

## The Astronomy Department of the University of Geneva (UNIGE) and its Exoplanet Team

### About the Astronomy Department

The Department of Astronomy of the University of Geneva (UNIGE) is located on the commune of Versoix, 15 km from the Geneva city center. The main buildings (l'Observatoire) are in the forest on the site of Sauverny, 5 km from the town of Versoix. Another site, Ecogia, closer to town hosts most of our space developments. Grounded in 1772 as the Geneva Observatory the institute became the Department of Astronomy of UNIGE in 1973.

Today, a group of approximately 150 people are employed, including scientists, PhD candidates, students, technical staff (computer and electronics specialists, mechanics), as well as administrative staff.

The Astronomy Department manages a permanent astronomical observation station: a 1,2 m telescope on the site of La Silla (ESO, Chile). Observations are also regularly obtained with the other ESO facilities, from the 1.93m telescope on the site of St-Michel (Observatory of Haute Provence, OHP, France), and from La Palma (Canary Islands, Spain).

### Astronomy Department Research Overview

Research in the Department of Astronomy is described according to the [Roadmap for Astronomy in Switzerland 2007-2016](#) four main themes:

- [Exoplanetary systems](#)
- [Stars formation & evolution](#)
- [Galaxies & Universe](#)
- [Extreme Universe](#)



Main Building of the Astronomy Department in Versoix/Genève

## Research at the Exoplanetary Group

The discovery of planets orbiting other stars (exoplanets) has been one of the major breakthroughs in astronomy of the past decades. The main interests in the field undoubtedly now reside in the detection and **characterisation** of solid planets, to constrain the physical and atmospheric conditions at the planet surface, and to search for possible tracers of life in their atmospheres.

Today, more than 3000 established planetary companions are known to orbit stars of **spectral types from F to M**, most of which are giant gaseous planets due to limitations in our detection techniques. In the course of these discoveries, our understanding of planetary formation has had to integrate several new peculiar characteristics, leading us to continuously re-examine the statistical properties of the derived orbital elements and stellar-host and planet characteristics, in search of constraints for the different planet formation and evolution scenarios.

In the past decade, we have experienced a new breakthrough in the field with the detections of light, solid (rocky/icy) planets. A large population of Neptune-mass and super-Earth planets, outnumbering gaseous giants in planetary systems, has emerged from the observations (radial velocity, transit, microlensing). This is also in agreement with the predictions of planet formation models based on the core accretion paradigm (bottom-up building of the planets, starting from dust). From these discoveries, we learned that planetary systems may differ substantially from ours, in mass, composition, distance scale, orbital eccentricities, and global system architecture. The main surprise was the huge diversity of outcome Nature is able to provide and the most exciting prospect is the hint of existence among them of a large number of planets similar to ours (at least in size, mass and good position in the system, i.e. not too close, not too far from their Sun to be amenable for life).

The activities in the domain of exoplanets at the Astronomy Department cover the detection and characterisation of exoplanets, mainly based on an **observational approach**, pushing the development of a **work-class instrumentation on the ground and in space**, associated to well tailored observing programmes.

### NCCR "PlanetS"

The Astronomy Department UNIGE is co-leading with colleagues from the University of Bern the **NCCR "Planet S"** (National Center of Competence in Research). Established by the Swiss National Science Foundation in June 2014, the NCCR "PlanetS" brings together researchers from the Universities of Bern (Leading House), Geneva (co-Leading House), and Zürich as well as of the ETHs Zürich and Lausanne. It is structured in research projects and platforms that provide the long-term structuring elements of the NCCR. Through the involvement of the Astronomy Department, the artist will have possibilities to interact with researchers of the NCCR "PlanetS".

The discovery in 1995 of the first giant planet outside our solar system by Swiss astronomers spawned a unique revolution in modern astronomy. Since then, the progress has been such that the field is now shifting from an era of discovery to one of physical and chemical characterisation. The NCCR "PlanetS" allows responding to this shift by providing an interdisciplinary research programme dedicated to the study of the origin, evolution, and characterisation of planets.

