ENGINEERING LIFE

Grand programme de recherche de
l'Université Paris Sciences & Lettres

Institut Curie

Physics of cell and cancer (UMR168)

Membrane and Cell Functions (PCC: Physics of Cells and Cancer Lab)

institutCurie
Ensemble, prenons le cancer de vitesse.

Members involved in EnLife

Raju Regmi
(CR CNRS)

Feng-Ching Tsai
(CR CNRS)

Patricia Bassereau
(DR CNRS)

Relevant Axis

Axis 1: Controlling and programming biological living matter.

Axis 2: Emergence of spatial and temporal organization in living matter.

Axis 3: Information processing and dynamics of biological active matter.

Team expertise: **BioMEMBRANES**

- Membrane trafficking
- Mechanobiology (cells), Cellular protrusions
- Receptors, signaling
- Physics and mechanics of (active) membranes
- Biomimetic systems based on membranes + cytoskeleton + proteins (incl. trans-membrane)
- Single molecule dynamics and diffusion
- Optical tweezers, micropipette aspiration
  Optical microscopy (SPT, smFRET, STORM)

Question of Interest and/or Collaboration wanted:

- Chemical biology for protein labeling : quantum dots, unAA
- Protein production: cell-free systems, novel detergents, polymers for mammalian proteins extractions
- Microfluidics for encapsulation in droplets (proteins, cytoskeleton)
- Modeling dynamics & clustering of active proteins in membranes
- Simulations of membrane + proteins

Light-based Observation and Control of Cellular Organization (LOCCO)

PCC-UMR168 , Institut Curie

Mathieu COPPEY (DR CNRS)

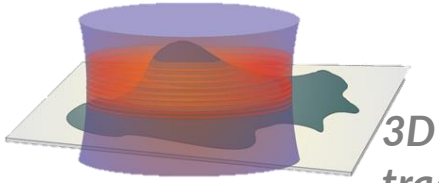
Bassam HAJJ (CRCN CNRS)

Enlife Axis:

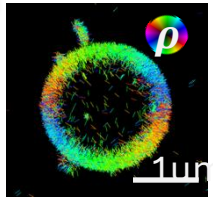
Axis 1: Controlling and programming biological living matter.
Axis 2: Emergence of spatial and temporal organization in living matter.
Axis 3: Information processing and dynamics of biological active matter.

Team expertise:

IMAGING



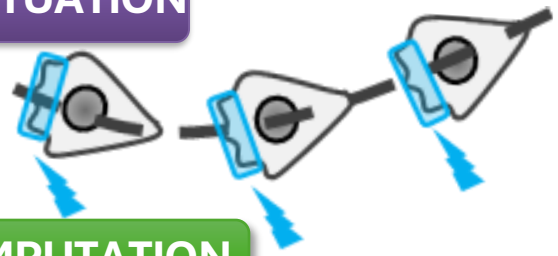
3D Imaging & tracking



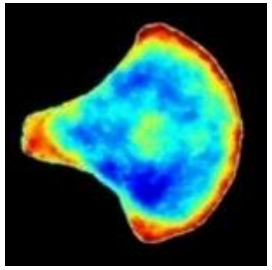
Single molecule localization and orientation microscopy

ACTUATION

Optogenetcis



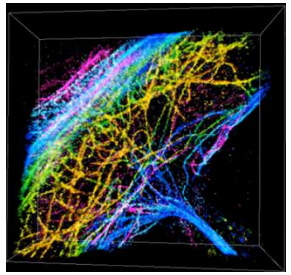
COMPUTATION



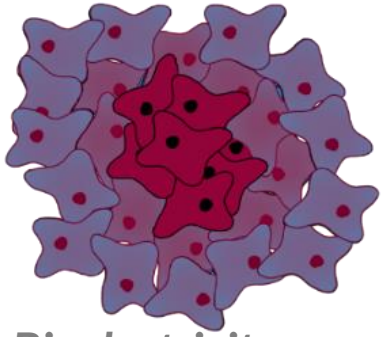
Physical properties

Physical models

Visualization

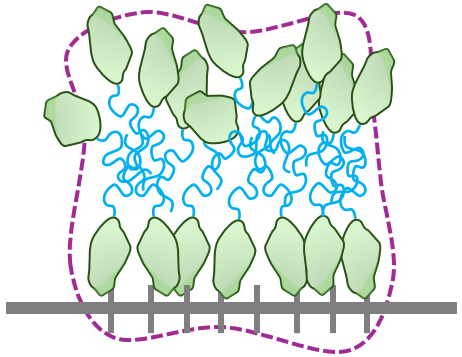


Research Interest:

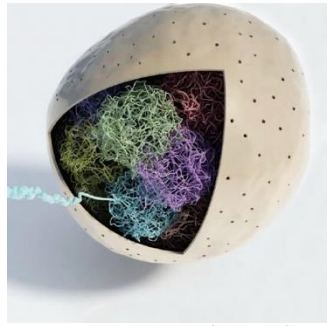


Bioelectricity

Advanced microscopy and data analysis



Nanocondensates



Nuclear Organization and dynamics

Genome functions in space and time

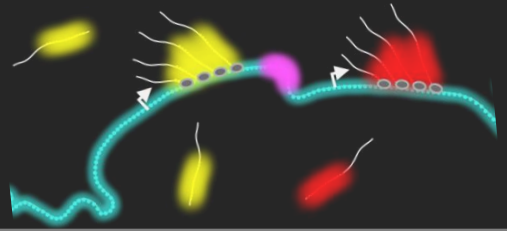


Antoine Coulon Vittore Scolari Kyra Borgman

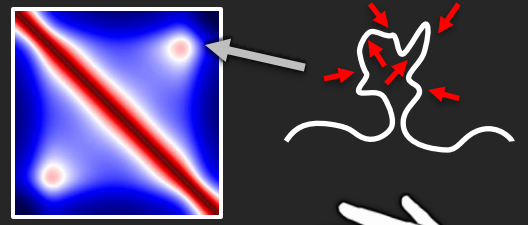
\+ Axis 1: Controlling and programming biological living matter.
\+++ Axis 2: Emergence of spatial and temporal organization in living matter.
\++ Axis 3: Information processing and dynamics of biological active matter.
Axis 4: Driving evolution within living systems.

Team expertise

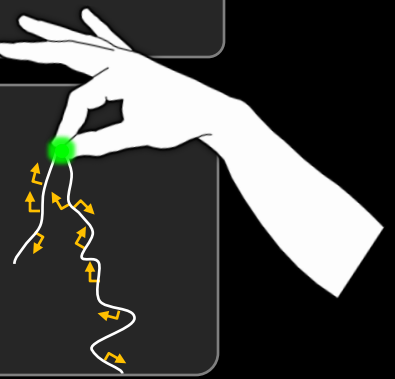
Genome & transcriptome imaging



Polymer modeling

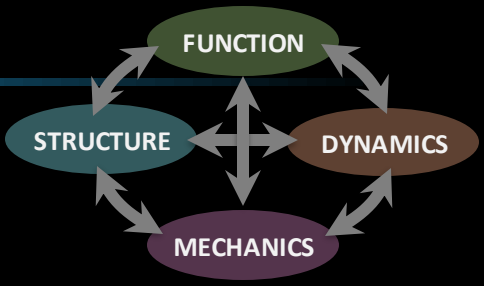


In cellulo mechanical manipulation of chromosomes

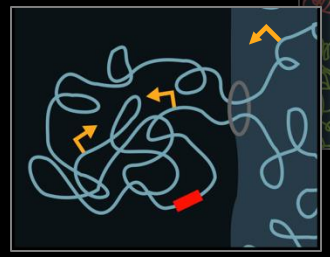


Magnetism
Microfabrication
Biochemistry
Molecular & cell biology
Microscopy
Image/data analysis
Polymer theory
Bioinformatics
Oligopaint FISH
Spatial transcriptomics

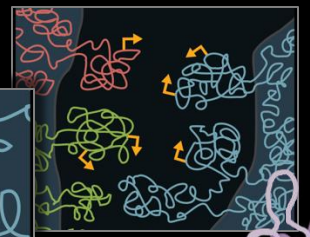
Studying the genome at the physics-biology interface



