

PhD PROPOSAL FOR THE DOCTORAL SCHOOL

« Ecologie, Géosciences, Agronomie, ALimentation »

GENERAL INFORMATION

Thesis title: Analyses of epigenomic modifications during the cognitive processes in Physarum
Acronym: Epicogn
Disciplinary field 1: <input style="width: 100px;" type="text" value="Ecology"/>
Disciplinary field 2: <input style="width: 100px;" type="text" value="Agronomy"/>
Three keywords: Cognition, Epigenetics, Physarum
Research unit : UFIP UMR-CNRS 6286
Name of the thesis director HDR (Habilitation thesis to supervise research) required: Thiriet Christophe
Email address of the thesis director: christophe.thiriet@univ-nantes.fr
Name of the thesis co-director (if applicable): HDR (Habilitation thesis to supervise research) required:
Email address of the thesis co-director (if applicable):
Name of the thesis co-supervisor 1 (if applicable):
Email address of the thesis co-supervisor 1 (if applicable):
Name of the thesis co-supervisor 2 (if applicable):
Email address of the thesis co-supervisor 2 (if applicable):
Thesis grant (funding origin and amount): Université de Nantes, Contrat Doctoral Etablissement (CDE – ex MRT) (75%), Internal funding UFIP UMR CNRS 6286 (25%)
Contact(s) (mailing address and E-mail): Christophe Thiriet, UFIP UMR-CNRS 6286, Faculté des sciences et techniques, 2 rue de la Houssinière, 44322 Nantes
Recruitment process: Recruitment process depends on thesis funding. To select the corresponding recruitment process, please visit the EGAAL website here . This information is needed for proposal publication.
<input checked="" type="checkbox"/> Doctoral school contest <input type="checkbox"/> Interview <input type="checkbox"/> Other (indicate) :

All sections must be filled. Once filled, please save the proposal form in pdf format using the following naming: Supervisor Name_Unit_Subject Acronym_EN.pdf

SCIENTIFIC DESCRIPTION OF THE PhD PROJECT

Socio-economic and scientific context : (10 lines)

While neuronal plasticity is a critical element in cognitive phenomena, the complexity of metazoan models makes it difficult to study these phenomena at the cellular and molecular scales. Also, the exploration of less complex biological models should make it possible not only to lay down molecular bases, but also the primitive mechanisms of cognition. Although a few studies suggest that changes in histones influence neuronal plasticity, the epigenetic mechanisms in cognition are still unclear. However, to improve the diagnosis of certain cognitive disorders, clinical trials are currently underway with molecules that inhibit histone acetylases (HDAC). In view of these data, it is reasonable to think that a rational exploration of histone modifications in a cognitive context should open up new avenues.

Assumptions and questions (8 lines)

The slime mold *Physarum polycephalum*, also known as Blob, is a model of definite interest in cognitive studies. For our study, we will pay particular attention to the habituation which corresponds to a simple form of learning and which has been described in the literature. Besides the habituation, a similar approach has also shown the Blob's ability to teach naïve congeners. However, epigenetic analyzes of these phenomena are lacking. Also, the project consists of filling this gap by taking advantage of our long-standing expertise, both on the original biological model, *Physarum*, and on that of epigenetic studies.

The main steps of the thesis and scientific procedure (10-12 lines)

The candidate will be trained in *Physarum* cultures under axenic conditions. First, habituation experiments will be carried out through the use of repellent molecules (sodium chloride, quinine and caffeine). Once habituation is in place, analyzes of the epigenome will be done by Western blot to examine changes in histone post-translational modifications and by genomic approaches (CUT & RUN). In a second step, learning experiments will be carried out using naïve cells and cells which have established the habituation. After observing the learning by the naïve cells, analyzes of the epigenome will be done as before.

Methodological and technical approaches considered (4-6 lines)

The envisaged approaches are basic techniques of culture of *Physarum* in axenic conditions. epigenome studies will be performed by biochemical chromatin analysis approaches such as western blotting and CUT & RUN.

Scientific and technical skills required by the candidate

No specific skills are required for the candidate to complete this project.

THESIS SUPERVISION¹

Unit name: UFIP UMR CNRS 6286	Team name: Epigenetics and chromatin dynamics
Unit director name: Bernard OFFMANN	Team director name: Christophe THIRIET
Mailing address of the unit director: Bernard.offmann@univ-nantes.fr	Mailing address of the team director: Christophe.thiriet@univ-nantes.fr

¹ In EGAAL Doctoral School, if only one scientist in thesis supervision = 100% of supervision rate; if 2 people involved in thesis supervision = from 50% to 70% of supervision rate for the director; if 3 people involved in thesis supervision = 40% / 30% / 30% of supervision rate distribution among supervisors.

