Philae Phones Home Again with

BIG NEWS!

By Henry M. Holden

IN THE January edition of World Airnews, we reported that "Science Fiction Becomes Science Fact – Almost," with the ten-year, four-billion-mile journey to the comet 67P/Churyumov-Gerasimenko, (67P) by the European Space Agency's (ESA) spacecraft Rosetta, and its probe Philae.

The landing was bumpy with Philae bouncing three times on the rugged surface. After coming to rest under a rock outcropping, it was denied the sunlight it needed to function. It transmitted 57-hours of data before going silent when Philae's batteries died.

Philae was pre-programmed to carry out a number of experiments as soon as it landed following a seven hour descent from the mother ship. One was to "sniff the air" so that experiments COSAC (Commentary Sampling and Composition) and Ptolemy could determine the chemical make-up of the gas and dust being given off by the comet.

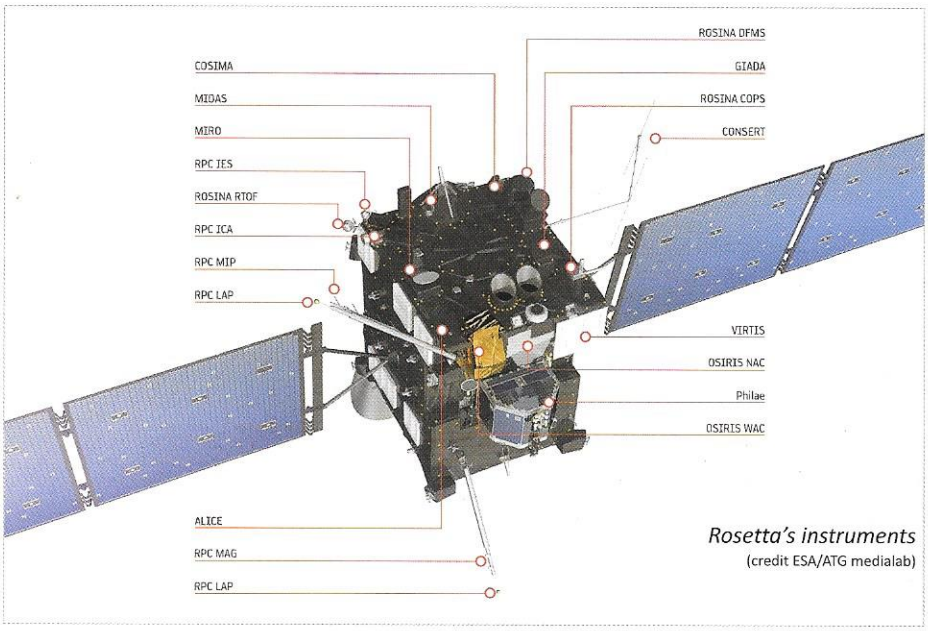
Philae first woke up on June 13, after seven months of silence on the comet's surface. At that point scientists had not reviewed the data, and some scientists speculated that there may be single-celled extremophile life present on the comet. The probe again went silent on June 24, greatly disturbing the mission controllers.

Project scientists knew there were problems with the probe's transmitters, and contact was lost again.

Then after a 15-day silence, Philae had a 20-minute "conversation" with ground control via its mother ship Rosetta, in orbit around the comet.

The good news is that the comet is tearing towards the Sun, travelling at about 31 kilometres (19 miles) per second allowing Philae's batteries to warm up and recharge. Since then Philae has called home eight times, French space agency CNES reported.

And this time Philae has phoned home with Big News, and what may be its own "Rosetta Stone" with its potential to decipher the origins of Earth. The eighth contact was the longest yet, with an uninterrupted 12 minutes, reported the CNES, which allowed the downloading of critical data obtained from Philae's probing of its alien world.



Rosetta's instruments
(credit ESA/ATG medialab)

WHAT'S BEEN FOUND SO FAR

Comets have always been a good place to go looking for the origins of life in the universe. They are considered the most unspoiled artefacts of the early solar system — condensing out of the cosmic cloud that formed the sun and the planets, but remaining in the deep freeze of deep space for most of their very long lives, meaning that their chemistry has not changed much over time.

A startling discovery has added fresh evidence to suggest that it is possible that life on Earth could have been kick-started by a comet strike.

The ESA, which is leading a consortium that includes NASA, announced that the mission to explore Comet 67P has discovered organic compounds, described as "carbon and nitrogen-rich."

The gas-sniffing instruments Ptolemy analyzed sampled ambient gas entering tubes at the top of the lander and detected the main components of coma gases – water vapour, carbon monoxide and carbon dioxide, along with smaller amounts of carbon-bearing organic compounds, including formaldehyde.

Some of the compounds play a key role in the pre-biotic synthesis of amino acids, sugars and nucleon bases: the ingredients for life. For example, formaldehyde is implicated in the formation of ribose, which ultimately features in molecules like DNA, according to the ESA.

