

Rosetta-Alice spectrograph to begin close up ultraviolet studies of comet surface and atmosphere

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The Alice ultraviolet imaging spectrometer will be the first to study a comet up close. The shoebox-sized instrument is one-third to one-half the mass of comparable UV instruments, yet with more than 10,000 times as many imaging pixels as the spectrometer aboard Galileo. Credit: Southwest Research Institute

After a 10-year journey that began in March 2004, the European Space Agency's Rosetta comet orbiter has its sights set on comet 67P/Churyumov-Gerasimenko. The orbiter's payload, including the Alice ultraviolet (UV) spectrograph developed by Southwest Research Institute (SwRI), is poised to begin the first orbital and closest-ever observations of a comet.

Alice begins its science mission in June to probe the origin, composition and workings of the comet, gaining sensitive, high-resolution compositional insights that cannot be obtained by either ground-based or Earth-orbital observations. Along with other Rosetta instruments, Alice begins a mapping campaign of the comet's surface in August. Spectrographs split or disperse light—ultraviolet light, in Alice's case—from objects into wavelengths for later analysis.

"Alice has successfully checked out and been calibrated after its long journey and hibernation. Soon it will spend hundreds of days in orbit around Churyumov-Gerasimenko, analyzing the composition of its atmosphere, mapping its surface, and studying the properties of fine dust particles coming off the comet. It will be the first ultraviolet spectrograph ever to examine a comet," says Dr. Alan Stern, Alice principal investigator and an associate vice president of the SwRI Space Science and Engineering Division.

The shoebox-sized, high-tech Alice is a highly miniaturized UV imaging spectrograph with more than 1,000 times the data-gathering capability of instruments flown a generation ago, yet it weighs less than 4 kilograms and draws just 4 watts of power. A sister Alice instrument developed by SwRI and launched aboard the New Horizons spacecraft to Pluto in January 2006 to study that distant world's atmosphere will reach Pluto in July 2015.

"During the long cruise phase, we were able to exercise Alice and make

scientific observations of a couple distant comets as well as during flybys of Earth, Mars and the two asteroids Steins and Lutetia," says Dr. Joel Parker, Alice deputy principal investigator and director of the SwRI Planetary Science Directorate. "Those experiences show that Alice and our operations and science teams are ready for the prime mission when we arrive at comet Churyumov-Gerasimenko in a few months."

Alice is one of three instruments funded by NASA flying aboard Rosetta. SwRI also built and will operate Rosetta's Ion and Electron Sensor (IES), another instrument with miniaturized electronic systems. With a mass of 1.04 kilograms, IES achieves sensitivity comparable to instruments weighing five times more.

To reach its comet target, the Rosetta spacecraft experienced four gravity assists (three from Earth, one from Mars) and a nearly three-year period of deep space hibernation, waking up in January 2014 in time to prepare for its rendezvous with Churyumov-Gerasimenko. Rosetta also carries a lander, Philae, that will drop to the comet's surface in November 2014, attempting the first-ever direct observations of a [comet](#) surface.

"The Rosetta investigation is designed to provide an unprecedented window into both the origin of comets and the way comets work," says Stern.

Rosetta is an ESA mission with contributions from its member states and NASA. Rosetta's Philae lander is provided by a consortium led by DLR, MPS, CNES and ASI. Airbus Defense and Space built the Rosetta spacecraft. NASA's Jet Propulsion Laboratory (JPL) manages the U.S. contribution of the Rosetta mission for NASA's Science Mission Directorate in Washington, under a contract with the California Institute of Technology (Caltech). JPL also built the Microwave Instrument for the Rosetta Orbiter and hosts its principal investigator, Dr. Samuel

Gulkis. Southwest Research Institute (San Antonio and Boulder, Colo.) developed the Rosetta orbiter's Ion and Electron Sensor and Alice instrument and hosts their principal investigators, Dr. James Burch (IES) and Dr. Alan Stern (Alice).

Provided by Southwest Research Institute

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