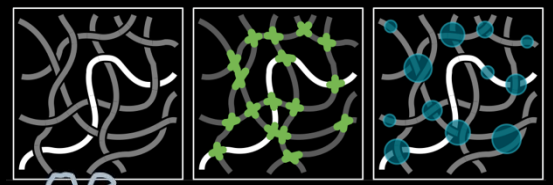
TADs and gene regulation

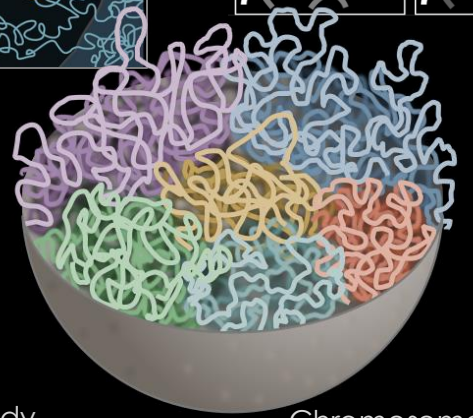


Compartmentalization of transcription

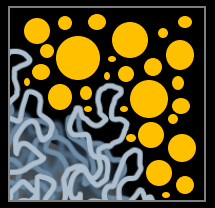


Material states of chromatin

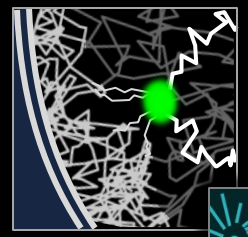




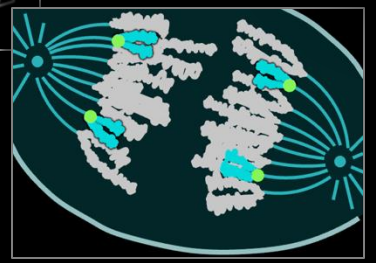
Molecular crowding



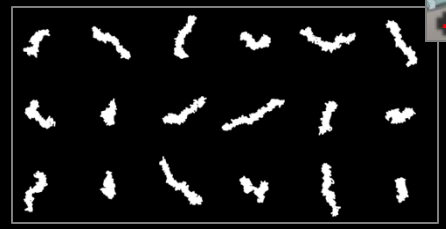
Coupling with nuclear envelope



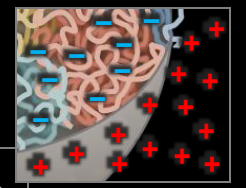
Mitosis & aneuploidy



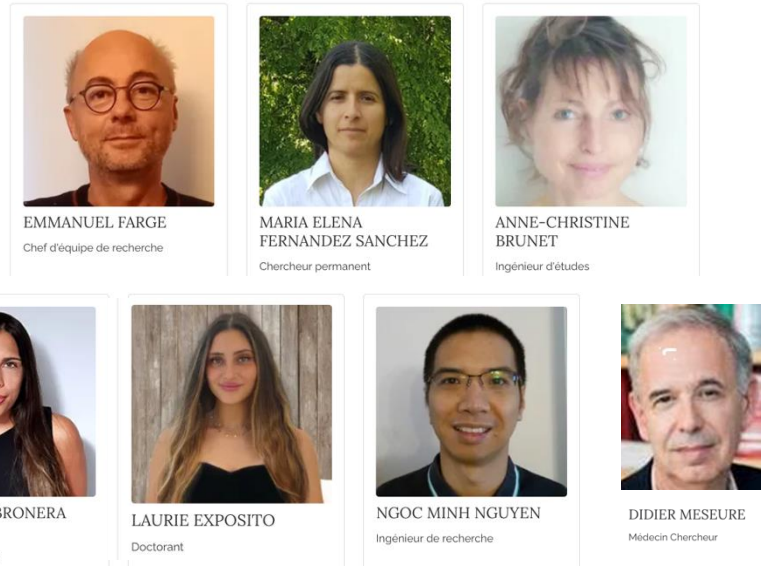
Chromosome mechanics & relaxation



Nuclear electrobiology



Mechanics and Genetics of Embryonic and Tumour Development



Indicate in which axis your team relates to:

Axis 1: Controlling and programming biological living matter.
Axis 2: Emergence of spatial and temporal organization in living matter.
Axis 4: Driving evolution within living systems.

Team expertise

Mechanotransduction *in vivo* in:

Developmental Biology
Cancer Progression
Colon Stem Cells Production
Evolutionary Emergence of First Metazoa

Question of Interest and/or Collaboration wanted

The Mechanics and Genetics of Embryonic and Tumour Development team studies the role of mechanical strain and deformation of macroscopic biological structures at the cell or multi-cellular scale, into the regulation and the generation of active biochemical processes at the microscopic molecular scale, including gene expression, *in vivo*. The group found the mechanical control of cell differentiation, and focuses on the coupling between mechanical strains and biochemical signalling in developmental, cancer and evolution biology.

Molecular Microscopy of Membrane

List of the member of the team involved in EnLife

Manuela Dezi, MDC Sorbonne University
Koyomi Nakazawa, CRCN CNRS
Julien Maufront IR, Curie
Aurelie Di Cicco IE, Curie
Daniel Lévy, DR CNRS

If possible, add pictures of the members

Indicate in which axis your team relates to:

Axis 1: Controlling and programming biological living matter.

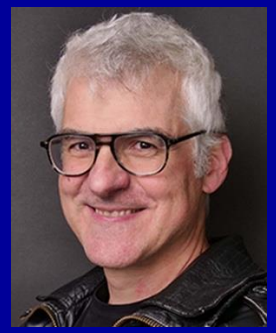
Team expertise:

In vitro reconstituted systems
Membrane protein
Nano-condensates
Cryo-electron tomography
Structure of protein
Image analysis

Question of Interest and/or Collaboration wanted:

Supramolecular organisation of membrane proteins
Communication between organelles
Membrane driven protein condensates

Hair cells and Biomimetic molecular systems @ PCC



Pascal MARTIN
(DR CNRS)

Antony LEE
(CR CNRS)

EnLife research axes:

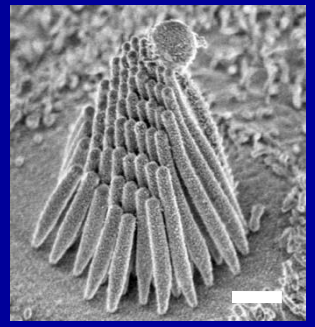
Axis 1: Controlling and programming biological living matter.
Axis 2: Emergence of spatial and temporal organization in living matter.
Axis 3: Information processing and dynamics of biological active matter.

Team expertise:

- Micromanipulation (pN forces, nm movements)
- Cell mechanics
- Protein micropatterning
- Actin-filament polymerization / motor proteins
- Image analysis
- Theoretical modeling (collaborations)

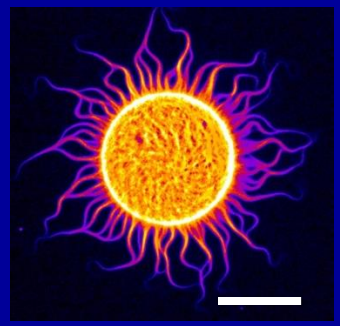
Topics of interest:

HAIR CELLS



- Mechanosensitivity, bioelectricity
- Frequency selectivity
- Mechanical amplification
- Entropy production

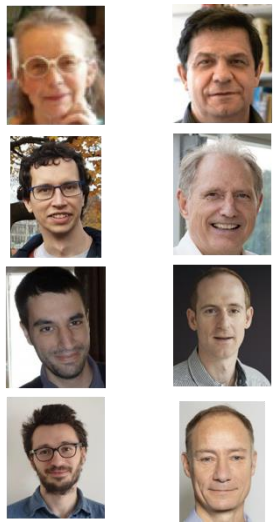
SELF-ORGANIZATION



- Motility and chirality at mesoscales
- Motor coordination ↔ bending waves
- External vs. internal friction
- Synchronization phenomena

