

## Job offer – PhD in Cognitive Neuroscience

**Research Project Short Title as Submitted to CEFIPRA:** “Adult cortical angiogenesis: contribution of a novel actor to the formation and consolidation of enduring memories”

**Main scientific contact for the French Institution:** “Dr. Bruno Bontempi, [bruno.bontempi@u-bordeaux.fr](mailto:bruno.bontempi@u-bordeaux.fr)”, Aquitaine Institute for Integrative and Cognitive Neuroscience, CNRS UMR 5287, University of Bordeaux  
<https://www.bordeaux-neurocampus.fr/qui-sommes-nous/les-6-unites-de-recherche/incia/>

**Reference Number of the Job Offer:** IFI\_CEF\_24\_10

### Project description:

- **Keywords:** Memory consolidation, Brain imaging, Cerebral microvasculature, Vascular remodeling, Neuronal plasticity, Cortex

- **Context:**

Initially labile, memory traces—the so-called engrams—undergo a process of consolidation which relies on time-dependent interactions between the hippocampus and a broader network of cortical brain regions that serve as the final repository of enduring memory engrams. While considerable efforts have been devoted to unraveling the mechanisms underlying the organization of recent and remote memories, experimental studies have largely favored a neuronal perspective while neglecting some other components of the brain functioning, in particular the vascular sphere. Highly dynamic, the cerebral microvasculature is capable of modifying its architecture by creating new blood vessels from preexisting ones. While well documented for brain tumors or injuries, the contribution of this angiogenic sprouting to the physiological process of memory formation has surprisingly remained unexplored. The PhD project aims at filling up this void.

- **Abstract of the Research Project:**

This Indo-French project is funded by the Indo-French Center for the Promotion of Advanced Research (CEFIPRA/IFCPAR) and involves two principal collaborators with complementary expertise in the fields of memory and brain imaging. The French collaborator is Dr. Bruno Bontempi from the Aquitaine Institute for Cognitive and Integrative Neuroscience (INCIA, CNRS UMR 5287) located at the University of Bordeaux. The Indian collaborator is Dr. Balaji Jayaprakash from the Indian Institute of Science at Bangalore. The proposed 3-year PhD position is open at INCIA and will involve visits to the Indian laboratory during the course of the PhD project. The successful candidate will join the “Memory team” at INCIA which has a longstanding experience in exploring learning and memory functions in rodents. Expected duties concerns the design and implementation of innovative learning and memory approaches in mice coupled to imaging approaches tailored to examining the functioning of the neurovascular unit in brains regions involved in memory processing. Experiments will be conducted in close collaboration with the Indian team.

- **Scientific Objectives of the Project:**

Three main objectives will be addressed. Using longitudinal in vivo two-photon fluorescence imaging, Objective 1 will simultaneously image vascular and neuronal remodelling as memories mature over time in cortical brain regions. Using specific vascular modulators delivered intracerebrally coupled to ex vivo immunostaining methods, Objective 2 will seek to establish a causal role of adult cortical angiogenesis in modulating positively or negatively the formation of enduring memories. Objective 3 will explore the potential of cortical angiogenesis in modulating memory forgetting by enabling the formation of memory engrams less prone to degradation over time. Overall, the envisioned multi-level approach is expected to provide behavioral, anatomical and functional insights into a novel non-neuronal mechanism crucial for the formation of enduring memories and whose dysfunction may contribute to the memory deficits associated with neuropsychiatric disorders.

- **Methodology and Timeline of the Project:**

Longitudinal in vivo two-photon fluorescence imaging developed by the Indian team will be used to simultaneously monitor and label vascular and neuronal remodelling in cognitively challenged transgenic mice expressing fluorescent viral constructs. Ex vivo immunolabeling of brain sections and 3-D reconstruction of vascular networks will refine the dynamics of the angiogenic process and determine the cellular nature of vascular changes within cortical networks (French team). Intracerebral stereotaxic infusions of specific pharmacological modulators in freely moving mice or rats will permit the causal manipulations of the neurovascular unit (French and Indian teams). The consequence of these manipulations on the organization or recent and remote memories, vascular density and neuronal plasticity will be determined using brain sections from the same animals. Mice will be trained in associative olfactory and contextual memory tasks available in the two collaborative teams.

### Candidate profile

- Indian candidates or candidates with a research experience in India are eligible; French candidates are not eligible
- Applicants for PhD must have a master's degree in the Neuroscience field (or be in the process of obtaining one) or have a University degree equivalent to a European Master's (5-year duration) to be eligible at the time of the deadline of the call;
- No competences in French language is required
- Candidate competences
  - Solid background in Cognitive Neuroscience
  - High interest for animal behavior and well-being
  - Good communication skills and level of verbal and written English language
  - Scientific curiosity, motivation, creativity and attention to details
  - Ability to work independently as well as in a team
- Candidate know-how
  - Skills in data sorting, analyzes and statistics
  - Previous experience with rodent handling and behavior (mouse or rat)
  - Previous wet lab skills in biochemistry or immunocytochemistry
  - Experience with stereotaxic surgery or programming a plus
- Expected starting date: **Between October 2024 and January 2025**

### How to candidate ?

Documents to be provided :

- i. A cover letter (reasons for the candidature, professional project ...) max 2 pages
- ii. A copy of the master's degree or a proof of the program followed (and expected date of end)
- iii. A copy of results for previous scholarship (max 3 pages)
- iv. International curriculum vitae (max 2 pages)
- v. Two letters of recommendation: one from any Indian institution and one from the French institution planned to host the candidate –mandatory- (max 2 pages)
- vi. All should be submitted within 1 pdf file of no more than 10 pages.

Applications should be submitted to the following email address: [msi@ifindia.in](mailto:msi@ifindia.in) mentioning the reference number of the Job offer clearly.

**Research Project Title as Submitted to CEFIPRA:** “Adult cortical angiogenesis: contribution of a novel actor to the formation and consolidation of enduring memories”

**Candidates are requested to contact the French scientific principal investigator of the project before submission. A recommendation letter from the scientific principal investigator is mandatory.**

**Benefits:**

- Monthly allowance of 1710 euros for PhD
- Travel allowance
- University fee
- Carte de séjour fee
- Campus France management fee
- Registration to the French social security scheme

**Selection process:**

Selection is made by a dedicated selection committee of at least 4 persons. Decisions will be transmitted by the Embassy of France to CEFIPRA. **No consideration will be given for candidates with no recommendation letter from the French institution.**

**Criteria for applicants’ selection:**

Academic excellence

- Excellence of the Academic background, Academic records, Honors, Letters of support, Participation to international research projects, exchange programmes and conferences.

Motivation and qualities

- Academic maturity: appropriation of the thesis project (stakes and contexts) • Quality of the presentation (oral expression, skills for synthesis, English level) • Maturity of the professional project: capacity to project her/himself within five years in terms of career development.

**About CEFIPRA:**

Indo-French Center for the Promotion of Advanced Research (CEFIPRA/IFCPAR) is an Indian body which promotes scientific cooperation between France and India in advanced fields of Science and Technology. It is supported by the Department of Science and Technology, Government of India and the Ministry of Europe and Foreign Affairs of the French government