide the theoretical and practical grounding necessary to fully appreciate recent breakthroughs in the field. In the second half of the module, we will go on to survey the literature focusing on recent advances in appropriate and leading edge topics.

6b. Outline Content

Practical tools

Bioinformatics

- Building analytical pipelines using shell and R

Population genetics and genomics

- Population structure, Fst, PCA, ADMIXTURE, F statistics
- Detecting natural selection within populations

Phylogenetics and Phylogenomics

- Ape package in R
- Inferring divergence dates between species (Beast)
- Detecting natural selection between species dN/dS ratio in phylogenomics

Paleogenomics

Biodiversity

- Environmental DNA
- Metagenomics

Geospatial techniques

Topics to be covered, but subject to change as topics advance

Primate diversity and evolution

The human fossil record

Modern human diversity

6c. Key Texts/Literature
The reading list to support this module is available at: https://readinglists.aru.ac.uk/

6d. Specialist Learning Resources
Access to relevant computer software resources and datasets

7. Learning Outcomes (threshold standards)

No.	Type	On successful completion of this module the student will be expected to be able to:
1	Knowledge and Understanding	Identify, describe, and discuss the principles of evolutionary biology, evolutionary genetics, and biodiversity theory
2	Knowledge and Understanding	Critically review key recent advances in evolutionary biology and biodiversity
3	Intellectual, practical, affective and transferrable skills	Develop and apply key bioinformatics skills necessary to prepare and process large genomics datasets
4	Intellectual, practical, affective and transferrable skills	Apply key genomics software to perform evolutionary genomics analyses

8a. Module Occurrence to which this MDF Refers

Year	Occurrence	Period	Location	Mode of Delivery
2025/6	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence

Learning Activities	Hours	Learning Outcomes	Details of Duration, frequency and other comments
Lectures	11	1-2	11 x 1 hour lectures/active learning sessions
Other teacher managed learning	25	3-4	11 x 2 hours workshops + 3 hours revision
Student managed learning	114	1-4	Reading, preparation for assignments, independent study
TOTAL:	150		

9. Assessment for the above Module Occurrence					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
010	Practical	3-4	50 (%)	Fine Grade	30 (%)
Pracitcal Computational Assessment (1500 words equivalent)					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
011	Coursework	1-2	50 (%)	Fine Grade	30 (%)
Journal Article Review (1500 words)					

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:
(a) achieve the qualifying mark for each element of fine graded assessment as specified above
(b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]