Physical approaches to biological problems

Françoise Brochard-Wyart
- Carles Blanch Mercader
- Michele Castellana
- Charlie Duclut
- Jean-François Joanny
- Jacques Prost
- Thomas Risler
- Pierre Sens

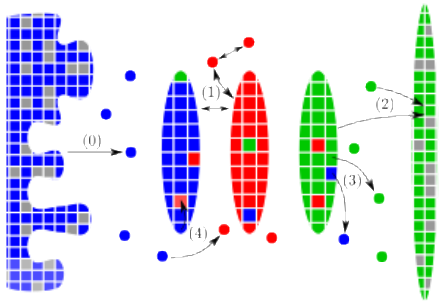


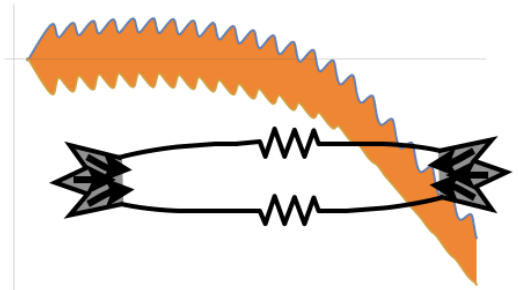
Indicate in which axis your team relates to:

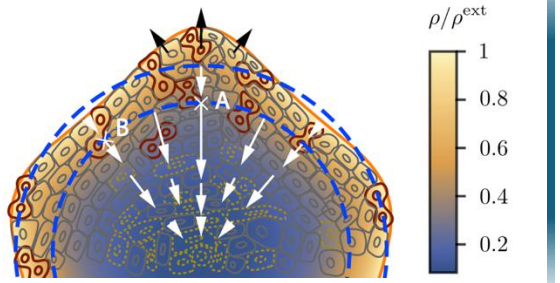
Axis 1: Controlling and programming biological living matter. ✅
Axis 2: Emergence of spatial and temporal organization in living matter. ✅
Axis 3: Information processing and dynamics of biological active matter. ✅
~~Axis 4: Driving evolution within living systems.~~

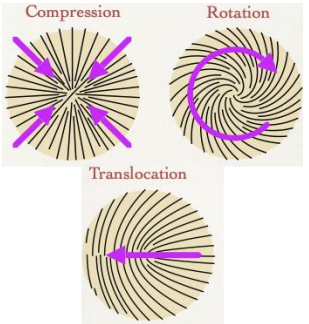
Team expertise:
- Soft active matter / Active mechanics
- Active liquid crystals, active gels
- Active electrohydraulics
- Spatio-temporal organization within living cells

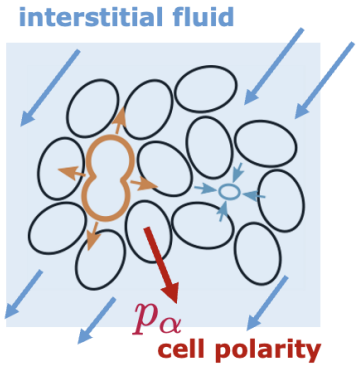
Question of Interest and/or Collaboration wanted:
- Strong interactions with experimentalists
- Systems of interests range from in-vitro reconstituted systems to living systems
- Across scales: from intracellular to cellular and tissue scale











Biology-inspired Physics at MesoScales (P. Silberzan)

+ Axis 1: Controlling and programming biological living matter.

++ Axis 2: Emergence of spatial and temporal organization in living matter.

+ Axis 3: Information processing and dynamics of biological active matter.

Axis 4: Driving evolution within living systems.

Team expertise:

- Experimental biological physics
- Collective cell behaviors
- Microfabrication
- Multiscale micro-environment
- Active Matter

Question of Interest and/or Collaboration wanted:

- Impact of the microenvironment on cell populations: micro-scale vs. meso-scales
- 2D-to-3D transition
- topological defects and conflicts of orientation

ENGINEERING LIFE

Grand programme de recherche de
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Institut Curie

Cell biology and cancer (UMR144)

Molecular Mechanisms of Chromosome Dynamics

Team leader: Daniele Fachinetti

Daniele Fachinetti

Josée Guirouilh-Barbat

The axis our team relates to:

Axis 1: Controlling and programming biological living matter.
Axis 2: Emergence of spatial and temporal organization in living matter.
Axis 3: Information processing and dynamics of biological active matter.

Team expertise:

- Centromere formation and functions
- Centromere aberration and genome instability
- Centromere crisis, aneuploidy and ageing

Question of Interest and/or Collaboration wanted:

- What defines the accurate separation of genetic material?
- spatial organization of centromeres in the nucleus? Impact on the occurrence of Whole Arm Chromosomal translocations (WACT)? Does that depend on the cell cycle phase
- What regulates the dynamics of centromere this very specific structure? ?

Asymmetric cell division & cell fate - Lara Kruger

List of the member of the team involved in EnLife

Matthieu Gélin (Lab manager)

Juliane Selot (Postdoc)

Indicate in which axis your team relates to:

Axis 1: Controlling and programming biological living matter.
Axis 3: Information processing and dynamics of biological active matter.

Team expertise:

- Asymmetric cell division
- Cell polarity
- Cytoskeleton
- Lysosome transport & fate control

- Reconstitution assays
- Synthetic biology

Question of Interest and/or Collaboration wanted:

- How does cell polarity control cell identity?
- How do cell organelles become unequally segregated during stem cell division?
- How do cell organelles tune cell identity in mammals?

TEAM : Intracellular Transport : Engineering and Mechanisms

F. Perez - CNRS UMR144 – Institut Curie

Indicate in which axis your team relates to:

Axis 1: Controlling and programming biological living matter

- Inducible and reversible protein capture and cell tuning
- Sensors (organelle damage, protein transport, etc.)
- Controlled trafficking (secretion, organelle identity, etc.)

Axis 2: Emergence of spatial and temporal organization in living matter

Axis 3: Information processing and dynamics of biological active matter

Axisi 4: Driving evolution within living systems

Team expertise:

- **Real-time imaging / Genome editing**
- **Synchronized trafficking (RUSH)**
- **Inducible Protein interaction (CATCHFIRE)**
- **Nanobody development**
- **Sensor development**

ITEM
Intracellular Transport Engineering & Mechanisms

Question of Interest and/or Collaboration wanted:

- **Quantitative analysis and modelling**
- **Nanotechnologies**

- **Sensor developement**
- **Instantaneous cell tuning**

Quantitative Physiology of the Cell

Matthieu Piel (PI)
Damien Cuvelier
Phong Tran

Post docs
Judith Pineau
Theresa Jakuszeit

Indicate in which axis your team relates to:

Axis 2: Emergence of spatial and temporal organization in living matter.

Axis 3: Information processing and dynamics of biological active matter.

Team expertise:

Cell biology of cell migration, growth and division

Biophysics of cell and nucleus size control (volume and dry mass)

Nucleus mechanics and mecanosensing

Microfluidics, cell confinement, cell migration assays,
Measure of live cell dry mass and volume

Question of Interest and/or Collaboration wanted:

Theory of cell size control and other homeostatic mechanisms (density, surface tension)

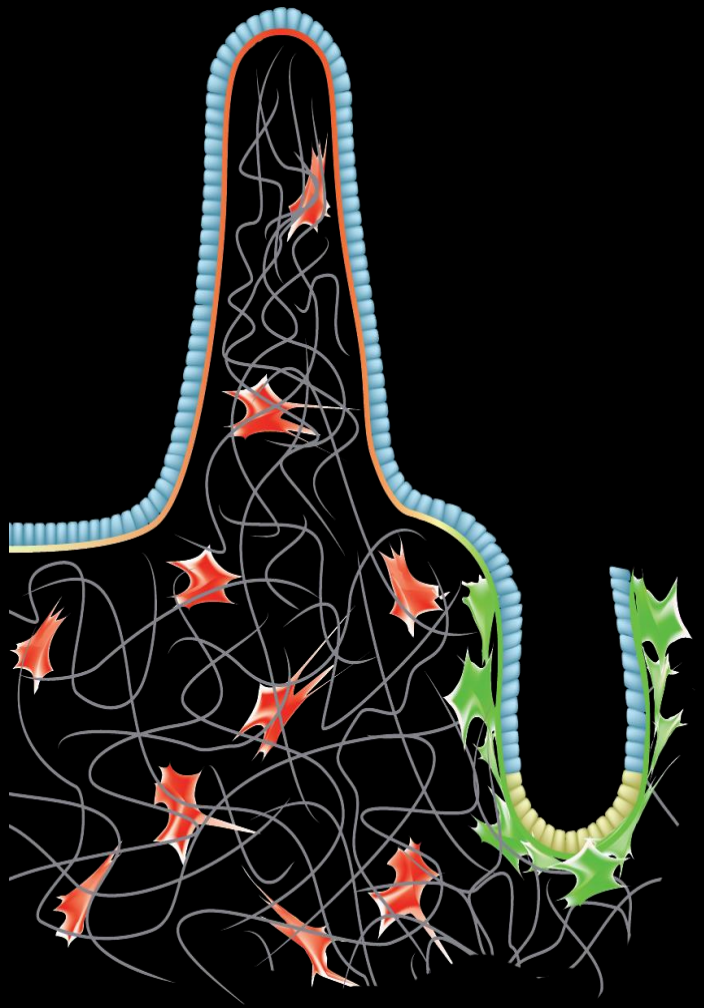
Physico-chemistry of the cytoplasm and nucleoplasm (crowding, rheology, density, phase separation)

Biophysics of chromatin – at the nuclear scale

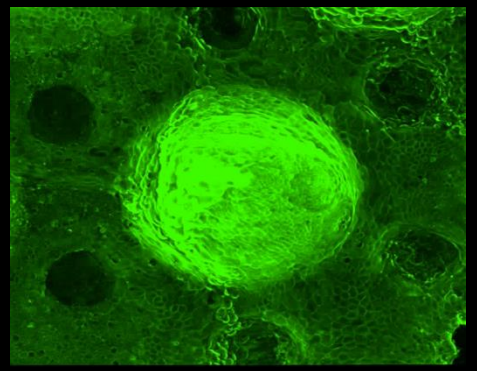
Team: Cell migration and invasion - Danijela Vignjevic

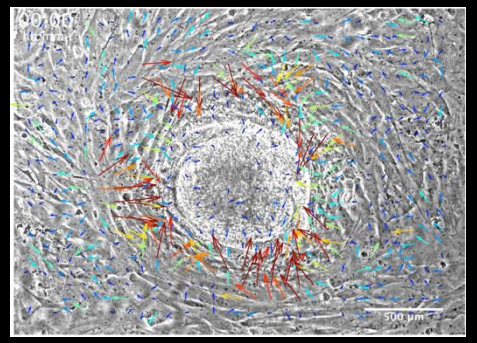
Interaction between epithelial cells-microenvironment in gut homeostasis, wound repair and cancer

Across scales

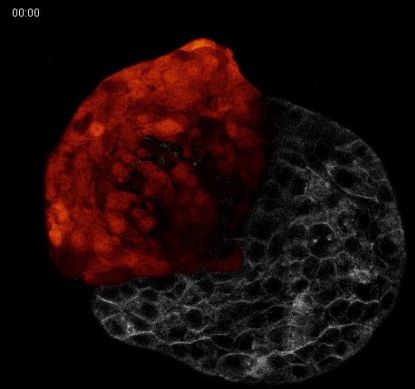


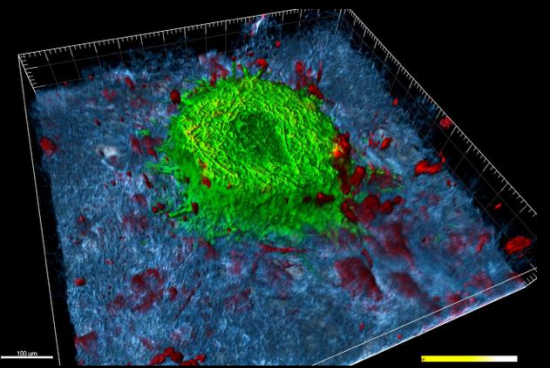
In vitro
2D, 3D models, organoids



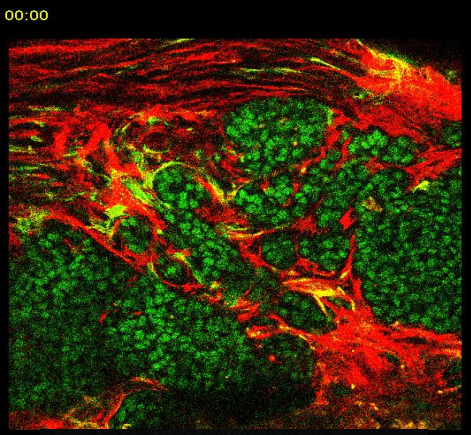


Ex vivo
Tissue slices





In vivo
Mouse models
Human samples



ENGINEERING LIFE

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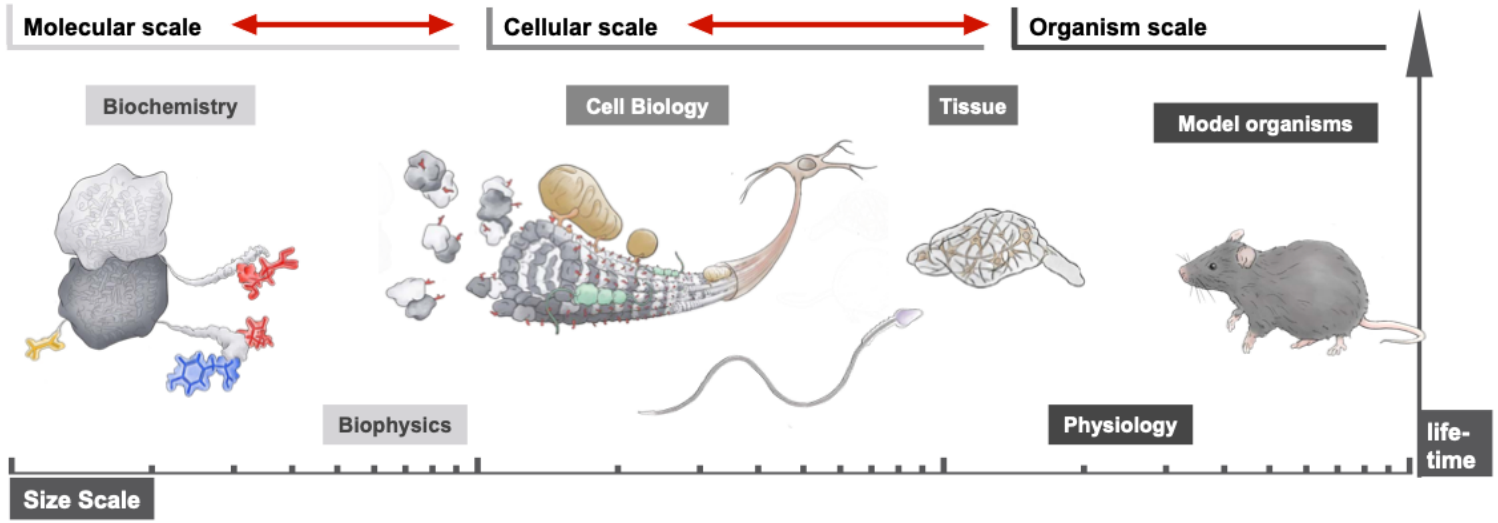
l'Université Paris Sciences & Lettres

Institut Curie

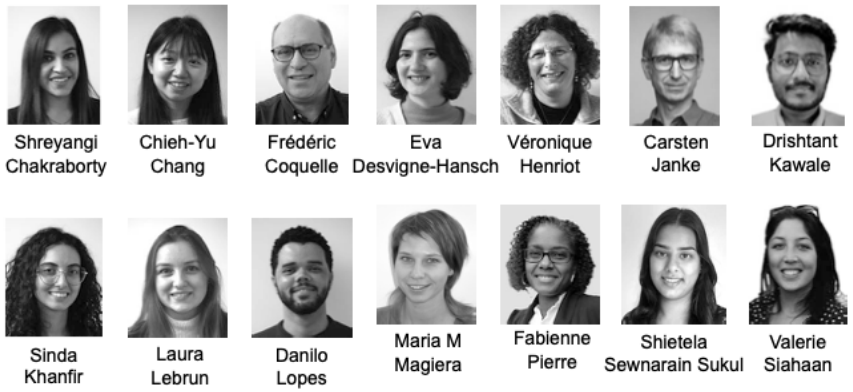
Genotoxic stress and cancer (UMR3348)

Carsten JANKE: Controlling Microtubule Dynamics and Functions with the Tubulin Code

Our approach: from molecules to organisms



Our team



Our scientific quest: decoding the tubulin code

?1 - molecules

What is the impact of tubulin post-translational modifications on microtubule structure, dynamics and interactions with associated proteins?

