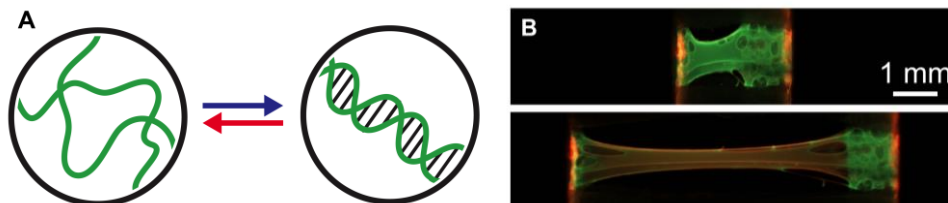


## Funded PhD position starting in September 2021 on “Mechanofluorescent DNA hydrogels”

Contact : [remi.merindol@umontpellier.fr](mailto:remi.merindol@umontpellier.fr)

**Project:** How to reproduce the mechanical behaviour of biological tissues? The extracellular matrix is a water swollen biopolymer network that interacts with cells, it can sense forces and reorganise without breaking. Synthetic hydrogels can serve as model extracellular matrix to study cells or build biomedical devices. However their mechanical properties remain far from that of their biological counterparts. Despite recent progress to produce biocompatible hydrogels we lack sufficient control over their supramolecular architecture to mimic natural ones. We aim to overcome this challenge in order to rationalize the mechanics of biological tissues and design better biomedical devices.

The proposed project rely on our expertise to create hydrogels using DNA. Complementary DNA strands self-assemble to form a double helix (Figure 1A), we can use this property to control the supramolecular architectures of DNA hydrogels. R. Merindol developed techniques to scale-up DNA self-assembly and produce macroscopic hydrogels that change fluorescence under stress (i.e. Mechanofluorescent, Figure 1B).<sup>1</sup> This PhD project will push this design to the next level by incorporating new supramolecular features in the hydrogel in order to control their reorganisation. We will further develop experimental set-up to quantitatively map stress distribution in 2D and 3D. Thereby we aim to rationalize the role of reorganisation on hydrogel mechanics and create a synthetic extracellular matrix that can report the forces exerted by cells.



**Figure 1 :** A) Self-assembly between complementary DNA strands. B) A mechanofluorescent DNA hydrogel that becomes red under stress.

**Profile:** Master in Material Science, Physical Chemistry, Physics or Chemistry. The candidate will be working on a challenging multidisciplinary project at the interface of physics, chemistry and biology. Interested candidates should send their CV to [remi.merindol@umontpellier.fr](mailto:remi.merindol@umontpellier.fr).

**Funding:** The position is funded by the ANR as part of a project coordinated by R. Merindol. Beyond the student salary the project provides a comfortable coverage of research and conference costs.

**Context:** The PhD thesis will be supervised by Dr. Rémi Merindol a physical-chemist specialised in DNA self-assembly,<sup>1,2</sup> and Prof. Luca Cipelletti a physicist specialised in rupture mechanics.<sup>3</sup>

The Laboratoire Charles Coulomb (<https://coulomb.umontpellier.fr/>) is a plurithematic physics laboratory based in the Montpellier Triolet Campus. In addition to a fully equipped laboratory for DNA synthesis a wide palette of techniques and setups are readily accessible to all team members: (fluorescence) microscopy, rheology, AFM, static and dynamic light scattering, small angle X-ray scattering... Several collaborative projects, regular group seminars and a lively and friendly atmosphere make the experience of master students, PhD and postdocs at L2C enjoyable and profitable.

### References:

- 1 R. Merindol, G. Delechiave, L. Heinen, L. H. Catalani, A. Walther, *Nat. Commun.* **2019**, *10*, 528.
- 2 R. Merindol, A. Walther, *Chem. Soc. Rev.* **2017**, *46*, 5588.
- 3 S. Aime, L. Ramos, L. Cipelletti, *P.N.A.S.* **2018**, *115*, 20171740