

## **Research Fellowship in Life Support Systems**

### **Directorate of Technical and Quality Management**

### **ESTEC, Noordwijk, The Netherlands**

### **ESA/RF-ESTEC(2015)018**

#### **Overview of the Division's mission**

The Mechatronics and Optics division provides support for space projects and executes technology developments in the areas of Optics, Opto-electronics, Automation and Robotics and Life and Physical Sciences Instrumentation and Life Support Systems. Within this frame, the Life and Physical Sciences Instrumentation and Life Support Section, is in charge of R&D activities deployment in the areas of instrumentation for life and physical sciences as well as of life support systems for space missions.

#### **Overview of the field of research proposed**

The MELiSSA system has been conceived by ESA to be the European model for Micro-Ecological Life Support System Application. MELiSSA is a five compartment ecosystem based on micro-organisms and higher plants, aiming at the regeneration of atmosphere and water as well as food production to support the crew-members during long term space missions. The higher plants play an essential role in MELiSSA due to their multiple regenerative functions. Indeed, they assimilate CO<sub>2</sub> and produce O<sub>2</sub>, food, and recycle water. The water represents by far the largest mass and its recycling is therefore a necessity for extended stay.

The use of the higher plant to recycle the water is one of the technical possibilities, which remains to be investigated in a systemic manner both on ground and in space. As a matter of fact, little is known on the impact of environmental conditions (e.g. air flow, relative humidity) on water movement mechanisms (i.e. in, across and out of the plant). Therefore, it is proposed to investigate the combined effect of air-flow and relative humidity on the water flow pathway of a selected crop specie (e.g. soybean, wheat, lettuce). In particular:

1. Morphological traits: organ size/shape and above/below ground architecture;
2. Anatomical traits: characterization of the pattern of the hydraulic system throughout the plant (number and size of different conduit element types, cell wall properties, etc.), proportion among tissues, stomata size and frequency, mesophyll characterization (cell density, indexes for carboxylation and gas exchange efficiency);
3. Physiological parameters linked with the efficiency of the photosynthetic process and on the anti-oxidant capacity due to scavenging activity (analysis of D1 protein, rubisco content, quantification of enzyme markers for scavenging activity such as Ascorbate peroxidase APX);
4. Plant water balance in the defined environmental conditions through modelling of transpiration and water uptake based on real-time data

### **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, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, and the UK, or Canada as a Cooperating State, Bulgaria, Estonia, Hungary, Latvia, Slovakia and Slovenia as European Cooperating States (ECS).

### **Required qualifications**

Applicants must have recently completed their PhD studies in Plant Sciences. Previous experience in the MELiSSA project is an asset.

Applicants should have good analytical and communication skills and should be able to work in a multi-cultural environment in an autonomous manner.

Applicants must be fluent in English and/or French, the working languages of the Agency. A good proficiency in English is required.

### **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 6 May 2015**, 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](http://www.esa.int).