?2 - cells

How do tubulin modifications control microtubule organisation and functions in cells, and how does this affect physiological functions of those cells?

?3 - organisms

How do tubulin modifications control life-long function at the organism level? How do they adapt organisms to environmental challenges?

Opportunities for collaborations:

- Modelling of the regulatory mechanism
- Reprogramming enzymes
- *in-vivo* detection tools
- evolutionary perspective
- implication in disease mechanisms

ENGINEERING LIFE

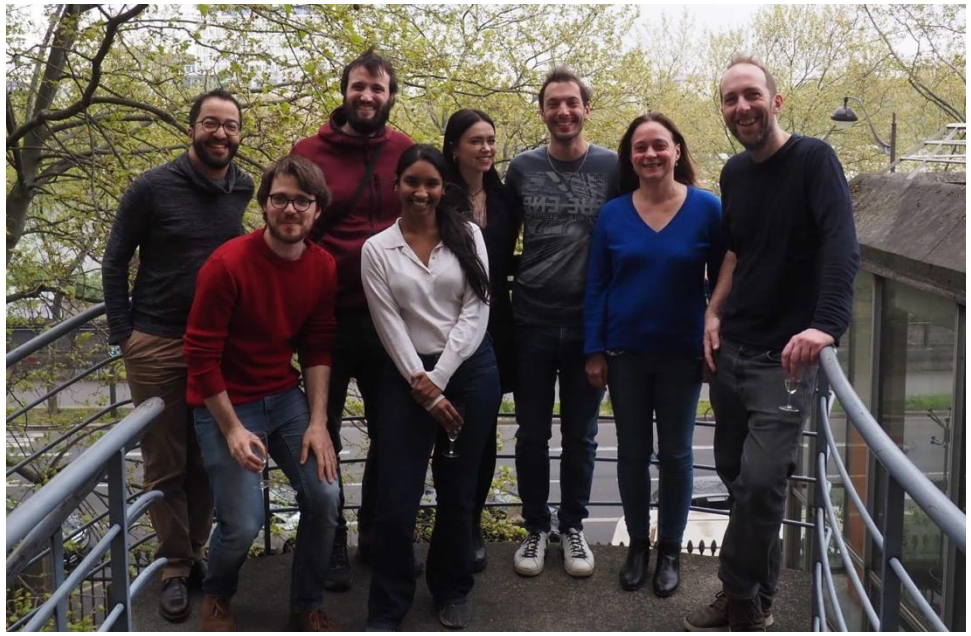
Grand programme de recherche de l'Université Paris Sciences & Lettres

ESPCI

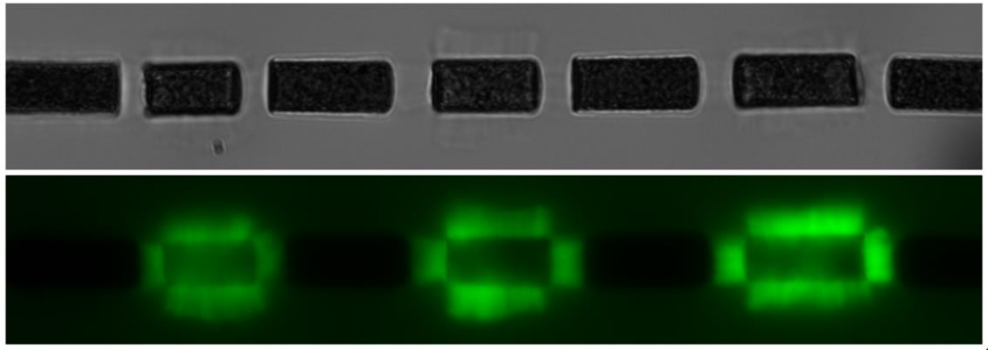
Physics and mechanics of heterogeneous media

(PMMH) (UMR7636)

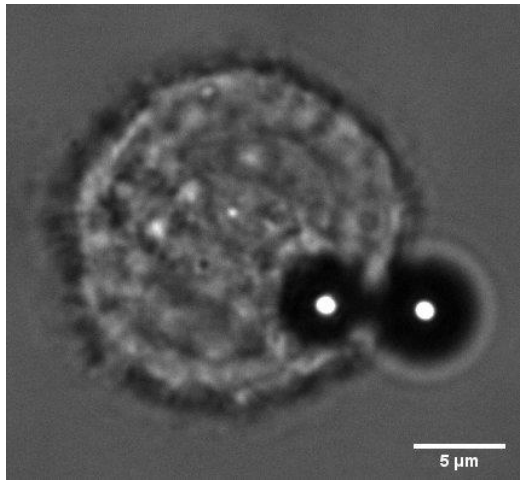
Julien Heuvingh & Olivia du Roure @ PMMH



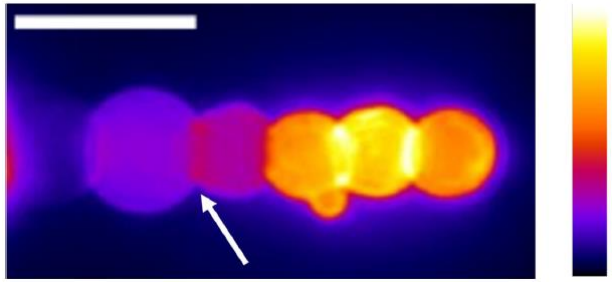
Axis 1: Controlling and programming biological living matter.
Axis 2: Emergence of spatial and temporal organization in living matter.



Magnetic beads and cylinders to deform (nN) and measure (nm) actin networks or fuse membranes.



Cell cortex dynamical and mechanical properties.
(with Matthieu Piel's Team)



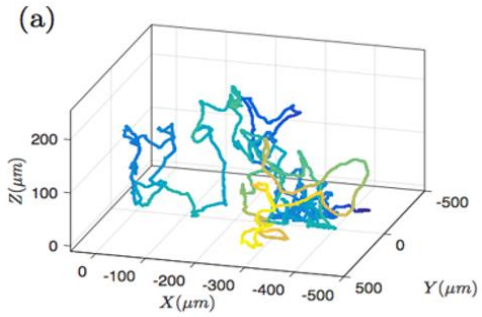
Possible collaborations: relevant biological phenomenons, other organelles (nucleus, mithocondria), cell mechanics.

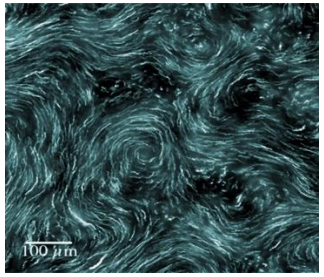
Active fluids group
PMMH-ESPCI

Eric Clement
PMMH Espci

Anke Lindner
PMMH Espci

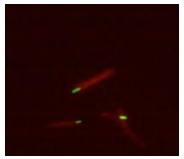
Florence Elias
PMMH Espci



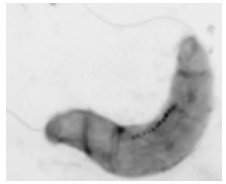


Axis 1: Controlling and programming biological living matter.
Axis 2: Emergence of spatial and temporal organization in living matter.
Axis 3: Information processing and dynamics of biological active matter.

