

Job Title: Internal Research Fellow (PostDoc) in Tools + Instrumentation for Planetary Surface Exploration

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EUROPEAN SPACE AGENCY

Research Fellowship Opportunity in the Directorate of Human & Robotic Exploration Programmes.

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Post

Internal Research Fellow (PostDoc) in Tools + Instrumentation for Planetary Surface Exploration

This post is classified F2.

Location

EAC, Porz-Wahn, Germany

Our team and mission

You will be based at the European Astronaut Centre (EAC) in the CAVES & PANGAEA team.

EAC's task is to focus on the 'human' component of human spaceflight: astronaut selection, training, medical support and surveillance, as well as support for astronauts and their families in preparation for and during space missions to the International Space Station (ISS).

The CAVES & PANGAEA team specialises in training programmes that equip astronauts and mission developers with scientific, expeditionary and behavioural and skill sets for current and future space exploration. The group's primary output is focused around two training programmes:

- CAVES (Cooperative Adventure for Valuing and Exercising human behaviour and performance Skills) teaches astronauts human performance and behavioural skills for exploration tasks through an expedition into a natural cave system. Cave systems present environments and situations very similar to spaceflight, making them ideal for this type of training.
- PANGAEA (Planetary ANalogue Geological and Astrobiological Exercise for Astronauts) is a geological and astrobiological field training course for astronauts and mission developers. It develops fundamental knowledge and skills in these disciplines, as well as observational and decisional skills such as identifying important geological features in the field, conducting efficient sampling and effectively communicating with scientists on Earth.

The CAVES & PANGAEA team has been working on tools to support and enhance these training programmes as well as prepare for the next phases of human spaceflight. This has included the creation of the Electronic Field Book (EFB) tool suite for supporting scientific field activities. This tool suite includes software for recording scientific information in the field, interfaces with external instruments such as COTS spectrometers, 360° cameras, microscopes, and bespoke 3D printed hardware, and telecommunications capabilities for distributing information across mission support elements. The suite also includes a set of machine learning tools and databases being developed to enhance mineral recognition on the Earth Moon, Mars. This tools suite needs to be continually developed, maintained, deployed, tested and improved to support the CAVES and PANGAEA training programmes and testing campaigns.

Interested candidates are highly encouraged to visit the ESA website: www.esa.int and the CAVES & PANGAEA websites www.esa.int/caves www.esa.int/pangaea

Field(s) of activities/research

You will be integrated into the CAVES & PANGAEA project team and will be centred on the continued research and development of technologies supporting surface and subsurface planetary exploration using humans, as well as supporting the implementation of CAVES & PANGAEA. You will help mentor interns, YGTs and any other positions contributing to these projects.

You will be working on the following activities:

- Performing R&D in coordination with the CAVES and PANGAEA Team related to the development of electronic tools for geological field exploration as well as for subsurface exploration
- Contributing to advancing the EFB tool suite for CAVES & PANGAEA, and in coordination with industry for planetary exploration
- Supporting the execution of the CAVES & PANGAEA field training and analogue test campaigns, with focus on the EFB tool suite
- Teaching CAVES and PANGAEA trainees where appropriate

- Continuing to develop Machine Learning (ML) algorithms for recognition of planetary materials from multispectral datasets, and helping to integrate them into the EFB
- Writing academic publications related to these projects where appropriate
- Preparing documentation regarding changes and updates to software and hardware systems, and instructions on how to use them for non-specialists
- Preparing presentations and participating in meetings, workshops, projects and outreach activities promoting synergies and dissemination of knowledge
- Identifying and developing new innovative solutions to help support scientific field activities during both analogue campaigns and human exploration on planetary surfaces
- Analysing the current trends and developments in the space industry to identify opportunities for innovative and novel products for enhancing planetary surface exploration
- Participating in workshops and working meetings with other space agencies to define solutions for upcoming lunar surface activities
- Ensuring that the R&D is coordinated and aligned with ESA and European activities, including:
 - Technology roadmaps
 - Human & robotic exploration scenarios
 - Relevant other on-going R&D activities
 - Commercially available technologies and instrumentation

Technical competencies

Knowledge relevant to the field of research

Research/publication record

Ability to conduct research autonomously

Breadth of exposure coming from past and/or current research/activities

General interest in space and space research

Ability to gather and share relevant information

Behavioural competencies

Innovation & Creativity

Continuous Learning

Communication

Relationship Management

Self Motivation

Problem Solving

Cross-Cultural Sensitivity

Education

You should have recently completed, or be close to completion of a PhD in a related technical or scientific discipline.

Preference will be given to applications submitted by candidates within five years of receiving their PhD.

Additional requirements

R&D experience in one or more of the following domains: software engineering, machine learning hardware engineering

Proficiency in using MS Office packages

Skills and experience in one or more of the following will be assets:

- Programming languages, frameworks or engines: JavaScript, AngularJS, Java, CouchDB, HTML, Ionic, Cordova, Electron, REST paradigm
- Machine Learning: Python, TensorFlow, Keras, Scikit-learn, Numpy. Experience with C#, UWP and UNIX
- Hardware, telecommunications and prototyping: UNIX embedded boards or generic electronics (e.g. RaspberryPi, ESP32, Arduino), basics of OpenWRT and of routing and networking protocols such as the ones used in mesh networking.
- Experience in hardware assembling and CAD 3D design-printing and prototyping
- Mentoring and coaching students and trainees through technical projects

Specificities

The position of Research Fellow in at ESA's CAVES & PANGAEA Team is similar to a regular academic Post-Doc placement, with a few notable key differences:

1. The priority of the CAVES & PANGAEA Team is delivering training courses for astronauts. R&D carried out in the group is generally in the service of this goal. The group has delivered a series of publications associated with this work over recent years, but it is not the team's primary focus
2. CAVES & PANGAEA RFs have no teaching obligations in universities, but contribute to the training of CAVES and PANGAEA trainees. In addition, they will be involved in the mentoring of Young Graduate Trainees and interns within the team
3. CAVES & PANGAEA RFs become involved in a range of activities in addition to research, and are expected to work across the group's activities when required

4. CAVES & PANGAEA RFs are joining a diverse, changing and interdisciplinary team embedded in a large space agency, in contrast to a more specialised, focused research group with close or similar competences

Other information

For behavioural competencies expected from ESA staff in general, please refer to the [ESA Competency Framework](#). The Agency may require applicants to undergo selection tests.

The closing date for applications is 01 November 2020.

In addition to your CV and your motivation letter, please add your proposal of no more than 5 pages outlining your proposed research in the "additional documents" field of the "application information" section.

If you require support with your application due to a disability, please email contact.human.resources@esa.int.

Please note that applications are only considered from nationals of one of the following States: Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, and the United Kingdom. Nationals from Latvia and Slovenia, as Associate Member States, or Canada as a Cooperating State, can apply as well as those from Bulgaria, Cyprus, Lithuania and Slovakia as European Cooperating States (ECS).

Priority will first be given to candidates from under-represented Member States.

In accordance with the European Space Agency's security procedures and as part of the selection process, successful candidates will be required to undergo basic screening before appointment