Research Fellowships in Space Science

Directorate of Science

European Space Agency, ESTEC (NL) and ESAC (E)

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Overview of the ESA Science Faculty's mission

As part of their mandate, the Scientific Support Office at ESTEC and the Science Operations Department at ESAC conduct research programmes covering many areas of Space Science. These research activities are coordinated and carried out by the ESA Science Faculty, a body made up by the scientists in both places. Research Fellows are encouraged to participate in these programmes, which are led by the scientific staff (with the appropriate engineering, technical and administrative support). Research fellows have no additional functional duties nor are they involved in support activities for ESA missions, but they are encouraged to take an active part in the scientific life of the establishments.

The research projects proposed by applicants for an ESA Fellowship should be related to ESA's scientific missions, to the space research programmes of the ESA member states or to the scientific activities of the ESA Science Faculty. A brief summary of the research activities carried out by Faculty members can be found on the ESTEC faculty research and ESAC faculty research pages or at the research programme overview page. Candidates should consult these pages to identify which of the two centres offers the best overlap with their research programmes and to identify one or more staff members who could act as mentors. While certain research programmes can be pursued at both centres, in most cases the location of the mentor defines where a fellowship can be held.

Overview of the fields of research proposed

A more detailed list of research activities and the contact persons can be found on the dedicated fellowship website.

SOLAR PHYSICS, HELIOPHYSICS AND SPACE PLASMA PHYSICS

- studying the physics of the Earth's magnetosphere using data from the Cluster, Double Star and Themis missions as well as from any other relevant facility. Topics of interest include magnetic reconnection, magnetospheric boundary layers, plasma transfer processes, ULF waves, polar cusp and inner magnetospheric dynamics
- studying the plasma environment of solar system bodies using data from all relevant planetary missions
- work on a number of topics in solar physics using data from SOHO, TRACE, Hinode or any other relevant facility. Topics of interest include studies of the structure and dynamics of the solar corona, chromoseismology, modeling of photospheric and coronal magnetic fields, and helioinformatics (development of advanced techniques for data assimilation, visualisation, and browsing)
- study of plasma physics through X-ray high-resolution spectroscopy of active stars

PLANETARY SCIENCE

- work on a number of topics on comparative planetology, including geology, impact craters, spectroscopy/mapping, water on Mars, planetary rings, atmospheres, ionospheres, meteors and astrobiology, with emphasis on the use of data from the Mars Express, Venus Express, Smart-1, Cassini-Huygens, Demeter, Bepi Colombo and Chandrayaan-1 missions as well as from other relevant facilities
- support the scientific preparation of the ExoMars rover mission with regards to early Mars (Noachian) surface and atmospheric history and landing site selection activities, with emphasis on the use of morphologic and spectral data from Mars Express and Mars Reconnaissance Orbiter, via interaction with the ExoMars rover instrument teams and with MEX and MRO investigators
- investigation of minor bodies in the solar system, including the Martian moons, to understand their formation and evolution in the frame of planetary system formation, using data from Rosetta, Herschel, other space missions and ground-based observations
- investigation of asteroids, cosmic dust and planetary discs, with space-based and ground-based observations and numerical models, to better constrain the orbital dynamics and physical and chemical properties of these objects.
- investigate the physics and chemistry of terrestrial planets and minor bodies through numerical modelling of their interior and near surface layers in order to better understand their formation and thermal evolution
- petrology and astrobiology analysis of mineral and organic samples exposed in Earth orbit or from Moon-Mars-planetary simulated

