

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

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, 2nd 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

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Station Biologique de Roscoff
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Practical course co-organized by:

Prof. Patrick Cormier, Université P & M Curie, Paris VI - cormier@sb-roscoff.fr
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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.