

## 2019-01299 - PhD Position F/M Knowledge-based 3D modeling and design of RNA-binding proteins

**Type de contrat :** CDD de la fonction publique  
**Niveau de diplôme exigé :** Bac + 5 ou équivalent  
**Fonction :** Doctorant

### Contexte et atouts du poste

**Thesis promotor/supervisor:** M.-D. Devignes / I. Chauvot de Beauchene

**Location:** LORIA lab (CNRS - INRIA - Lorraine University) at Nancy, France

**Starting date:** Between June and December 2019

**Duration:** 36 month

**Funding:** H2020-MSC-ITN project « RNAct », hold by W. Vranken (VUB, Brussel)

**Salary:** ~2100 euro/month net (+ family allowance if relevant)

The PhD project is part of a multi-disciplinary European ITN project called **RNAct**, involving 8 inter-connected PhD projects in computational and experimental molecular biology, biophysics and system biology.

RNAct research aim is the **design of novel proteins** containing **RNA recognition motifs (RRM)**, for exploitation in synthetic biology and bio-analytics. This is achieved through a design cycle that starts with computational approaches at the sequence and structure levels of proteins and RNA, in order to select amino acid positions and mutations for large-scale phage display experiments with RNA screening. Viable RRM will be further investigated at the atomic level with integrative structural biology approaches, and will be applied in synthetic biology, to post-transcriptionally regulate fatty acid processing via RRM, and in bio-analytics, to detect RNA in-cell and design RNA biochips.

The **CAPSID** research group develops computational tools for data mining on macromolecular assemblies and 3D modeling of those assemblies. We are part of an informatics-mathematics lab (LORIA), and have several collaborations with experimental biology/biophysics teams.

The PhD student will work in collaboration with another PhD from the RNAct project (working on protein-RNA docking) and a Post-Doc working on the representation of protein flexibility in docking.

### Mission confiée

Our PhD project focuses on two main axis:

1 / **The creation of a complete and comprehensive database** of available RRM information from the many available databases. This includes their sequence, structure, dynamics, RNA specificity and other data (binding affinity, biological function...). This database will be regularly extended with internal and external data as it becomes

### Informations générales

- **Thème/Domaine :** Biologie numérique  
Biologie et santé, Sciences de la vie et de la terre (BAP A)
- **Ville :** Nancy
- **Centre Inria :** **CRI Nancy - Grand Est**
- **Date de prise de fonction souhaitée :** 2019-09-01
- **Durée de contrat :** 3 ans
- **Date limite pour postuler :** 2019-04-30

### Contacts

- **Equipe Inria :** **CAPSID**
- **Directeur de thèse :**  
Chauvot De Beauchene Isaure /  
[isaure.chauvot-de-beauchene@loria.fr](mailto:isaure.chauvot-de-beauchene@loria.fr)

### A propos d'Inria

Inria, l'institut national de recherche dédié aux sciences du numérique, promeut l'excellence scientifique et le transfert pour avoir le plus grand impact. Il emploie 2400 personnes. Ses 200 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3000 scientifiques pour relever les défis des sciences informatiques et mathématiques, souvent à l'interface d'autres disciplines. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 160 start-up. L'institut s'efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

### L'essentiel pour réussir

#### Eligibility

European funding require an international mobility: The candidates must not have resided or carried out their main activity in France for more than 12 months in the 3 years prior to the recruitment.

#### Consignes pour postuler

##### Sécurité défense :

Ce poste est susceptible d'être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L'autorisation d'accès à une zone est délivrée par le chef d'établissement, après avis ministériel favorable, tel que défini dans l'arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l'annulation du recrutement.

##### Politique de recrutement :

Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.

**Attention:** Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.

available, will be published and released at the end of the project as a deliverable, and is key to the development of computational approaches in the RNAct project. The PhD student will analyse these different RRM data, and will liaise with the other PhD students to enrich the data with results from *in silico* methodologies. The database will serve for **application of machine learning** to sequence-to-structure predictions and design

**2/ The computation of protein-RNA binding energies by **molecular dynamics simulations** of RRM-RNA 3D models.** For example, we will first investigate why the *Drosophila* Sex-lethal (Sxl) protein, and its putative human homologue HuR, bind more specific RNA sequences than the U2AF65 protein. Then, we will predict the RNA-binding specificities of the newly designed proteins.

### Principales activités

The PhD student will work in collaboration with another PhD from the RNAct project (working on protein-RNA docking) and a Post-Doc working on the representation of protein flexibility in docking.

The PhD student will spend 3 months of secondments at the VUB (Brussel, Belgium) to learn about sequence-based methods for protein design and analysis.

### Compétences

Candidates must have a masters degree in bio-informatics or computer science.

The project is highly interdisciplinary. **Good programming skills** (preferentially Python and/or C++) are essential. Skills in database creation and management, knowledge-based discovery, machine learning and/or statistics are very desirable. Knowledge of structural biology would be appreciated (but not mandatory).

Most importantly, candidates must be motivated to learn about all disciplines relevant to the project.

Candidates must be fluent either in French or in English.

### Avantages

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

### Rémunération

Salary: 1982€ gross/month for 1st and 2<sup>nd</sup> year. 2085€ gross/month for 3rd year.

Monthly salary after taxes : around 1596,05€ for 1st and 2<sup>nd</sup> year. 1678,99€ for 3rd year. (medical insurance included).