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## Swiss space telescope CHEOPS: Rocket launch set for 17 December 2019

The space telescope CHEOPS is scheduled to begin its journey into space on Tuesday, December 17th on board a Soyuz rocket from the European Space Agency (ESA) in Kourou, French Guiana. CHEOPS is a joint mission of ESA and Switzerland, led by the University of Bern, in collaboration with the University of Geneva.

CHEOPS (short for **CH**aracterising **ExO**Planet **S**atellite) consists of a space telescope developed and assembled by the University of Bern, in collaboration with the University of Geneva (UNIGE), and a satellite platform that carries the telescope and allows the control of the satellite from the ground. CHEOPS, which will be operated by the University of Geneva, is the first mission jointly run by Switzerland and ESA. The mission serves to study exoplanets by observing the stars around which the planets orbit. CHEOPS will measure the minuscule changes in brightness which occur when a planet passes in front of its host star. These changes being proportional to the surface of the transiting planet, CHEOPS will allow to measure the size of the planets. The mission targets stars which are orbited by planets with dimensions ranging from Earth-like to Neptune-like with the goal to obtain the most precise possible measurement of their size. This data, together with available information about the masses of the planets, will provide their mean density. This means that scientists will be able to obtain key information about the bulk composition and structure of these planets – for example, whether they are predominantly rocky or made up of gases, or whether there are deep oceans on them. In turn, this is a decisive step for determining the probability of these planets to be habitable.

### "Every rocket launch is a sensitive moment"

In August 2019, CHEOPS passed the last tests at Airbus in Madrid. Willy Benz, astrophysics professor at the University of Bern and principal investigator of the CHEOPS mission, says: "After over six years of intensive work, I am of course very pleased that the launch is finally in sight." CHEOPS is now expected to start its journey into space on board a Soyuz rocket on Tuesday, December 17th, 2019, shortly before 10 a.m. in our time zone (6 a.m. local time). The multinational company Arianespace is responsible for the rocket launch. CHEOPS will start its journey into space together with a satellite which belongs to the Italian Cosmo-SkyMed satellite program. The carrier rocket will also have five small satellites, so-called "CubeSats" on board. Willy Benz will travel to Kourou with a Swiss delegation, including the 2019 Nobel Prize in Physics Didier Queloz, Professor at the Universities of Geneva and Cambridge, for the launch. "A rocket launch is always

a delicate and stressful moment where quite a few things can go wrong. In addition, poor weather conditions could also prevent the launch which is set very close before Christmas", explains Willy Benz.

After the launch, it will take approx. 140 minutes until CHEOPS leaves the rocket and orbits the earth at around 700 km height. The first data is expected at the beginning of 2020. While the CHEOPS Mission Control Center is based in Madrid, the CHEOPS Science Operations Center is in Geneva, the second Swiss partner university of the experiment. David Ehrenreich, CHEOPS Mission Scientist at the at the Observatory of the Faculty of Science of the UNIGE, says: "I too will only really be able to sleep peacefully again once CHEOPS has reached its orbit and is fully functional."

The mission presents an excellent opportunity for scientists world-wide, explains Kate Isaak, ESA Project Scientist: "With twenty percent of the observing time available through the ESA-run Guest Observers Programme, scientists from around the world will be able to capitalise directly on the unique capabilities of CHEOPS."

The launch of CHEOPS is a great moment for everyone involved, but in particular for Switzerland as well, as David Ehrenreich highlights: "CHEOPS was developed thanks to good collaboration between Swiss universities, led by the University of Bern and the industry – this shows once again that Switzerland is a space faring nation."

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**CHEOPS – in search of potential habitable planets**

The CHEOPS mission is the first of the ESA's newly created "S-class missions" (small class missions with an Agency budget under 50 million) and is dedicated to characterizing exoplanets' transits. "CHEOPS" (CHaracterising ExOPlanet Satellite) will take highly accurate measurements of stars and monitor small changes in their brightness that are caused by a planet transiting in front of the star.

CHEOPS was developed as part of a partnership between the European Space Agency (ESA) and Switzerland. Under the leadership of the University of Bern and ESA, a consortium of more than a hundred scientists and engineers from eleven European states was involved in constructing the satellite over five years. A Soyuz rocket will take the research satellite together with a larger Italian radar satellite in Earth orbit at 700 km altitude.

The Swiss Confederation participates in the CHEOPS telescope within the PRODEX programme (PROgramme de Développement d'EXpériences scientifiques) of the European Space Agency ESA. Through this programme, national contributions for science missions can be developed and built by project teams from research and industry. This transfer of knowledge and technology between science and industry ultimately also gives Switzerland a structural competitive advantage as a business location – and enables technologies, processes and products to flow into other markets and thus generate added value for our economy.

More information: [www.cheops.unibe.ch](http://www.cheops.unibe.ch)

### **Bernese space exploration: With the world's elite since the first moon landing**

When the second man, "Buzz" Aldrin, stepped out of the lunar module on July 21, 1969, the first task he did was to set up the Bernese Solar Wind Composition experiment (SWC) also known as the "solar sail" by planting it in the ground of the moon, even before the American flag. This experiment, which was planned and the results analysed by Prof. Dr. Johannes Geiss and his team from the Physics Institute of the University of Bern, was the first great highlight in the history of Bernese space exploration.

Ever since Bernese space exploration has been among the world's elite. The numbers are impressive: 25 times were instruments flown into the upper atmosphere and ionosphere using rockets (1967-1993), 9 times into the stratosphere with balloon flights (1991-2008), over 30 instruments were flown on space probes, and with CHEOPS the University of Bern shares responsibility with ESA for a whole mission.

The successful work of the [Department of Space Research and Planetary Sciences \(WP\)](#) from the Physics Institute of the University of Bern was consolidated by the foundation of a university competence center, the [Center for Space and Habitability \(CSH\)](#). The Swiss National Fund also awarded the University of Bern the [National Center of Competence in Research \(NCCR\) PlanetS](#), which it manages together with the University of Geneva.

### **Exoplanet research in Geneva: 24 years of expertise awarded a Nobel Prize**

CHEOPS will provide crucial information on the size, shape, formation and evolution of known exoplanets. The installation of the "Science Operation Center" of the CHEOPS mission in Geneva, under the supervision of two professors from the [UniGE Astronomy Department](#), is a logical continuation of the history of research in the field of exoplanets, since it is here that the first was discovered in 1995 by [Michel Mayor and Didier Queloz, winners of the 2019 Nobel Prize in Physics](#). This discovery has enabled the Astronomy Department of the University of Geneva to be at the forefront of research in the field, with the construction and installation of [HARPS](#) on the ESO's 3.6m telescope at La Silla in 2003, a spectrograph that remained the most efficient in the world for two decades to determine the mass of exoplanets. However, this year HARPS was surpassed by ESPRESSO, another spectrograph built in Geneva and installed on the VLT in Paranal.

CHEOPS is therefore the result of two national expertises, on the one hand the space know-how of the University of Bern with the collaboration of its Geneva counterpart and on the other hand the ground experience of the University of Geneva supported by its colleague in the Swiss capital. Two scientific and technical competences that have also made it possible to create the [National Center of Competence in Research \(NCCR\) PlanetS](#).