Research Fellowship on Sample Analogue Development for ESA Exploration Missions

Directorate of Human Spaceflight and Robotic Exploration Programmes

ECSAT, Harwell, United Kingdom

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Introduction

E3P (European Exploration Envelop Program) defines the new Exploration program of the European Space Agency following the ministerial meeting in December 2016. E3P addresses seven key exploration topics:

- ISS,
- Human Exploration beyond Low Earth Orbit,
- Exomars,
- Lunar Resource Lander
- SciSpaceE (science on ISS and non ISS platform)
- ExPeRT (Exploration Preparation, Research and Technology)
- Commercial partnerships.

ExPeRT will in particular develop future exploration technology and also prepare new projects in human and robotic exploration for decision at the 2019 ESA council meeting at ministerial level.
ExPeRT will be able to capitalise on technology development activities from previous programs. In particular, within the frame of MREP (Mars Robotic Exploration Program), technologies and expertise related to analogues and sample receiving facilities have been initiated for potential mission framework like Mars Sample Return or Phobos Sample return.
The use of soil analogues is required for many on-going and future activities. **ESA²C (ESA Exploration Sample Analogue Collection)** was created to fulfil this need. The collection gathers a certain number of naturally occurring analogues (mainly originating from quarries) for Mars, Phobos or the Moon (moon analogues also exist at EAC, the European Astronaut Centre). In order to use and expand the collection, a curation facility is currently being developed. Presently hosted at the Natural History Museum (NHM), London, the curation facility will eventually move to the Harwell campus where **ECSAT** is located, benefiting from the multiple analysis capabilities already available on the campus as well as dedicated ones.
In parallel to the analogue capability, dedicated sample receiving technologies are being developed as a potential key European contribution on ground for any sample return scenario, with particular emphasis on Mars. Prototypes for a double wall isolator and haptics manipulation system will be available soon for further characterization. Analogue curation and sample return facilities are in many ways related, with a strong need of geological expertise.
ExPeRT will also benefit from the existing spaceship EAC model that develops operational ideas and low TRL technologies for lunar habitation. A similar concept will be developed eventually at ECSAT and strong synergy between the 2 entities is expected in the field of analogues, as well as field testing. ECSAT will build on the expertise of the spaceship EAC to develop its own spaceship specificities, based on the Harwell campus industrial and institutional components.

Overview of the field of research proposed

The research fellow shall work on the following topics:

(a) Research on new analogues for present and future missions

- Icy Analogues for future lunar missions
- Dedicated mixtures of existing analogues to create new ones
- Analogues based on advanced manufacturing processes and materials, in particular by developing the synergy with the ESA-RAL Advanced Manufacturing laboratory at Harwell.

(b) Operation and expansion of ESA²C and related curation facility

- To provide a key focus point for all requests related to ESA²C (i.e. towards the scientific community and public outreach)
- Carry out curatorial duties incorporating addition and acquisition of new samples entering the ESA²C and facilitate loans of samples to investigators
- Support the existing technology development activity led by NHM (Natural History Museum)for the development of the analogue curation facility and implementation in Harwell (frequent visits to the NHM)

(c) Support ExPeRT activities requiring or generating analogues, field tests:

- Request and advise on analogue materials
- Advise on best location for field tests for target applications
- Participation to field trials (ExoFit,...) as geological experts and in order to insure proper analogue collections for ESA²C
- Review of relevant documentation from technology development activities
- Participation to workshops and meetings when applicable.

(d) Sample receiving facility technologies:

- Support any on-going technology development activity (such as Double Wall Isolator, Remote manipulation system) by providing hands-on geologist expertise for sample manipulations.
- Further develop test program after delivery and installation of the prototypes on the campus
- Provide expert feedbacks to improve the system and contribute to the overall definition of a European sample receiving facility

(e) Spaceship ECSAT development

- To establish a dedicated link with the EAC spaceship
- Identify specific areas of interest for ExPeRT to further develop the spaceship concept at ECSAT, in particular with respect to the Harwell campus present and future capabilities.
- Support the early development and operation of the spaceship ECSAT

Who can apply

The programme is open to suitably qualified women and men. Preference will be given to applications submitted by candidates within five years of receiving their PhD.
The Research Fellow Programme is open to nationals of the following states: Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, and the UK, Slovenia as an Associate Member or Canada as a Cooperating State, Bulgaria, Cyprus, Latvia, Lithuania, Slovakia as European Cooperating States (ECS).

Required Qualifications

Applicants shall have completed their PhD or equivalent qualification in the field of geology or related field. Experience in laboratory for characterization of physical, chemical and mineralogical rock or soil properties is required. Recognized experience in planetary sciences (Mars, Moon , Phobos) and/or curation process is a considerable asset.

The Research Fellow will be part of a small team of engineers at ECSAT and he will frequently interact with and visit the laboratories of the NHM (London Natural History Museum). To this extent the candidate should be able to work with high autonomy in a diverse and multi–cultural environment and show high degree of autonomy and initiative. A demonstrated ability to think outside the box, an innovative mind and intellectual curiosity toward different engineering and scientific domains are critical to this role. The ability to drive others and initiate new ideas is also a key to the position.

How to Apply

Please fill in the online application form attaching to it, in one document only, your CV, your motivation letter and your research proposal.

Candidates must also arrange for up to three letters of reference to be sent by e-mail, before the deadline, to temp.htr@esa.int. The letters must be sent by the referees themselves. The candidate's name must be mentioned in the subject of the email.

Applications satisfying the general conditions for eligibility, to be submitted by 12 May 2017, will be evaluated and successful applicants will be invited for an interview.

Interested candidates are highly encouraged to visit the ESA website: www.esa.int.