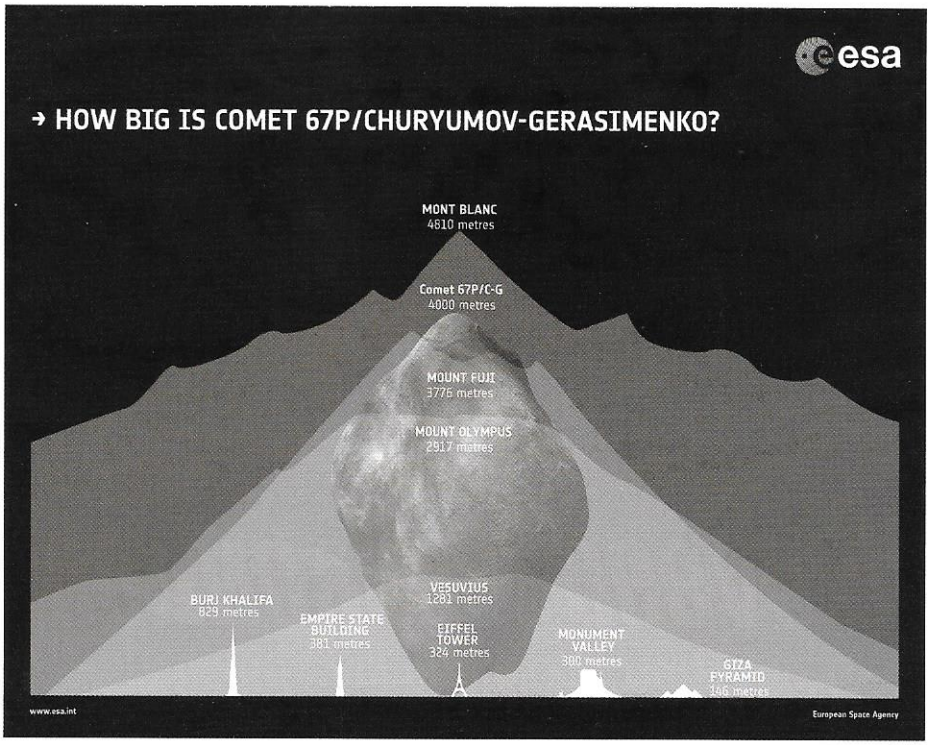
The existence of such complex molecules in a comet, a relic of the early Solar System, imply that chemical processes at work during that time could have played a key role in fostering the formation of pre-biotic material.

Philae found several organic molecules including four never before detected on a comet, which are important building blocks of life.

In total, 16 compounds have been identified from six classes of organic molecules, including alcohols and amino acids. They have also discovered the composition of the comet is not what scientists thought it was.

Comets are frozen balls of dust, ice and gas left over from the Solar System's formation some 4,6-billion years ago, and scientists had expected to find objects held together by ice, but instead they found complex organic molecules formed at the birth of the solar system.

"Taken together, these first pioneering measurements performed on the surface of a comet are profoundly changing our view of these worlds and continuing to shape our impression of the history of the Solar System,"



This illustration shows the relative scale of the comet that ESA's Rosetta and Philae spacecraft is exploring "up-close and personal" Diagram of Comet 67P compared to terrestrial landmarks. Diagram: ESA

said Jean-Pierre Bibring, a lead lander scientist and principal investigator of the Compact Infrared and Visible Analyzer (CIVA) instrument at the IAS in Orsay, France.

TAKING A CLOSER LOOK

Rosetta has been flying in orbit alongside the comet and recently orbited at an altitude of around 26 kilometres (16 miles). Mission controllers want to pin down Philae's location on the comet.

Meanwhile, ESA tweeted that Rosetta passed just six kilometres (less than 4 miles) above the surface of comet 67P and is sending back the never before seen up close photos of a comet.

Some experts believe that comets smashed into our infant planet, providing precious water and the chemical building blocks for life.

Commenting on the findings, lander system engineer, Laurence O'Rourke, said it was an important discovery. "If you apply energy to such organic compounds ... like a comet hitting a planet ... it could lead to the creation of amino acids which make up proteins, which are the basis of life itself," he said.

AN IMPORTANT LANDMARK

The mission approached an important landmark called perihelion, a point in its orbit where it is closest to the sun, about 185-million km (115-million miles). Comet 67P, Rosetta and Philae, are travelling at nearly 75 000 miles per hour and came closest to the Sun on August 13. Then 67P swung around and began its outward journey. This comet returns every 6,5 years.

As the comet approaches the sun, increasing solar energy will warm up the frozen ice, turning it to vapour.

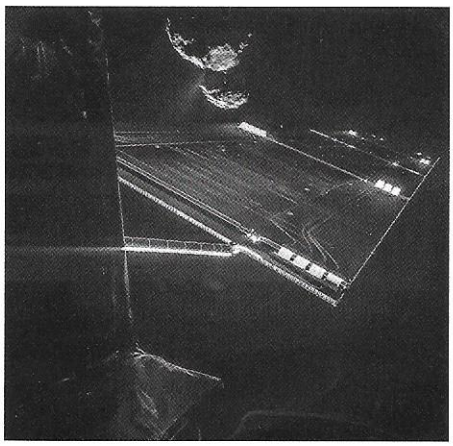
The ESA's website explains that the gases drag away the comet's dust, appearing as a tail extending sometimes hundreds of thousands of miles into space.

"Perihelion is an important milestone in any comet's calendar," said Matt Taylor, an ESA Rosetta project scientist.

"Perhaps even more so for the Rosetta mission because this will be the first time a spacecraft has been following a comet from close quarters as it moves through this phase of its journey around the Solar System. