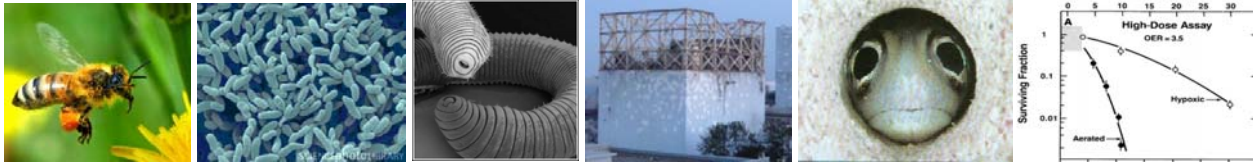




# MINA410: Environmental Radiobiology

22-26<sup>th</sup> June 2015, CERAD/NMBU, Norway

5 ECTS MSc/PhD Course organised by the Centre of Environmental Radiation, Norwegian University of Life Sciences and Stockholm University, supported by DoReMi and COMET



## Course Aims and Overview

The aim of the course is to give students an overview of the fundamental principles of radiobiology, but within the context of effects on wildlife. As such, the course will cover both the history and the state-of-the-art of our knowledge on the biological effects of radiation on humans, including how recent studies are challenging established paradigms, but will concentrate specifically on those issues and applications of most relevance for other organisms. This includes effects and endpoints of relevance for non-human organisms, ways in which radiobiology methods and biomarkers are being applied in ecological research, factors influencing radiosensitivity in different organisms, and ecological risk assessment. Case studies will include ecological research in Chernobyl and Fukushima, and laboratory work on biomarker analysis in model organisms.

For students of radioecology the course provides the opportunity to get a better understanding of the fundamentals of radiobiology; for radiation biology students it offers the chance to see how radiobiology concepts and tools are applied in other areas of radiation research, thus gaining a more in depth understanding of their subject.

## Teachers

Prof Carmel Mothersill and Prof Colin Seymour (McMaster University), Prof Andrzej Wojcik (Stockholm University), and Prof Deborah Oughton (Norwegian University of Life Sciences)

## ECTS accreditation

Environmental Radiobiology (MINA410) is a 5 ECTS Bologna Accredited course. Student fees in Norway are low (ca. 40 euro for the course) and organisers can help with MSc and PhD student registration.

## Accommodation

Accommodation is available on a first-come-first-served basis, and ranges from rooms in student residence halls to shared apartments and hotels. A limited number of accommodation support grants are available.

## Extracurricular activities

The 22-26th June coincides with Midsummer in Norway, and various cultural activities, including a Midsummer Festival celebration will be organized for students.

**Application Deadline 15<sup>th</sup> May 2015**

Further information and application for the course: [deborah.oughton@nmbu.no](mailto:deborah.oughton@nmbu.no)  
[www.doremi-noe.net](http://www.doremi-noe.net)

## Overview of course contents and laboratory activities:

The course is mainly lecture based, with one afternoon of laboratory practicals and demonstrations linked to the preparation and analysis of samples for biomarker assessment following in vitro irradiation of whole organisms (fish and earthworms). In general, the days are split into lectures on radiobiology (Seymour and Wojcik) and ecotoxicology (Mothersill, and Oughton). Coffee/tea and a simple lunch will be provided by NMBU.

### Day 1

*Morning:* Radiobiology refresher: DNA damage and repair, cell survival curves, etc. (Colin Seymour)

*Afternoon:* Effects of Ionising Radiation on Non-human biota – history, concepts and endpoints, differences in concepts of radiation protection of non-human species and humans (Deborah Oughton and Carmel Mothersill)

### Day 2

*Morning:* RBE and weighting factors: comparison of human and non-human approaches; Non-targeted effects and new paradigms in radiation biology (Carmel Mothersill and Colin Seymour)

*Afternoon:* Field studies of radiation ecological effects: Chernobyl, Komi, Fukushima (Deborah Oughton)

### Day 3

*Morning:* Ecosystem Approach and Radiation Ecology (Deborah Oughton)

Introduction to radiation biomarkers and applications in non-human biota (Carmel Mothersill)

*Afternoon:* *Afternoon:* Visit to the NMBU low dose irradiation facility, FIGARO. Laboratory work: organism dissection, cell cultures, harvesting for bystander analysis, comet assay, micronuclei assay. Demonstrations and hands on exercises

### Day 4

*Morning:* Radiosensitivity and radioresistance in non-human species, intra and interspecies differences, life history stages. (Carmel Mothersill)

*Afternoon:* Factors influencing cell radiosensitivity; Oxygen status, cell cycle, etc. (Colin Seymour and Andrzej Wojcik)

### Day 5

*Morning:* Environmental Risk Assessment and Regulation of Effects on Non-human Species (Deborah Oughton)

Biomarker tools and endpoint assessments, applications in non-human biota; chromosome aberration, micronuclei, microarray, immunohistochemical (Andrzej Wojcik)

Follow up on laboratory sample preparation: cell cultures, media harvesting (Carmel Mothersill)

The exam is a course assignment to produce a detailed experimental description and plan to test a specific hypothesis. In addition to the one week intensive teaching, students are expected to spend one week on research and assignment, and will be given tutoring (distance) by the course teachers during this time.

Teachers: Prof Carmel Mothersill and Prof Colin Seymour (McMaster University, Canada, visiting lecturers at NMBU) Prof Deborah Oughton (NMBU), Prof Andrzej Wojcik (SU).