

# **Gaia Project Team Scientists**

**at**

## **Mullard Space Science Laboratory, University College London**

### **CONTEXT**

These posts are within the Astrophysics Group ([www.mssl.ucl.ac.uk/www\\_astro/](http://www.mssl.ucl.ac.uk/www_astro/)) in the Department of Space and Climate Physics ([www.mssl.ucl.ac.uk](http://www.mssl.ucl.ac.uk)) at Mullard Space Science Laboratory. For administrative purposes the Department is part of the UCL Faculty of Mathematical and Physical Sciences (MAPS). The post-holders will report to Prof Mark Cropper.

UCL is one of the leading multi-faculty universities in Europe. It has a long and distinguished tradition having been founded in 1827 as the original University of London. It was the first English university to admit students without regard to their religious affiliation, and the first to admit women and men on equal terms. UCL has excelled in both physical sciences (it had the first teaching laboratory for physics in an English university and four of the elements were discovered at UCL) and biomedical sciences (and is now the heart of one of the largest biomedical research complexes in Western Europe). Eighteen Nobel prizes have been awarded to its staff or graduates and twenty faculty members are currently on the ISI *Most Highly Cited* list. It was recently ranked as the 4<sup>th</sup> best university in the world by the Sunday Times. The College currently has more than 3,800 academic and research staff and 18,000 students, more than a third of whom are postgraduates. Although part of the federal University of London, the College has a very high degree of financial and managerial autonomy, and its annual income is in excess of £600 million.

Mullard Space Science Laboratory is the Department of Space & Climate Physics at UCL ([www.mssl.ucl.ac.uk](http://www.mssl.ucl.ac.uk)) and is located on its own campus in the beautiful Surrey Hills, surrounded by woodland. MSSL is the UK's largest university space research group. Space science is a discipline that demands highly innovative technologies and MSSL has an international reputation for excellence in this area. UCL was one of the first universities in the world to become involved in making scientific observations in space. Since MSSL was established in 1966, we have participated in over 35 satellite missions with the European Space Agency, NASA (US), Japan, Russia, China and India, and flown over 200 rocket experiments. The total staff complement is approximately 140, of which are 35 academic staff, fellows and postdocs. We have the unique capability of designing, building and testing instruments and other spacecraft systems on site. Our research scientists and development engineers work together to ensure that the instruments we produce are as relevant as possible and that the subsequent data analysis benefits from a fundamental understanding of the instruments' individual responses. MSSL has more than a dozen instruments operating in orbit, addressing science in astronomy/astrophysics, Solar and space plasma physics. Current projects undergoing hardware development in the astronomy/astrophysics area include Herschel (ESA), JWST (NASA) and *Gaia* (ESA).

The Astrophysics group has a coherent, strategic programme of astronomy research where we exploit the data provided by astrophysics facilities in which we have made a key investment (*XMM-Newton*, *Swift*, Herschel), and which supports our hardware involvement and scientific exploitation of future key space astrophysics facilities (*JWST* and *Gaia*, and the Euclid and PLATO missions under study for ESA's Cosmic Vision programme). For this reason, our astrophysics programme is multi-wavelength, multi-facility, and makes the best of both ground-based and space-based instrumentation. We have a strong theoretical element to complement our observational research with theoretical research and modelling.

MSSL has a significant role in ESA's *Gaia* project. The *Gaia* mission will unravel the dynamical and chemical evolution of the Galaxy. It combines 15  $\mu$ arcsec astrometry with photometry and spectroscopy to provide full 6-D phase space motions for 1.5 billion stars, together with luminosities, abundances and gravities, and will transform our knowledge of how the Galaxy was formed and how it has evolved. It will also discover thousands of new extragalactic objects, supernovae, exoplanets and Solar system bodies. MSSL has a hardware role in *Gaia*, and is responsible for the major science workpackages in the spectroscopic part of the *Gaia* data flow system, a survey on an unprecedented scale of  $10^8$  stars measured  $\sim 40$  times each.

## **JOB DESCRIPTION**

### **Job Title**

Gaia Data Flow System Scientist

### **Department**

Department of Space & Climate Physics, Mullard Space Science Laboratory, University College London.

