



Junior Contract Researcher Post-doctoral contract in public law

Category : A

Presentation of the University of Angers

In the heart of a region recognized for its quality of life, the University of Angers, the 3rd largest employer in the region, offers an environment conducive to the development of its staff and students. The UA is a multidisciplinary university, welcoming more than 26000 students spread over 3 campuses and 2 relocated campuses (in Cholet and Saumur). It has 8 components (5 UFR, 1 IUT, 1 internal engineering school and 1 internal business and management school), and 31 federative research units and structures. Thanks to the many innovative projects it carries out and its openness to the world, the AU allows everyone to evolve in a stimulating environment. Its annual budget is \in 156 million (including \in 123 million in payroll). The UA has 1167 teachers and teacher-researchers, 917 administrative and technical staff and nearly 2000 individual contractors and is looking for involved and daring actors. You recognize yourself in this job offer ? Join us !

Contract features:

Starting date : 1st September 2025
Contract duration : 18 months French law work contract
Work quota : 100%
Monthly wage : 3200 euros
Location : UMR 6112 CNRS LPG (Laboratory of Planetology and Geosciences) Located on the university science faculties of Nantes, Angers and Le Mans, the "Laboratoire de

Planétologie et Géosciences" (LPG) is a multi-site Mixed Research Unit that is supported by the CNRS and the Universities of Nantes, Angers and Le Mans. . Its activities are divided into three research themes: Coastal and Marine Systems, Earth, and Planets and Moons. The post doc will be located at the University of Angers and integrated in the theme « **Coastal and Marine Systems** ».

Name of research project : BioIndic-IA « Deep learning for automatic image-based biomonitoring of aquatic ecosystems ».

The scientific project is founded by the French ANR project **BioIndic-IA** dealing with « **Deep learning for automatic image-based biomonitoring of aquatic ecosystems** ». This global project is supervised by M. Laviale (LIEC, Lorraine University) in collaboration with different French (Marseille University CEREGE, Angers University LPG...) and Luxemburg (LIST) institutions. The post-doc grant is founded by the ANR. Worldwide intensification of land and coastal use and aquatic resources has led to a drastic increase in the intensity and diversity of anthropogenic pressures, simultaneously driving changes in local biotic communities which ultimately impair ecosystem functioning and ecosystem services over multiple spatial and temporal scales. This highlights the **urgent need for developing innovative ecological diagnostic tools supporting robust management responses** to every pressure of human origin impairing the water physical and chemical quality and/or the integrity of habitats. Biomonitoring has been initially based on diversity indices, which rely on taxonomic inventories, and later on biotic indices, which combine the relative abundance of indicator species to their ecological profile, i.e. their sensitivity or tolerance to environmental variables. Within the European Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD), these approaches have already proven their efficiency for assessing the global ecological quality of water bodies using a given biological compartment, such as BENTHIC DIATOMS or BENTHIC FORAMINIFERA, that are both unicellular organisms with shells living on the bottom of aquatic ecosystems.

BENTHIC FORAMINIFERA-based indices are recent and still seldom included in regulatory ecological assessments despite their confirmed potential to track the ecological quality status of coastal ecosystems. Besides taxonomy, the assessment of traits should be also now considered. However using foraminiferal based indices and developing new tools based on traits are time consuming studies. This is a lock to include such relevant tools to European and National regulatory ecological assessments.

For any group of organisms, **classical bioindication relies on visual recognition by human experts of indicator species** based on morphological criteria (for foraminifera: chamber and aperture shape, texture of the test...). Some of these morphological traits hold more than just taxonomic information. Indeed, variability in traits can be observed across species (e.g. big vs. small species) but also at the intraspecific level (e.g. porosity for foraminiferal shell) in response to environmental changes. However, manual identification of species or routine measurements of traits is too time-consuming, often subject to multiple biases (human expert's experience, imaging system quality) and requires a high level of expertise. Nevertheless, automatic **images acquisition and machine learning for identifying foraminiferal species and measuring morphological traits are promising methods.** State-of-the-art methods from artificial intelligence, such as deep learning based on convolutional neural networks (CNNs) can be used for taxonomic classification and the quantification of morphological traits⁹. However, **the performance of these methods is strongly dependent on the availability and quality of curated image datasets** used for model training, a common bottleneck when implementing machine learning (ML) for ecological image automatic processing.

Provisional project schedule:

The post doc research is dealing with image acquisition, machine learning for automatic identification of species and traits of living benthic foraminifera. The objectives of the post-doc will be to:

1) Improve the development of automatic image acquisition of living benthic foraminifera using two methods: a low cost system based on 3D printer combined with a camera allowing to image the rose Bengal stained specimens AND a higher cost system based on automatic scanner coupled with an epifluorescent light allowing to image living specimens labelled with a fluorescent probe.

- 2) Train and validate Machine Learning algorithms based on an extensive qualitycontrolled labelled datasets at the species level for different study area of interest
- 3) Quantify key morphological traits
- **4) Apply** our automatic approach to several case studies in the context of a regulatory (WFD, MFSD) foraminiferal-based biomonitoring approach.

Expected results :

- development of automatic acquisition images using an automatic scanner coupled with epifluorescent light
- Various model of foraminifera identification
- Identification of morphological traits
- At least 2 scientific articles

Expected skills :

Knowledge :

<u>Know-how</u>:

Python language

Soft skills:

 New technologies based on machine learning

-Taxonomic identification of microorganisms particularly of benthic foraminifera
- Ecological knowledge of foraminifera

Qualifications

Candidate should have a PhD in marine biology/ecology or geology (micropaleontology for example).

Recruitment procedures and contact :

You must submit your CV, cover letter and doctoral degree by mail at : <u>christine.barras@univ-angers.fr</u> and emmanuelle.geslin@univ-angers.fr copy to : <u>recrutement@univ-angers.fr</u>

Deadline for applications: 28th June 2025 This job description is available until the closing date for applications. On that date, it will no longer be available on the website.

If needed, your contact for any further information: Christine Barras (E-mail: <u>christine.barras@univ-angers.fr</u>) or Emmanuelle Geslin (E-mail: emmanuelle.geslin@univ-angers.fr).

