

Title and scientific content of the training course

## **EXPERIMENTAL BIOLOGY COURSE ON MARINE INVERTEBRATES**

Time and location of the training course

**30 April – 12 May 2007**

**STATION BIOLOGIQUE DE ROSCOFF (F)**

**[www.sb-roscoff.fr](http://www.sb-roscoff.fr)**

### **Organizers and main lecturers of the training course:**

**Prof. Stefano Piraino** – University of Lecce, (MarBEF member), Italy

**Dr Patrick Cormier** – CNRS/UPMC Paris VI - Station Biologique de Roscoff, France

**Dr. Bertrand Cosson** - CNRS/UPMC Paris VI - Station Biologique de Roscoff, France

**Prof. Daniela Candia Carnevali** – Università di Milano, Italy

**Prof. Volker Schmid** – University of Basel, CH

Invited Lecturers:

Prof. Ferdinando Boero – University of Lecce

Prof. Heinrich Reichert – University of Basel

Prof. Thierry Lapage - CNRS/UPMC Paris VI - Observatoire Océanologique de Villefranche-sur-Mer, France

Dr Xavier Bailly - Station Biologique de Roscoff, France

### **Description and program of the training course**

This international course, which associate 4 universities from 3 different european countries (Basel, Switzerland ; Lecce and Milano, Italy ; Paris VI, France), is open to 18-20 graduate students having successfully achieved their first three years in Biology. The course is also accessible for doctoral students. It will be given in English. The scientific themes will cover comparative analysis of basic developmental processes in a variety of invertebrate taxa (sponges, cnidarians, ctenophores, annelids, echinoderms, tunicates). The organizers expect that the course will raise interest in developmental biology, life cycles, and evolution. During the course, students will make observations on invertebrate anatomy and reproductive patterns, larval ecology and life cycles, do experimental bench work on topics ranging from cell cycle analysis, fertilisation, embryogenesis and larval development, tissue differentiation and morphogenesis, regeneration, reverse development. Active participation in the course will be requested. A Journal Club session will be devoted to discussion of relevant breakthrough articles in the field to promote critical reading of the scientific literature and to open discussion for broader interpretation. The participant students will lead the journal club. Communication skills will be developed, including informal interactions with instructors, collaborative work with other participants, oral presentation of their current interests, written report describing the performed experiments and analysing their results, debriefing of the course. Finally, this international inter-university course will provide the framework for exchanges between students of different european universities. Upon agreement between the 4 partner Universities, this course will be credited as a « Master Course Program » and provide 6 ECTS credits.

**EXPERIMENTAL BENCH WORK** is organized as follows :

- *Common experiments* will be performed by each student individually or in small groups. Those are described in the handout and concern developmental processes of species from selected phyla (sponges, cnidarians, ctenophores, echinoderms, tunicates, annelids). New experiments will be started almost every day.
- In parallel more specific *team projects* will be performed by groups of 2 students. The projects will cover descriptive and experimental work, often with research character and undetermined result. Own initiative is required/encouraged. Organizers will advise where necessary. These groups will be formed on the 1st day and the selected projects proposed by the organizers will be carried out over the course. All participants will be informed by email not later than end of March about the envisaged projects. Participants are asked to read carefully the projects and name their 1st, 2<sup>nd</sup> and 3rd priorities to the organizers. They will form the groups of two and beforehand prepare the equipment for the projects. At the end of the course each team will prepare a poster about their work and give a short oral presentation.

**PROPOSED EXPERIMENTS** (tentative list):

- Observations of feeding, gametogenesis, fertilisation, embryogenesis, larval development and metamorphosis in a large variety of species
- Cnidarian dissociation, regeneration experiments, cellular determination (DAPI + phalloidin-FITC staining)
- Chemical induction/inhibition of metamorphosis of larvae
- Grafting experiments on medusae, depending on available material
- Body axis and tissue differentiation: peroxidase, phosphatase, acetylcholinesterase stainings
- Cell cycle analysis: BrdU staining, anti-phosphoHistone H3, inhibition of DNA synthesis (aphidicolin)
- Nerve cell analysis: Immunohistochemistry with neuronal-specific antibodies
- Sea urchins: polyspermy experiments, induction of animalised and vegetalised eggs, protein

# Experimental Biology Course on Marine Invertebrates

Université PMC Paris VI  
Station Biologique de Roscoff  
[www.sb-roscoff.fr](http://www.sb-roscoff.fr)

30 April - 12 May 2007



Practical course co-organized by:  
Prof. Patrick Cormier, Université P & M Curie, Paris VI - [cormier@sb-roscoff.fr](mailto:cormier@sb-roscoff.fr)  
Prof. Bertrand Cosson, Université P & M Curie, Paris VI - [cosson@sb-roscoff.fr](mailto:cosson@sb-roscoff.fr)  
Prof. Daniela Candia Carnevali, Università di Milano - [daniela.candia@unimi.it](mailto:daniela.candia@unimi.it)  
Prof. Stefano Piraino, Università di Lecce - [stefano.piraino@unile.it](mailto:stefano.piraino@unile.it)  
Prof. Volker Schmid, Universität Basel - [v.schmid@unibas.ch](mailto:v.schmid@unibas.ch)



