

## Master 2 and/or PhD project

**Advisor: Karine Guevorkian**

Group: "Biomimetism of Cellular Movement"

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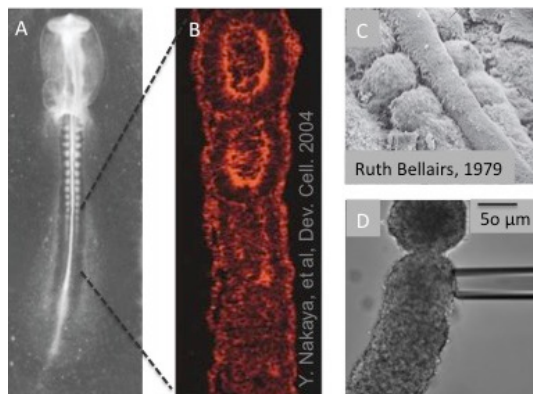
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**Title:** Cell and tissue mechanics during somite formation in the chicken embryo

One of the challenges in modern developmental biology is to understand how mechanical cues shape tissue patterns from which organs emerge. A good example of pattern formation is the generation of somites in vertebrate embryos. Somites are compact segments of thousands of cells that pinch-off periodically from the tail tissue of vertebrates, reminiscent of droplets formed from a water jet. Our skeleton, muscles and the skin emerge from these somites. We are interested in understanding the origin of the mechanical instabilities that lead to the separation of somites in the chicken embryo. These instabilities arise from the internal stresses produced by cells inside the tissue, as well as the rheology of the tissue. Therefore, we aim to assess the role of cell and tissue mechanics in the process of somite formation, by borrowing concepts used in soft-matter physics.



(A) Formation of somites in 2-day chicken embryo. (B) Actin reorganization. (C) Electron micrograph showing the detachment of the somites, appearing as cellular balls. (D) Micropipette aspiration to assess the rheology of the somites.

In this master's project, we will develop new ex-vivo approaches to explore the role of actin polymerization, and myosin activity during somite formation and characterize the rheological properties of the tissue, using micromanipulation techniques. The continuation of this project, as a PhD thesis, involves studying the role of cell-cell and cell-matrix interactions, and force generation during somitogenesis by combining in-vivo and ex-vivo approaches.

Our team benefits from the highly interdisciplinary environment at PCC, hosting experimental and theoretical physicist, biologists and biochemists, as well as the vicinity of Cell Biology and Developmental Biology departments of Curie Institute.