Mechanisms controlling microtubule diversity and functions

Lab..... Regulation of microtubule dynamics and functions by the tubulin code

Team leader. Carsten JANKE (Carsten.Janke@curie.fr; +33 169863127)

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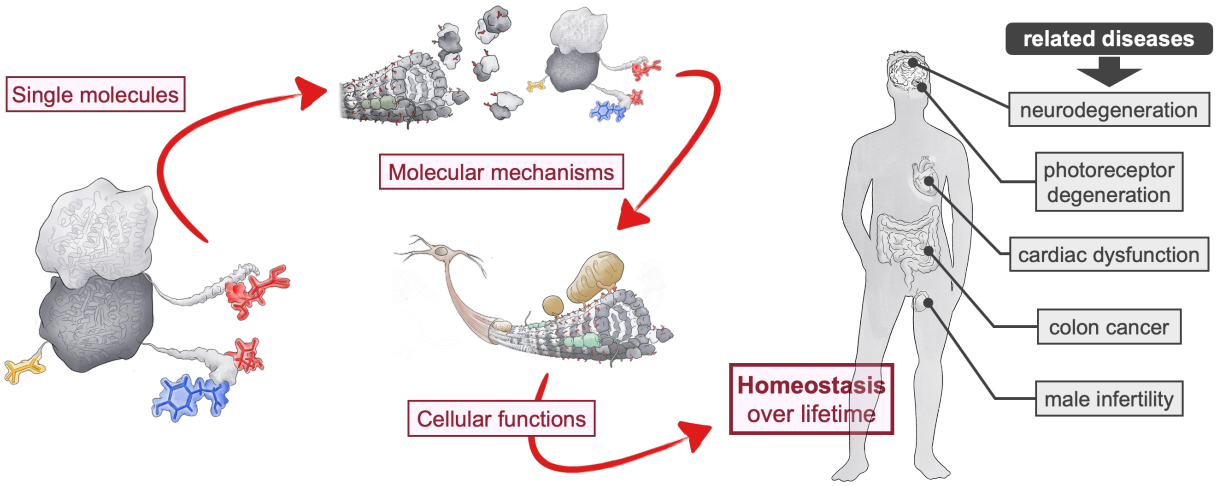
Salary ..... M2 monthly stipend 500-600 €

Follow-up..... PhD studentship with the PhD programs BioSigne (https://www.universite-paris-saclay.fr/ecoles-doctorales/signalisations-et-reseaux-integratifs-en-biologie-biosigne) or FIRE (https://phd.learningplanetinstitute.org/en/phd-program)

Our team aims at understanding how the microtubule cytoskeleton adapts to its many different functions in living cells and how it is involved in diseases such as neurodegeneration, cancer, or male infertility. We use an interdisciplinary approach to understand how microtubules are regulated at the molecular level to control their functions in cells, and how this contributes to organism homeostasis. We develop a wide range of innovative technics ranging from in vitro assays (biochemistry and biophysics) to super-resolution microscopy (cell biology) and whole organism studies (mouse biology), enabling us to explore cytoskeletal functions from the molecular to the whole organism scale.



Who we recruit

We recruit **creative and enthusiastic students motivated by interdisciplinary research**. Candidates will be given the opportunity to choose their projects based on their interests. During their internship, candidates will receive close guidance from experienced researchers of our team, and will also interact with international collaborators.

Students acquire up-to-date technical expertise, learn to independently design experiments, and will be trained in communication skills during our weekly lab meetings. Successful master students will be able to apply for a PhD studentship to pursue their work in our team.

Microtubule cytoskeleton, tubulin code, neurodegeneration, microscopy, in vitro reconstitution, cell biology

How to apply

Please send a motivation letter, CV, copies of transcripts (which lectures followed, grades and ranking, level of English), and if possible reference letters to Maria.Magiera@curie.fr and Carsten.Janke@curie.fr.

Which projects are currently ongoing in our lab

Our lab offers projects in the domains of **cell** and **organism biology** and **biochemistry**.

1. Molecular control of microtubule interactions with associated proteins (MAPs) – **cytoskeletal architecture**.
2. Control of neuronal functions by tubulin modifications – **neuronal physiology**.
3. Perturbed tubulin polyglutamylation – novel **mechanisms of neurodegeneration**.
4. The impact of tubulin mutations on microtubule mechanics, dynamics and functions – **neurodevelopmental disorders**.

Which techniques are used

Our team has expertise in a range of modern experimental techniques, such as

- Molecular cloning and protein expression in mammalian cells
- Lentivirus-mediated gene delivery
- Protein purification, biochemistry
- In vitro reconstitution assays and TIRF microscopy
- CRISPR-Cas9 gene engineering
- Cell biology (including primary cell culture)
- Live-cell imaging with spinning disk microscopy; expansion and superresolution microscopy
- Mouse biology, histology, tissue clearing

Where to find more details

Mercey O, Gadadhar S, Magiera MM, Lebrun L, Kostic C, Moulin A, Arsenijevic Y, Janke C, Guichard P, Hamel V (2024) Glutamylation imbalance impairs the molecular architecture of the photoreceptor cilium. *EMBO J* **43:** 6679-6704

Genova M, Grycova L, Puttrich V, Magiera MM, Lansky Z, Janke C, Braun M (2023) Tubulin polyglutamylation differentially regulates microtubule-interacting proteins. *EMBO J* **42:** e112101

Jijumon AS, Bodakuntla S, Genova M, Bangera M, Sackett V, Besse L, Maksut F, Henriot V, Magiera MM, Sirajuddin M, Janke C (2022) Lysate-based pipeline to characterize microtubule-associated proteins uncovers unique microtubule behaviours. *Nat Cell Biol* **24:** 253–267

Bodakuntla S, Yuan X, Genova M, Gadadhar S, Leboucher S, Birling M-C, Klein D, Martini R, Janke C, Magiera MM (2021) Distinct roles of alpha- and beta-tubulin polyglutamylation in controlling axonal transport and in neurodegeneration. *EMBO J* **40:** e108498

Gadadhar S, Alvarez Viar G, Hansen JN, Gong A, Kostarev A, Ialy-Radio C, Leboucher S, Whitfield M, Ziyyat A, Toure A, Alvarez L, Pigino G, Janke C (2021) Tubulin glycylation controls axonemal dynein activity, flagellar beat, and male fertility. *Science* **371:** eabd4914

Janke C, Magiera MM (2020) The tubulin code and its role in controlling microtubule properties and functions. *Nat Rev Mol Cell Biol* **21:** 307-326

Magiera MM, Bodakuntla S, Ziak J, Lacomme S, Marques Sousa P, Leboucher S, Hausrat TJ, Bosc C, Andrieux A, Kneussel M, Landry M, Calas A, Balastik M, Janke C (2018) Excessive tubulin polyglutamylation causes neurodegeneration and perturbs neuronal transport. *EMBO J* **37:** e100440