## **Provisional Work Program**

**P: Practical Work, T: Theory, S: Seminar, D: Discussion**

### **Monday, 30.4.07**

#### **Plankton**

- 09.00 **T:** Introduction to the course  
**T:** Presentation of the Marine Station of Roscoff  
**T:** Introduction to the plankton
- 10.30 **P:** Analysis of the plankton
- 13.30 **P:** Plankton, discussion of group work (group work will be done besides the general work program)
- 14.00 **T:** Introduction to Roscoff littoral ecology: biological zonation, tides and currents
- 15.00 **Excursion/collection** at low tide into the littoral (exact time to be defined according to tide tables)
- 16.30 **P:** Discussion and start of the group work
- 20.15 **T:** Metazoan evolution

### **Tuesday, 01.5.07**

#### **Phylum: Porifera**

- 09.00 **T:** Introduction to Porifera, basic anatomy and functional biology  
**P:** Identification of the sponge material
- 10.30 **P:** Screening of plankton for medusae and ctenophores
- 11.00 **S:** Development and evolution of sponge (2 students)
- 14.00 **T:** Introduction to the cell adhesion experiments  
**P:** Starting experiments in groups of 2
- 17.00 **S:** Participants (presentation of own work)
- 20.00 **T:** Evolution of the brain – I

### **Wednesday, 02.5.07**

#### **Phylum: Cnidaria**

- 09.00 **P:** Handling of sponge experiments  
**S:** Sorting out in sponge and vertebrates (2 students)
- 10.00 **T:** Introduction to Cnidaria: basic anatomy, functional biology and life cycles
- 11.00 **P:** Identification of cnidarian material/anatomy
- 14.00 **T:** Introduction to embryonic development and metamorphoses of cnidarian larvae
- 15.00 **P:** Starting metamorphoses experiments
- 16.00 **S:** Participants (life cycle reversal, control of metamorphoses)
- 17.00 **S:** Evolution of the brain II
- 18.00 **P:** Changing medium, again after dinner  
**P:** Starting fertilization experiments
- 20.30 **S:** Seminar invited lecturer

### **Thursday, 03.5.07**

Low tide: 18.56, 3.96m

- 09.00 **P:** Protocol of metamorphoses and sponge experiments, follow-up  
10.00 **T:** Introduction to antibody experiments  
**P:** Start with Immunohistology and BrdU experiments  
13.00 **P:** Continuation of staining and group work  
**S:** Regeneration in Cnidaria  
16.00 **P:** Protocol of immunohistology in groups of two  
20.00 **P:** Protocol of immunohistology in groups of two

### **Friday, 04.5.07**

#### **Phylum: Annelida/Ctenophora**

- 09.00 **T:** Ctenophora embryology  
Introduction to the Annelida and Sabellaria embryology/experiments  
09.45 **P:** Fertilization experiment, protocol of early development, group work  
11.00 **S:** Contribution of participants  
14.00 **P:** Sabellaria development, group work  
16.00 **P:** Plankton (isolation of Ctenophores), Sabellaria and group work  
17.00 **T:** Functional biology of Echinoderms  
20.00 **S:** The evolution of muscle

### **Saturday, 05.5.07**

Ending the week's work

- 9.00 Breakfast with all participants  
9.45 **P + D:** Analysis of experiments, immunohistology  
Group works

### **Sunday, 6.5.07**

Free / Excursion to Ile de Batz?

### **Monday, 7.5.07**

#### **Phylum Echinodermata**

- 09.00 **T:** Introduction to echinoderm embryology  
09.30 **P:** Handling animals, gametes and embryos of sea urchins  
protocol of fertilisation, fertilization membrane and division cycles  
11.00 **T:** Post transcriptional regulation analysis during first mitotic divisions in sea  
urchins, description of the experiment  
14.00 **P:** Start of the experiment  
15.00 **S:** Lecture: "Regulation of gene expression at the translational level. A lesson  
from the sea urchin early embryo  
18.00 End of experiments  
20.00 **S:** Seminar Invited lecturers (Lepage)

## **Tuesday, 8.5. 07**

### **Phylum: Echinodermata - Mutability of connective tissues (MCT) and Regeneration**

- 9.00 **T:** MCT: Short introduction to the practical work  
9.15 **P:** Handling animals and incubation with anaesthetics  
9.25 **T:** Exploring the biomechanical potential of MCT  
9.55 **P:** Practical work : Response/ recovery after different treatments (anaesthetics, etc.)  
Afternoon session: (14.00-20.00)  
14.00 **T:** MCT: discussion of experiments .  
REGENERATION: BrdU Practical work

## **Wednesday, 09.5. 07**

- 9.00 **T:** Introduction to the practical work  
10.00 **P:** Arm and test regeneration (whole animal vs. explants) evaluated with microscopic and statistical analysis.  
11.30 **P:** BrdU Practical work  
14.30 **T:** REGENERATION: Discussion of the experiments  
16.00 **T:** Introduction to tunicate anatomy and embryology  
**P:** Tunicate fertilization  
20.00 **S:** Regeneration in Echinoderms

## **Thursday, 10.5. 07**

### **Phylum: Tunicata**

- 09.00 **S:** Contributions of participants  
10.00 **P:** Tunicate embryology – larval development/ muscle cell differentiation experiments  
16.00 **S:** Contribution of students  
Preparations of posters (group work)

## **Friday, 11.5.07**

- 9.00 **T and P:** Metamorphoses of tunicate larvae  
10.30 **S:** Annelid evolution at the black smokers  
11.30 **S:** Why Acoelomorpha are useful model system in evo-devo investigations?  
11.00 **P:** Finishing up experiments  
14.00 **D:** Presentation of posters  
Clean up

## **Saturday, 13.5.04**

- Conclusive discussion of the course  
Good-bye and travel well

**Contact address with e-mail**

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**Tentative audience of the training course:**

16-20 diploma/doctoral students in Biology.