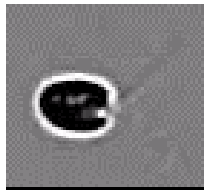
Model microorganisms…



E.coli



MTB



Alga

… in a soft-matter physics
& hydrodynamics lab

Question of Interest

- Transport and dispersion in flows & complex environments (porous media/foams, mucus etc…)
- Collective dynamics
- Taxis

Collaboration prospects

- Biologically relevant environments/interactions
- Other microorganisms, functional mutants
- Analytical techniques

ENGINEERING LIFE

Grand programme de recherche de
l'Université Paris Sciences & Lettres

ESPCI

Gulliver lab (UMR7083)

LACOSTE David

Email: david.lacoste@espci.fr
Web: https://dlacoste22.github.io/

Indicate in which axis your team relates to:

All 4 axis

Axis 1: Controlling and programming biological living matter.
Axis 2: Emergence of spatial and temporal organization in living matter.
Axis 3: Information processing and dynamics of biological active matter.
Axis 4: Driving evolution within living systems.

Team expertise:

- Chemical reaction networks
- Origin of life
- Fluctuations and growth in cell populations, cell size control
- Stochastic thermodynamics
- Models of lipid membranes, filaments, molecular motors

Question of Interest and/or Collaboration wanted:

- Design and control of chemical reaction networks
- Information processing and computational capabilities of living systems

Olivier Dauchot : Collective dynamics in living materials

List of the member of the team involved in EnLife

Olivier Dauchot
Michel Fruchart

Paul Bernard PhD
Qingju Qi PhD
Zeynep Tuna PhD

Indicate in which axis your team relates to:

Axis 2: Emergence of spatial and temporal organization in living matter.

Team expertise:

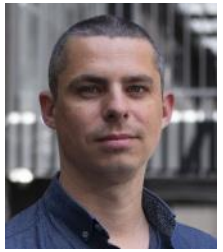
Collective dynamics and mechanical responses in model systems of living matter

Question of Interest and/or Collaboration wanted:

Origin of synchronized dynamics and mechanics of biological tissues
Existing collaboration with Pascal Silberzan and Thomas Risler
Experiments with epithelial cells anticipated

Molecular Programs & Systems

List of the member of the team involved in EnLife



Guillaume Gines

Yannick Rondelez

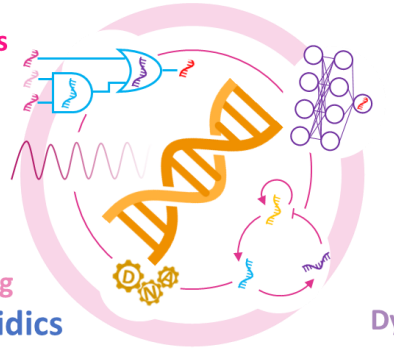
Indicate in which axis your team relates to:

Axis 1: Controlling and programming biological living matter.
Axis 2: Emergence of spatial and temporal organization in living matter.
Axis 3: Information processing and dynamics of biological active matter.
Axis 4: Driving evolution within living systems.

Our objects of study are rather « *artificial in vitro systems* » than « *living systems* »

Team expertise & interests:

Molecular Neural Networks
DNA nanotechnology
Self-assembly & self-organization
Biosensing
Single-molecule detection
Enzyme engineering
Microfluidics



Molecular diagnosis
CRN
Active matter
DNA encryption
DNA data storage
DNA computation
Molecular classifiers
Dynamical systems

Question of Interest and/or Collaboration wanted:

Open to discussion

Olivier Rivoire, Gulliver ESPCI

Webpage: https://statbio.net/

Email: olivier.rivoire@espci.fr

Axis 1: Controlling and **programming biological living matter.**

Axis 2: **Emergence of spatial and temporal organization** in living matter.

Axis 3: **Information processing** and dynamics of biological active matter.

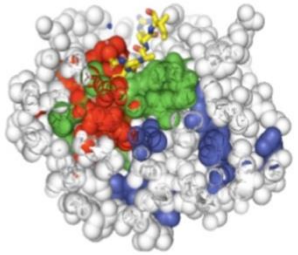
Axis 4: **Driving evolution** within living systems.

Expertise and questions of interest:

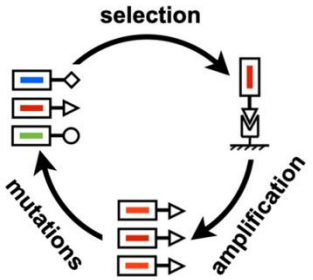
- Protein evolution and design
- Physics of catalysis and allostery
- Role of genetic context in gene transcription
- Information processing & adaptation in evolution
- Models for the origin of life

See https://statbio.net/

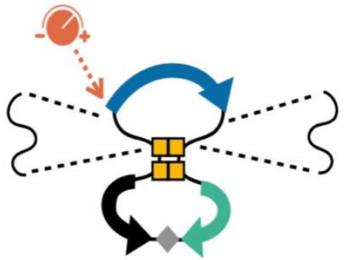
Coevolution in proteins



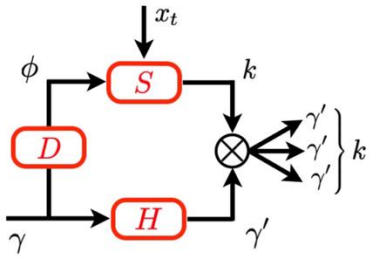
Directed evolution



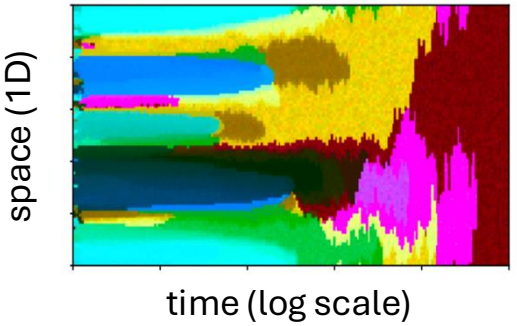
Gene regulation



Information processing



Models for the origin of life



ENGINEERING LIFE

Grand programme de recherche de
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ESPCI

Institut Chimie Biologie Innovation (UMR8231)

CytoMorpho Lab

Paris (IPGG, CBI)

Manuel THERY
CEA

Louise BONNEMAY
CEA

Grenoble (IRIG, LPCV)

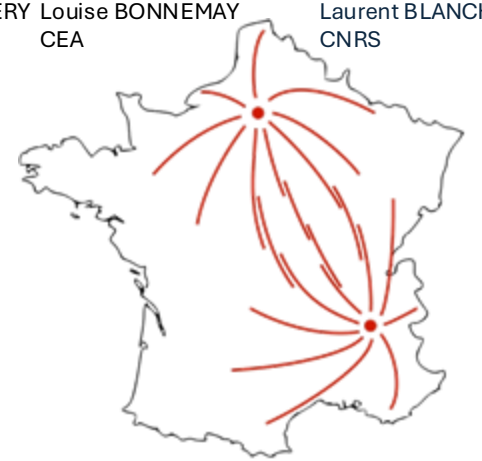
Laurent BLANCHOIN
CNRS

Laetitia KURZAWA
CEA

Benoit VIANAY
CEA

Alexandra COLIN
CNRS

Jérémie GAILLARD
CNRS



www.CytoMorphoLab.com

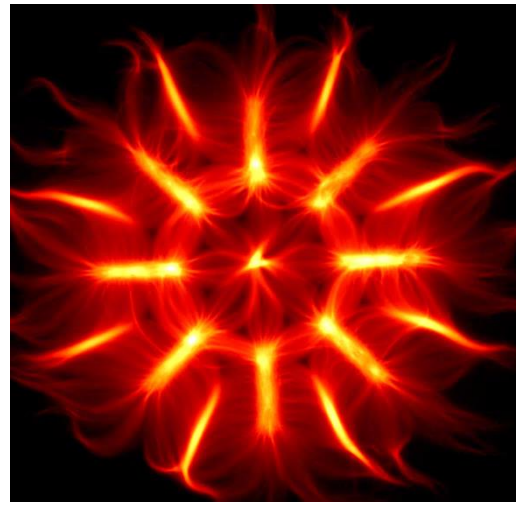
Christophe GUERIN
CNRS

Team expertise:

- Surface micropatterning, microwells, microfluidic.
- Cell culture, imaging, video-microscopy.
- Purification of cytoskeleton proteins.
- Reconstitution in vitro of dynamic networks of filaments and motors.

