Training Opportunity for Irish Trainees

Reference	Title	Duty Station
IE-2018-SCI-OOX(1)	**Adapting areas of a large scientific analysis package using Python**	**ESAC**

Overview of the unit's mission:

The XMM-Newton Science Operations Centre (SOC) at ESAC is responsible for:

- Handling of Announcements of Opportunity and proposals for observations of the XMM-Newton X-ray mission, including technical evaluation and support to the Time Allocation Committee.
- Long- and Short-Term planning of observations, including instrument handling, calibration observations and Targets of Opportunity.
- Scientific calibration and analysis software development.
- Pipeline processing and data distribution.
- Scientific users support.

Overview of the field of activity proposed:

XMM-Newton is the European Space Agency (ESA) X-ray space observatory, aimed at studying the most energetic cosmic phenomena, from black holes to the origin of the Universe.

The XMM-Newton Science Analysis System (SAS) is a software package dedicated to the reduction, calibration and analysis of the scientific data collected with the XMM-Newton instruments. As such, SAS has been used by astronomers worldwide in more than 5500 refereed scientific publications, contributing to the high mission success. Moreover, the SAS also represents the core of the Pipeline Production System (PPS), the source of all official mission products.

The development of SAS started in a highly distributed manner two decades ago. Since then it has been maintained and further developed to cope with new requirements, to adapt to the evolution of instruments in space and to new observation and analysis techniques. Not only instruments have evolved in 20 years, but also computer operating systems, libraries and 3rd party software packages have experienced enormous changes to which the SAS needs to adapt. As of today, a small team centralised at ESAC is taking care of the whole system.

One of the current main challenges of the team is to ensure the longest possible life to the analysis package after the end of the mission, even if this mission end is not yet on the horizon. In this context, a migration to Python, language of choice in the modern astronomy, of certain important areas of the SAS is seen as fundamental to this purpose. The areas to migrate comprise all the graphical output area as well as the interactive scripting area. The postholder will participate actively in this migration, working within the team of software specialists at the XMM-Newton SOC.

In the course of this project, the Trainee will gain deep real-world experience in the challenges of software development and maintenance within an evolving environment and be able to contribute to tools, which will be used by astronomers for many more years to come. She or he will also learn about data analysis techniques, scientific uses of X-ray satellites and the challenges and procedures of operating a space mission. This project would be a strong stepping stone for anyone interested preparing themselves for involvement for future X-ray satellites like ATHENA.

Required education:

Master's degree in science or engineering discipline
Programming experience with Python is required; demonstrable experience with developing scripts or graphical output would be helpful.
Experience with X-ray, especially XMM-Newton, analysis would be desirable.
A basic astrophysical background is desirable, but not required.