ASTROPHYSICS: STARS AND PLANETS

- study of stellar populations, star formation in the local group, pre-main sequence stars, the and dynamical evolution of stellar clusters, the properties of their initial mass function and its relationship with the physical conditions of the environment, using UV, optical and IR data from space (HST) and ground-based (VLT)
- observational studies of galactic star-forming regions (Orion, Carina, etc.), including low-mass stars, brown dwarfs, circumstellar discs, jets, and outflows, as well as field brown dwarfs, using X-ray, optical, and IR data from ground-based telescopes (VLT, VISTA, UKIRT) and space-based facilities (Chandra, Spitzer, and ultimately JWST
- study of young high-mass star-forming regions with observations from Spitzer, Herschel, and ground-based
- understanding the evolution of massive stars and star clusters using ground- and space-based facilities to study the most massive stars stars in the Galactic Center, 30 Doradus (the Tarantula Nebula) and beyond; including proper motion searches for walkaway, runaway and hyper-velocity stars
- Multi-wavelength studies of massive stars (using XMM, HST, Herschel, VLT, and others) with abroad science objectives which include understanding the phyics of massive stars, their formation and evolution, interaction with their environment and impact on the Universe. We are also interested in techniques which enable discovery and exploitation of astrophysical archives
- Multi-wavelength study of disc evolution and exo-planet formation with observations from Spitzer, Herschel, WISE, SDSS, AKARI with potential follow-up of transitional discs from major ground-based observatories (GTC, VLT, ALMA and others)
- observational and theoretical work on debris discs around stars using existing space- and ground-based observations, including data from Herschel and ongoing ground-based submillimetre observations
- studies linked to the scientific yield of the Gaia mission, in particular structure and evolution of open clusters, OB associations or star forming clouds in the Gould Belt, using astrometric, photometric or spectroscopic
- characterisation of the far-infrared properties of stars in the transition phase from the asymptotic giant branch to the planetary nebula stage through the analysis of data taken by the Herschel space observatory; search for new transition sources using WISE all-sky survey data at mid-infrared wavelengths, complemented with AKARI data obtained at mid- and far-infrared wavelengths, and data taken by other space facilities using Virtual Observatory techniques [
- study of plasma physics through X-ray high-resolution spectroscopy of active
- research on X-ray binaries (black holes and neutron stars), emission mechanisms, physics of accretion, activity timescales, X-ray bursts
- X-ray studies of Classical Novae in outburst

ASTROPHYSICS: GALAXIES AND INTERSTELLAR MEDIUM

- studies of the galactic interstellar medium using observations from the all-sky surveys by Planck
- Observational studies of large organics in space (such as fullerenes and polycyclic aromatic hydrocarbons PAHs) using interstellar spectroscopy
- investigating the nature of nuclear star clusters and their connection with active galactic nuclei and supermassive black holes, using optical, IR and sub-mm data from space (HST) and ground (VLT, IRAM) facilities
- X-ray spectroscopic studies of acretion processes onto supermassive black holes in Active Galactic Nuclei, and of nuclear activity feed-back onto the host galaxy environment on various scales (pc to kpc)
- study of morphology and complexity of the diffuse interstellar medium in the Galactic plane and in star-forming clouds of the Gould's Belt, using data from Herschel large-scale surveys
- studies of X-ray emission components in nearby spiral galaxies (diffuse and point-like) including extra-planar halo emission and the environment of cluster galaxies
- studies of the Galactic Centre, especially Sgr A* and the Central Molecular Zone

FUNDAMENTAL PHYSICS

- development of LISA Pathfinder data analysis algorithms and methods, with the goal of extending this work to future low frequency gravitational wave detectors, such as eLISA
- work on the development of algorithms and methods for gravitational wave data analysis and work related to future gravitational observatories
- work on applications of atomic quantum sensors (atomic clocks, atom interferometers, etc.) to fundamental physics studies in

INSTRUMENTATION

- preparatory work in support of the JUICE mission to analyse and model the local Jovian environment, especially concerning the energetic radiation and its effects on the mission and scientific payloads, using data from previous Jupiter missions and ground-based observations together with various environment models of Jupiter and its moons and radiation transport tools such as Geant4

Required qualifications

Applicants must have completed their PhD (or equivalent), or be about to complete it, with the means of performing research in space science. Applicants should have good analytical and communication skills and should be able to work in a multi-cultural environment in an autonomous manner and as part of a team.

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

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

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.
For your research proposal, you are encouraged to use a MS-Word template that can be downloaded here.

http://www.cosmos.esa.int/documents/13627/359849/Research+Proposal+Form+%28new+2016%29.docx/fb07025f-2f60-4618-a7ec-d1e423a014f8

Candidates must also arrange for up to **three letters of reference** to be sent by e-mail, before the deadline, to the **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 **29 October 2016**, 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.