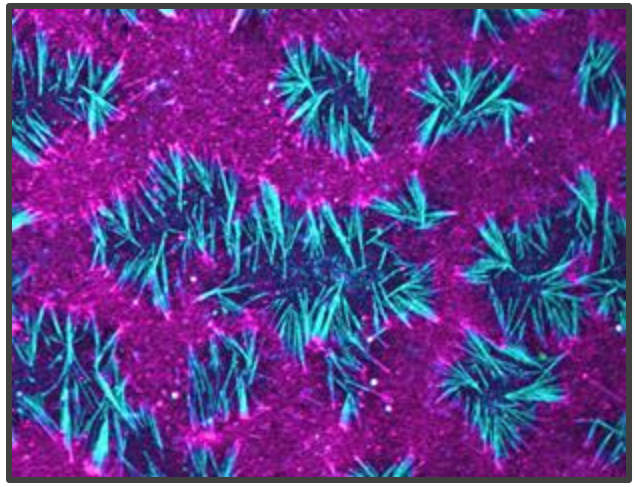
Axis 1: Controlling and programming biological living matter.

Cytoskeleton network adaptation to spatial boundary conditions
- in vitro reconstitution
- in living cells.



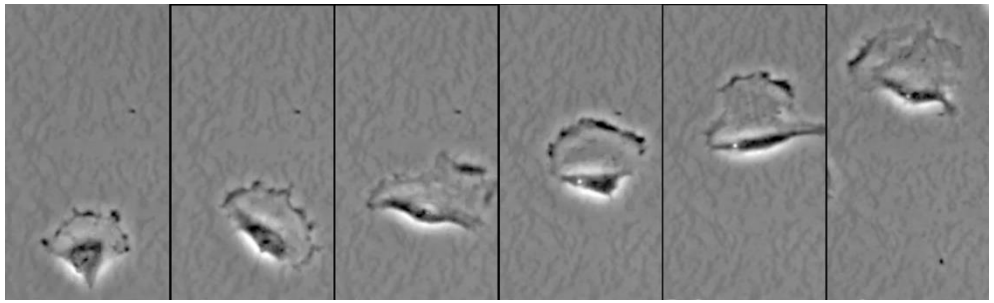
Axis 2: Emergence of spatial and temporal organization in living matter.

- Emergence of shape and polarity.
- Force balance in dynamic steady-states.



Axis 3: Information processing and dynamics of biological active matter.

Memory of shape
Motion persistence



ENGINEERING LIFE

Grand programme de recherche de
l'Université Paris Sciences & Lettres

ENS

Physics department of ENS (LPENS)

(UMR8023)

Grand programme de recherche de
l'Université Paris Sciences & Lettres

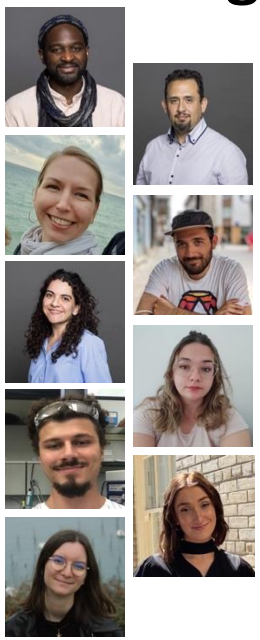
Microfluidic, Emulsion and Biology

PI: Abdou Rachid Thiam, DR CNRS

Mohyeddine OMRANE research engineer

Jennica Trager Post-Doc
Mehdi Zouiouich Post-Doc

Helin Elhan PhD candidate
Lisa Kauffmann PhD candidate
Sami Kchir PhD student
Murphy Mc Dermott PhD student
Bleuenn Feuillet PhD student



Indicate in which axis your team relates to:

Axis 1: Controlling and programming biological living matter.
Axis 2: Emergence of spatial and temporal organization in living matter.
Axis 3: Information processing and dynamics of biological active matter.
Axis 4: Driving evolution within living systems.

Team expertise:

- Giant Organelles Vesicles.
- *In-vitro* cellular membranes physical properties measurements.
- *In-vitro* model of lipid droplet nucleation.
- *In vitro* study of protein–bilayer/monolayer interactions
- Biochemical analysis of cellular lipid droplets/ER membranes

Question of Interest and/or Collaboration wanted:

- ❖ **Cell biology and biophysics of lipid droplets and the endoplasmic reticulum.**
  - ➢ Impact of lipid droplet composition on protein binding through amphipathic helices.
  - ➢ Impact of proteins and neutral lipids on lipid droplet nucleation process.
  - ➢ Organelles contact sites and lipid transfer mechanism.
  - ➢ Autophagic degradation of lipid droplets.

Theoretical Biophysics and Neuroscience @ LPENS


Francis Corson


Lionel Foret


Xiaowen Chen


Vincent Hakim


Jean-Pierre Nadal


Martine Ben Amar

Our team is related to

→ Axis 1: Controlling and programming biological living matter.

→ Axis 2: Emergence of spatial and temporal organization in living matter.

→ Axis 3: Information processing and dynamics of biological active matter.

Axis 4: Driving evolution within living systems.

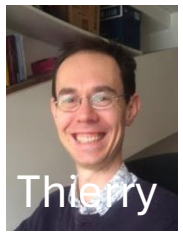
Team expertise:

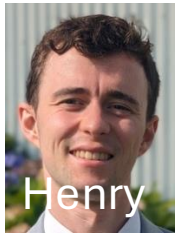
- Theory and modeling
- Development, neural learning and coding, biomechanics of membrane and tissues, morphogenesis, mechanics, gene networks, cancer, collective animal behavior.
- active matter and out-of-equilibrium physics, cellular motility, statistical inference, complex systems

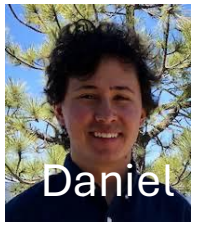
Question of Interest and/or Collaboration wanted:

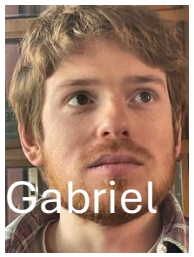
- Experimentalists on active matter, cellular motility, collective behavior
- Cellular differentiation/morphogenesis
- Gene regulation, gene networks, epigenetics
- Cancer

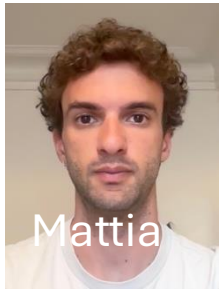
Thierry Mora and Aleksandra Walczak - StatBioPhys@LPENS

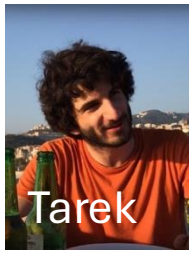












Anthia
Monika
Evgenii
Max
Paul

Interested in all 4 axes:

Axis 1: Controlling and programming biological living matter.

Axis 2: Emergence of spatial and temporal organization in living matter.

Axis 3: Information processing and dynamics of biological active matter.

Axis 4: Driving evolution within living systems.

Team expertise:

theory group interested in all biological systems

data → statistical analysis → models

Recent work:

- vertebrate immunity
- coevolution
- information processing in cells
- cellular condensates
- learning

Multiscale physics of living systems (LPENS)

Members of the team

D. Amor (CPJ PSL)
JF Allemand (PR ENS)
R. Bailleul (JRC Qbio)
D. Bensimon (Eméritus)
V. Croquette (DR CNRS)
N. Desprat (MC UPCité)
B. Ducos (IR CNRS)
R. Jeanneret (CR CNRS)
J. Valle Orero (MC AUP)

Indicate in which axis your team relates to:

Axis 1: Controlling and programming biological living matter.
Axis 2: Emergence of spatial and temporal organization in living matter.
Axis 3: Information processing and dynamics of biological active matter.
Axis 4: Driving evolution within living systems.

