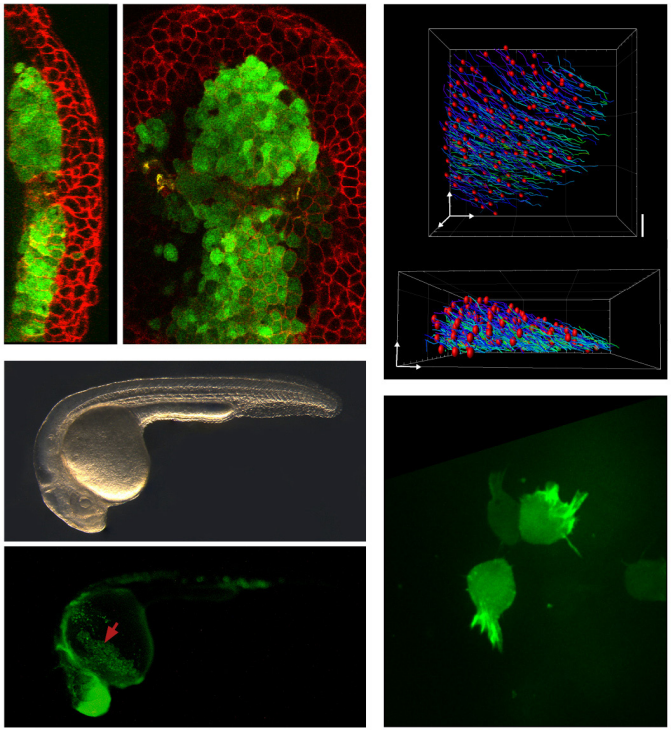
Molecular and cellular bases of collective migration in the zebrafish embryo.

The role

We are seeking a highly motivated candidate strongly interested in cell and developmental biology, to join our team and help us elucidate the mechanisms driving the collective cell migrations taking place in the early embryo.



Collective cell migrations are migrations in which the movement of a cell is influenced by its neighbours. Collective migrations are frequent and key to many physiological and pathological situations, yet, their cellular and molecular basis is just starting to be unraveled. A few years ago, we established that cells leading the embryonic axis extension undergo a collective migration. Our latest results demonstrate that cells perceive the mechanical forces exerted by their neighbours, and use it a directional information. Propagation of this information through the tissue allows large scale coordination of cell movements.

The project involves classical embryological approaches (embryo injections, cell transplants), live-imaging (regular confocal, two-photon, laser ablations, potentially light-sheet), image and data analysis, basic molecular biology. All techniques are in use in the lab, and all the required equipment is available.

The project is funded through an ANR grant aimed at identifying the mechanisms linking mechano-perception at adherens junctions to actin dynamics and collective behaviours. Details of the project are open to discussion with the candidate.

Initial funding is for 1 year, and the candidate is expected to apply to fellowships to which he/she is eligible.

Keywords: cell migration, zebrafish, live imaging, development, morphogenesis.

Whom we would like to hire:

The candidate should be enthusiastic and creative, have good communication skills and be eager to learn and work in a highly interdisciplinary lab. A background in developmental or cell biology is required. Skills in microscopy and/or basic coding are preferred but not required.

The offer:

- 1 year postdoc position, funded by ANR.
- Target start date : no later than 1 February 2023

Applications and inquiries:

Inquiries or questions should be addressed to Nicolas David: nicolas.david@polytechnique.edu
Applications should be made online through the CNRS portal:
https://emploi.cnrs.fr/Offres/CDD/UMR7645-NICDAV-002/Default.aspx?lang=EN

The team and lab:

This project will be carried out in the Laboratoire d'Optique et Biosciences at Ecole Polytechnique (Palaiseau, France), in the team of Nicolas David, who demonstrated the collective nature of the prechordal plate migration, and has a long standing experience in analysing in vivo cell migration. The laboratory is equipped with a fish facility and has all the required material and expertise for working on Zebrafish embryos. In addition, the LOB comprises world leading experts of fast and non-linear in vivo imaging. The project will directly benefit from their expertise and unique microscopes.

Ecole Polytechnique is located on the 'Plateau de Saclay', in the rapidly developing Paris-Saclay area, 25km from the center of Paris. The campus can easily be reached by public transport. It offers a wide range of activities (sports, culture, associations). More info on https://www.ip-paris.fr/en

Relevant publications:

- Boutillon, A., Escot, S., Elouin, A., Jahn, D., González-Tirado, S., Starruß, J., Brusch, L., David, N.B. Guidance by followers ensures long-range coordination of cell migration through α-catenin mechanoperception. Dev. Cell 57, 1529-1544.e5. https://doi.org/10.1016/j.devcel.2022.05.001.
- Souchaud, A., Boutillon, A., Charron, G., Asnacios, A., Nous, C., David, N.B., Graner, F., and Gallet, F. (2022). Live 3D imaging and mapping of shear stresses within tissues using incompressible elastic beads. Development 149(4). https://doi.org/10.1242/dev.199765.
- Boutillon, A., Escot, S., and David, N.B. (2021). Deep and Spatially Controlled Volume Ablations using a Two-Photon Microscope in the Zebrafish Gastrula. J. Vis. Exp. https://doi.org/10.3791/62815.
- Polesskaya, A., Boutillon, A., Wang, Y., Lavielle, M., Vacher, S., Schnitzler, A., Molinie, N., Fokin, A., Bièche, I., David, N.B., et al. CYFIP2 containing WAVE complexes inhibit cell migration. BiorXiv (in revision at Curr. Biol.)
- Boutillon, A., Giger, F.A., and David, N.B. (2018). Analysis of In Vivo Cell Migration in Mosaic Zebrafish Embryos. Methods Mol. Biol. 1749, 213–226.
- Giger, F.A., and David, N.B. (2017). Endodermal germ-layer formation through active actin-driven migration triggered by N-cadherin. Proc. Natl. Acad. Sci. 114, 10143–10148.
- Dumortier, J.G., Martin, S., Meyer, D., Rosa, F.M., and David, N.B. (2012). Collective mesendoderm migration relies on an intrinsic directionality signal transmitted through cell contacts. Proc. Natl. Acad. Sci. U. S. A. 109, 16945–16950.