



Offre n°2021-04163

Post-Doctoral Research Visit F/M [BIOCORE-POSTDOC2021] Modelling and control of algae-bacteria interactions in a biofilm

Le descriptif de l'offre ci-dessous est en Anglais

Type de contrat : CDD

Niveau de diplôme exigé : Thèse ou équivalent

Fonction : Post-Doctorant

Niveau d'expérience souhaité : Jeune diplômé

A propos du centre ou de la direction fonctionnelle

The Inria Sophia Antipolis - Méditerranée center counts 34 research teams as well as 8 support departments. The center's staff (about 500 people including 320 Inria employees) is made up of scientists of different nationalities (250 foreigners of 50 nationalities), engineers, technicians and administrative staff. 1/3 of the staff are civil servants, the others are contractual agents. The majority of the center's research teams are located in Sophia Antipolis and Nice in the Alpes-Maritimes. Four teams are based in Montpellier and two teams are hosted in Bologna in Italy and Athens. The Center is a founding member of Université Côte d'Azur and partner of the I-site MUSE supported by the University of Montpellier.

Contexte et atouts du poste

BIOCORE team applies and develops mathematical and computational methods from Control Theory and Dynamical Systems to the study of models of biological networks (genetic networks, metabolic networks, signaling networks...) and microbial community in bioreactors.

See: <http://team.inria.fr/biocore>

Web page of Olivier Bernard <http://www-sop.inria.fr/members/Olivier.Bernard/>

Within the framework of the ANR PhotoBiofilm Explorer which will provide experimental data.

The post-doc takes place within the framework of the **PhotoBiofilm Explorer** project, involving 6 partners, among which the Laboratory of Oceanography from Villefranche in which validation experiments will be carried out.

There is an urgent need to identify new drugs to deal with major health challenges such as the control of serious pathogens which have gained resistance against current antibiotics. **Microalgae constitute a source of eukaryotic organisms to be explored for the production of more efficient and biologically active compounds.** They have gained interest lately for innovative solutions in various applications and they are now recognized as a valuable and sustainable source for food and feed. They are classically cultivated in photobioreactors or raceways as **liquid suspension**. To further enhance productivity at reduced environmental cost an innovative approach has been developed consisting in growing microalgae in a **biofilm** on a moving conveyor belt. A biofilm is an assemblage of microorganisms associated to a surface and embedded in a secreted matrix of extracellular polymeric substances. Surprisingly, **most of the tested biofilms are extremely resistant to biological contamination.** Even when adding glucose, the cellular ratio bacteria/microalgae in the biofilm remains strongly controlled to a very low value suggesting that some compounds released by microalgae (and/or associated native bacteria within the biofilm) are able to inhibit invaders and play a significant role in the biofilm resilience and stability. These compounds are known to reach concentrations high enough to also impact planktonic microorganisms in the neighbourhood of the biofilm.

Frequent interactions with all the partners to better understand the underlying biological processes is required, and to integrate the latest acquired data. In the end, an implementation of the model will be carried out with matlab together with the development of toolboxes for calibration, validation and optimisation.

Mission confiée

So far, the developed algal biofilm models did not include bacteria, nor the production of allelopathic compounds. The first objective of the project is to **develop a model of the production of molecules providing the resistance of the biofilm**. The second objective is **to include a bacterial compartment in this model to account for the possible interactions**.

The post-doc will then have to calibrate this model with data from the PhotoBiofilm Explorer project and improve it to deal with the periodic light supply on the biofilm process. Once calibrated, an extensive simulation campaign must be carried out with the objective of determining the optimal operating conditions to maximise the algal biomass or the nutrient removal rate. On-line control strategies will be finally derived from the identification of the optimal operating modes.

Principales activités

Main activities :

- Literature review
- Model development
- Model implementation with Matlab
- Parameter identification
- Model optimisation

Compétences

Technical skills and level required : Expertise in modelling biological systems. Optimization of systems given by ordinary differential equations

Scientific languages (Matlab, Scilab or Python).

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

Gross Salary: 2653 € per month

Informations générales

- **Thème/Domaine** : Modélisation et commande pour le vivant
Calcul Scientifique (BAP E)
- **Ville** : Sophia Antipolis
- **Centre Inria** : [Centre Inria d'Université Côte d'Azur](#)
- **Date de prise de fonction souhaitée** : 2022-03-01
- **Durée de contrat** : 3 mois
- **Date limite pour postuler** : 2021-12-14

Contacts

- **Équipe Inria** : [BIOCORE](#)
- **Recruteur** :
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A propos d'Inria

Inria est l'institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 215 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3900 scientifiques pour relever les défis du numérique, souvent à l'interface d'autres disciplines. L'institut fait appel à de nombreux talents dans plus d'une quarantaine de

métiers différents. 900 personnels d'appui à la recherche et à l'innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 200 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

Team working, collaboration with biologists.

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.

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.