Team expertise:

- Micromanipulations, single molecules
- Live microscopy, image analysis,
- Cell microbiology
- Ecology and Evolution of Microbial Communities
- Antibiotic Resistance
- Swimming microalgae, active hydrodynamics
- Light control of microorganisms
- Optogenetics in zebrafish/bacteria
- Quantitative genomics
- Culture of marine organisms

Question of Interest and/or Collaboration wanted:

- Nucleic acid structures/molecular motors
- Bacterial colonies
- Evolution
- Soft matter (lipid domains)
- Multiscale biological engineering for the management of microbiotas and ecosystems.
- How do we drive microbial communities towards desired (healthy) stable states?
- Collective behavior, active matter
- Development of marine organisms
- Cell reprogramming in living systems
- Cancer initiation/induction and monitoring

Membrane Molecular Mechanism

Christine Gourier

Frédéric Pincet

Nicolas Rodriguez

The team is more into:

Axis 2: Emergence of spatial and temporal organization in living matter.

Team expertise:

- Experimental studies of biological phenomena involving biomembranes
- Membrane fusion
- Fertilization and mouse gametes
- Golgi apparatus' architecture
- Confocal and expansion microscopy imaging
- Model membranes and micromanipulation
- Microfluidics

Question of Interest and/or Collaboration wanted:

Complementary expertise in biochemistry, bioengineering, cellular biology…

ENGINEERING LIFE

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ENS

Institute of biology of ENS (IBENS)

(UMR8197/U1024)

Grand programme de recherche de
l'Université Paris Sciences & Lettres

Silvia De Monte
Eco-Evo Math team, IBENS

Axis 2: Emergence of spatial and temporal organization in living matter.

Axis 4: Driving evolution within living systems.

Expertise:

Eco-evolutionary dynamics of collective behaviour

1. Microbial community ecology: statistical descriptions and models of large systems of interacting species
2. Evolution of under artificial selection: nested models for community evolution
3. Evolutionary emergence of multicellular life cycles

Question of Interest and/or Collaboration wanted:

What is the constructive role of cell heterogeneity in the early emergence of collective function?

Looking for an experimental system adapted to the study of the dynamics of heterogenous cell populations on the ecological and evolutionary time scales.

Offering theoretical insight in eco-evo models.

ENGINEERING LIFE

Grand programme de recherche de
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ENS

Laboratory Physical and Biological Chemistry of Living Matter (CPCV) (UMR8228)

Grand programme de recherche de
l'Université Paris Sciences & Lettres

Analyse et Imagerie du Vivant

AUJARD Isabelle
JULLIEN Ludovic
MARIE Emmanuelle

Axis 1: Controlling and programming biological living matter.
Axis 2: Emergence of spatial and temporal organization in living matter.

Team expertise:

Imaging & sensing with fluorescence and phosphorescence
Optogenetics with caged compounds
Out-of-equilibrium Chemistry

Question of Interest and/or Collaboration wanted:

Open to discussions and collaborations

Team SOFT (PI: Damien Baigl)

CPCV (UMR 8228), Dept of Chemistry, ENS

Damien Baigl

Mathieu Morel

Sergii Rudiuk

Ayako Yamada

Indicate in which axis your team relates to:

Axis 1: Controlling and programming biological living matter

- Microfluidics (micro-environment & scaffolds)
- Gene circuits (cell reprogramming)
- DNA origamis (programmed interaction with cells)

Axis 2: Emergence of spatial and temporal organization in living matter

- DNA self-assembly
- Cellular self-organization in multicomponent organoids
- *In vivo*/*in vitro* coacervates/DNA nanogels

Axis 3: Information processing and dynamics of biological active matter

- Synthetic cell communication, cell reprogramming

Team expertise:

- **Soft Matter**
  (self-assembly, colloids, photo-actuation, polyelectrolytes)
- **DNA nanotechnology at cell interface**
- **Nanobiotechnology**
- **Synthetic Cells**
- **Gene circuits**
- **Microfluidics & microfabrication**
  (to investigate synthetic cells, living cells and living tissues)
- **Organs-on-chip**
  (especially brain organoids)

Question of Interest and/or Collaboration wanted:

- **Physicists/Mathematicians/Computer scientists** for **modelling and design the dynamic behaviours of our experimental systems:**
  - Gene networks
  - Isothermal DNA self-assembly dynamics
- **Biologists interested by our tools:**
  - Microfluidics for dynamic micro-environment
  - Microfabrication for smart scaffolds
  - Soft DNA nanotechnology to control spatio-temporal distribution of proteins/peptides/ligands, at the nanoscale (DNA origamis) or transfected inside cells (DNA nanogels)

ENGINEERING LIFE

Grand programme de recherche de
l'Université Paris Sciences & Lettres

Collège de France

Center for Interdisciplinary Research in Biology

(CIRB) (UMR8228)

SMILE

Stochastic
Models for the
Inference of
Life
Evolution

Guillaume ACHAZ

Amaury LAMBERT

Indicate in which axis your team relates to:

Axis 1: Controlling and programming biological living matter.
Axis 2: Emergence of spatial and temporal organization in living matter
Axis 3: Information processing and dynamics of biological active matte
Axis 4: Driving evolution within living systems.

Team expertise:

- Mathematical modelling of evolutionary processes
- Inference of evolutionary processes from genomes

- Somatic evolution (pathological and normal development, tumorigenesis, antibody affinity maturation)
- The formation of new species
- Population genomics, traces of selection/demography

Question of Interest and/or Collaboration wanted:

What are the evolutionary causes of the presence/absence of Darwinian properties of cells in multicellular species ?

Ecology & evolution of health

Samuel Alizon (DR CNRS)

The team is more into

Axis 4: Driving evolution within living systems.

Team expertise:

- *community ecology modelling*
- *genomics*
- *vaginal microbiota*

Question of Interest and/or Collaboration wanted:

- *Setting up micro-fluidic 3D systems to study microbiota (importing systems developped in the USA and currently being implemented at Université de Montpellier)*

- *Combining bacterial community ecology models with expertiments*

ENGINEERING LIFE

Grand programme de recherche de l'Université Paris Sciences & Lettres

ChimieParisTech

Institut de recherche de chimie Paris (IRCP)

UMR8247

Organometallic Chemistry and Polymerization Catalysis (COCP)

List of the member of the team involved in EnLife

Prof. Christophe Thomas

Prof. Kawthar Bouchemal

Indicate in which axis your team relates to:

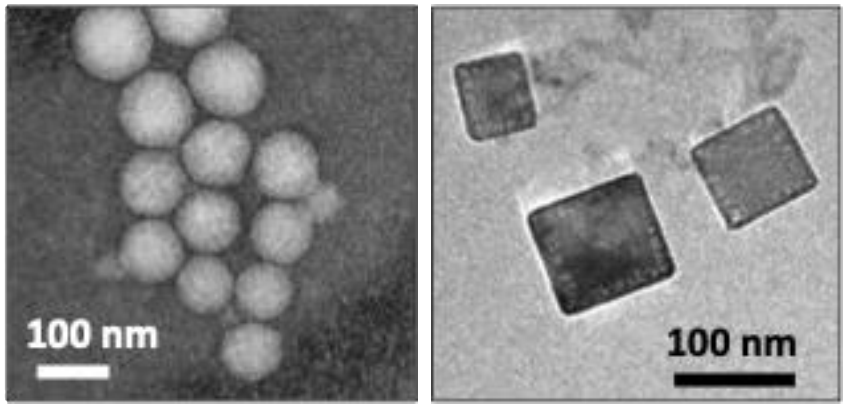
Axis 1: Controlling and programming biological living matter.
Axis 2: Emergence of spatial and temporal organization in living matter.
Axis 3: Information processing and dynamics of biological active matter.
Axis 4: Driving evolution within living systems.

Team expertise:

One-pot synthesis of bio-sourced and biodegradable materials

-Development of new catalytic systems

-Synthesis of polymers with controlled properties



Polymer-based nanomaterials

Question of Interest and/or Collaboration wanted:

Biological evaluations

In vitro, ex vivo, in vivo

Advanced characterizations

polymers, formulations interactions with artificial membranes and biomolecules

Multiscale molecular modelling

Molecular interactions, macromolecular modelling