### **Grade**

Research Grade 7 (salary in the range £28,839 to £35,469). The appointment level will be commensurate with accomplishment and experience.

### **Reports to**

Prof Mark Cropper.

### **Summary of Job Function**

The post holders will be key members of the MSSL team developing scientific data processing software for the *Gaia* Data Processing and Analysis Consortium (DPAC). (S)he will provide the scientific expertise and leadership required to develop optimal algorithms for determination of radial velocities from the *Gaia* spectroscopic data in order to maximise the science return. In particular (s)he will support the main MSSL workpackages of spectral extraction, calibration and the determination of the final mission-integrated radial velocities. The post holder will also be responsible for designing the tests that will prove the correct functionality of the algorithms once they have been implemented in the operational code and assist in the scientific aspects of the verification. He/she will specify data required to support the testing, and where necessary, carry out simulations to generate it.

## **Main Duties and Responsibilities**

The post-holders will be expected to:

- Provide scientific expertise within the team of software-developers at MSSL that are developing operational data processing chains for Radial Velocity Spectrograph (RVS) data from *Gaia*.
- Develop optimal algorithms for spectral processing of *Gaia* RVS data.
- Document detailed specifications for implementation of algorithms in software.
- Design and specify complete testing scenarios to validate the operational software which implements the scientific algorithms.
- Specify and simulate test data sets to support algorithm testing.
- Justify the algorithm design and validation process to scientific colleagues and peers.
- Represent scientists' interests within the development team in order to maximise the science return within the operational constraints.
- Review and, where necessary, write supporting documentation for MSSL's *Gaia* software development.
- Liaise with UK and international *Gaia* science teams
- Interface with the *Gaia* calibration teams
- Contribute to reports and presentations on MSSL *Gaia* activities at team and consortium meetings.
- Pursue a research programme in the structure and evolution of our Galaxy, other galaxies and related fields.

## **Special working conditions**

The post-holders will be required to travel to various European *Gaia* consortium institutes to represent MSSL at consortium meetings and to visit and to support and attend other scientific meetings or workshops as requested by the MSSL *Gaia* PI, Prof Cropper. The post holder may from time-to-time be required to work out of hours.

## **Contacts**

The post holders will be required to interact frequently and effectively with other local and international team members.

## **Other conditions**

The post holders will be required to actively follow UCL policies including 'Equal Opportunities', attend staff meetings and training as required, maintain an awareness of Fire and Health & Safety Regulations, carry out any other duties as are within the scope, spirit and purpose of the job, the title of the job and the grading as requested by the line manager or Head of Department. This job description reflects the present requirements of the posts. As duties and responsibilities change and develop, the job description will be reviewed and be subject to amendment in consultation with the post-holders.

## **PERSON SPECIFICATION**

### **Knowledge**

*Essential:* Familiarity with astronomical imaging, and spectroscopic and photometric techniques.

*Desirable:* Familiarity with issues related to space-based instrumentation, such as calibration.

*Desirable:* Understanding of software development cycles, and software testing in particular.

*Desirable:* Scientific expertise in a branch of observational astrophysics (a background in survey work would be advantageous).

### **Skills**

*Essential:* A demonstrated grasp of issues involving the development and validation of new algorithms for processing data from scientific instruments in space.

*Essential:* Good written and oral communication skills (working language is English).

*Desirable:* Working knowledge of one or more of the following: IDL, Java, Perl, C, Fortran 90/95, shell scripts, object-oriented concepts.

### **Aptitude**

*Essential:* Good interpersonal abilities and proven capability to work collaboratively.

*Essential:* Proven record of ability to manage time and work to strict deadlines.

### **Previous experience**

*Essential:* Research at PhD level.

*Essential:* Experience with scientific algorithm design, coding and verification.

*Desirable:* Experience of data simulation.

*Desirable:* Experience of working collaboratively within project (ideally space-based projects).

*Desirable:* Experience analysing data from space-based observatories.

*Desirable:* Research in astrophysics.

*Desirable:* Experience of working on international projects and/or with international agencies.