The correction of chromosome mis-attachments in the nematode *Caenorhabditis elegans.*

The proposed project aims to understand better how the errors of chromosomes segregation during the metaphase-anaphase transition are corrected during C. elegans mitosis. This internship will take place at the Institute of Genetics and Development in Rennes (IGDR, CNRS UMR 6290/Univ. Rennes 1, Brittany, France), and more precisely in the team CeDRE « Reverse engineering cell division ». The team CeDRE is composed of scientists with complementary expertise in biology, physics, images analysis, mathematics and statistics.

Interests and research approaches of the team:
Our team studies the cell division through a cell biophysics approach; we aim to understand the fidelity of the cell division by studying and modelling the biophysical and mechanical interactions between the molecular actors of mitosis. For that, we will use the embryo of C. elegans nematode as model organism for cell division. The first division of the development of this organism is a conserved and well-controlled process. This is an asymmetric division that enables from a mother cell to get two distinct daughter cells. Thus, several mechanisms of regulation are implemented and play crucial role to ensure a smooth running of mitosis. Indeed, the accumulation of non-corrected errors can have deleterious consequences for the cell and, in case of human cells, contribute to the apparition of cancers.

Motivation of the research project:
The main actor of mitosis well-defined choreography is the spindle, composed mainly by microtubules, their regulators, and molecular motors. These microtubules are highly dynamic filaments, constantly growing or shrinking by polymerization/depolymerisation, which generates and transmits mechanical forces. These forces enable specially the mitotic spindle positioning, the regulation of its length, and the separation and segregation of the daughter chromatids via the microtubules attachment to the kinetochores. Recently, some studies have suggested that these forces could have a role in the correction of a particular chromosome mis-attachment, called merotely (the same kinetochore being attached to the two opposed poles of the spindle). We propose to better understand this mechanism in our model by inducing merotelic attachments and by characterizing the mechanical behaviour of the spindle during the correction process.

Goal of the internship:
The trainee will contribute to the identification of the proteins enabling the generation of forces implicated in the mechanism of mis-attachment correction, using a gene candidate approach. This includes three steps: (i) In a context of induction and then correction of merotely, to reduce or suppress the candidate proteins by RNA inference or genetics, (ii) To acquire movies by fluorescence microscopy with a high temporal resolution, (iii) To analyse the images and the data with protocols and software developped in the team.

Expected skills:
The candidate, in M2 or equivalent, will have an education in molecular cell biology. Some knowledge/experience in optical microscopy will be an advantage. A high interest for methods of quantification and physics will enable him/her to acquire experience in biophysics, images analysis or statistics during his/her internship. According to the skills and the motivation of the student, a PhD thesis is possible at the end of the internship and the candidate will receive support to apply for scholarships. The candidate must be regularly registered at a university or education institution and will receive a stipend of ca 529 €. Application should include a curriculum vitae, if possible marks and rankings of current and two previous semesters and a cover letter detailing the motivation of the candidate. Application, as a single pdf, or informal enquiries should be sent to:

Contact : Xavier Pinson – xavier.pinson@univ-rennes1.fr
Team CeDRE (Jacques Pécréaux : jacques.pecreaux@univ-rennes1.fr)
Team website : http://pecreaux.openwetware.org/
IGDR, CNRS-UMR 6290 – Faculté de Médecine (Université de Rennes 1)
2 Avenue du Pr. Léon Bernard, 35000 Rennes Cedex, France