Thesis director

Surname, first name: Thiriet, Christophe

Position: Scientist

Obtained date of the HDR (Habilitation thesis to supervise research): 10/26/2010

Employer: CNRS

Doctoral school affiliation: EGAAL

Rate of thesis supervision in the present project (%): 100

Total rate of thesis supervision in ongoing theses (supervisions and co-supervisions) (%): 0

Number of current thesis supervisions/co-supervisions: 0

Thesis co-director

Surname, first name:

Position:

Obtained date of the HDR (Habilitation thesis to supervise research):

Employer:

Doctoral school affiliation:

Rate of thesis supervision in the present project (%):

Total rate of thesis supervision in ongoing theses (supervisions and co-supervisions) (%):

Number of current thesis supervisions/co-supervisions:

Thesis co-supervisor 1 (if applicable)

Surname, first name:

Position:

Habilitation thesis to supervise research yes no If yes, date diploma received:

Employer:

Doctoral school affiliation:

Rate of thesis supervision in the present project (%):

Total rate of thesis supervision in ongoing theses (supervisions and co-supervisions) (%):

Number of current thesis supervisions/co-supervisions:

Thesis co-supervisor 2 (if applicable)

Surname, first name:

Position:

Habilitation thesis to supervise research yes no If yes, date diploma received:

Employer:

Doctoral school affiliation:

Rate of thesis supervision in the present project (%):

Total rate of thesis supervision in ongoing theses (supervisions and co-supervisions) (%):

Number of current thesis supervisions/co-supervisions:

Private partner (if CIFRE funding, private funding,...)

Surname, first name:

Position:

Employer:

Rate of thesis supervision in the present project (%):

Total rate of thesis supervision in ongoing theses (supervisions and co-supervisions) (%):

Number of current thesis supervisions/co-supervisions:

International partner (if Cotutelle thesis)

Surname, first name:

Position:

Employer:

Rate of thesis supervision in the present project (%):

Total rate of thesis supervision in ongoing theses (supervisions and co-supervisions) (%):

Number of current thesis supervisions/co-supervisions:

Professional status of previous PhD students supervised by both director and co-supervisors (from 5 years)

Please provide the following information for each PhD students supervised

Surname, first name: Siami, Nader

Date of PhD beginning and PhD defence: 2013-2016

Thesis supervision: Christophe Thiriet & Gwenola Boucher

Professional status and location: Atlanpôle Biothérapies

Contract profile (post-doc, fixed-term, permanent): permanent

List of publications from the thesis work:

Complement C3 of the innate immune system secreted by muscle adipogenic cells promotes myogenic differentiation. T. Rouaud, N. Siami, T. Dupas, P. Gervier, M.-F. Gardahaut, G. Auda-Boucher and C. Thiriet (2017) *Scientific reports*, 7, 171

Five main recent publications of the supervisors on thesis subject:

- *Physarum polycephalum* for studying the function of histone modifications *in vivo*. V. Menil-Philippot and C. Thiriet (2017) *Methods in Molecular Biology*, 1528, 245-256.
- Nuclear dynamics at specific cell cycle stages in the slime mold *Physarum polycephalum*. C. Thiriet (2017) *Nuclear Dynamics*, 557-567.

- Histones H3 and H4 require their relevant amino-tails for replication-coupled chromatin assembly and efficient nuclear import *in vivo*. A. Ejlassi, V. Menil-Philippot, A. Galvani and **C. Thiriet** (2017) *Scientific reports*, 7,3050.
- Complement C3 of the innate immune system secreted by muscle adipogenic cells promotes myogenic differentiation. T. Rouaud, N. Siami, T. Dupas, P. Gervier, M.-F. Gardahaut, G. Auda-Boucher and **C. Thiriet** (2017) *Scientific reports*, 7, 171
- Replication-coupled chromatin remodeling: an overview of disassembly and assembly of chromatin during replication. C. Duc and **C. Thiriet** (2021) *Int J Mol Sci*, 22(3), 1113

THESIS FUNDING

Origin(s) of the thesis funding: Université de Nantes & UFIP UMR CNRS 6286
Gross monthly salary: 1770 €
Thesis funding state : <input type="text" value="Acquired"/>
Funding beginning date/Funding ending date: September 2021

Date: 03/29/2021

Name, signature of unit director: Hoffmann Bernard



Name, signature of team director: Thiriet Christophe



Name, signature of thesis project director: Thiriet Christophe.thiriet@univ-nantes.fr



