PhD Thesis offer : Biologically inspired autonomous solar tracker made with 4D printed shape-changing materials for lunar environment.

Context : ESA (European Space Agency) is looking for innovative ideas on enabling technologies for in-situ construction, manufacturing and maintenance of infrastructure, to support long term human exploration of a planetary body. Efforts towards human exploration beyond Earth are seeing a remarkable resurgence, with an increasing number of robotic missions to the surfaces of the Moon and Mars and plans to send humans to these destinations in the near future. Such objectives can only be realized with the appropriate infrastructure to support human presence in a sustainable manner. This includes infrastructure to shield the crew and equipment from environmental conditions or generate energy. Solar tracker systems[1] belong to solution that improve efficiency of solar panels. However they are mainly designed with electro-mechanical actuators that are prone to failure and maintenance.
In the context of AAP **"Out of Earth Manufacturing and building"** from ESA, we have proposed to design and manufacture novel 4D printed architectured composite materials that are able to actuate autonomously in lunar environment. Their microstructure and working principle will be inspired from sunflower *Helianthus annuus*.

We propose a PhD position driven by IRDL UMR CNRS (Univ UBS-Lorient), PIMM (ENSAM-Paris) and ESTEC-ESA (Noordwijk, the Netherland). The work will be mainly achieved in Lorient and Paris. Several investigations will be done ESA-ESTEC as well as in ACCIS (Bristol).

The research project includes :

- A design step with biomimicry and computer aided design
- Material selection according to space specifications
- A manufacturing step using 4D printing of composites
- Testing of the materials under various space environment.

Skills and knowledges : We are looking for a student with a Master 2 or from an engineering school with high skills in the field of material sciences (polymers and composites) and mechanical engineering. The student must be curious, open to the various disciplinary aspects of the project. Additive manufacturing skills are also required as well as fluent English.
The contract should extends over a period of 36 months from october 2020 if the fund applications are accepted (answers in July).

Required documents (deadline = 1rst June 2020:
- CV + Motivation letter
- Certificate of the M2 manager mentioning the average writing, the rank, the size of the promotion,
- Transcripts
- Recommendations letters

Salary :

1800 euros net/month

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[1] https://en.wikipedia.org/wiki/Solar_tracker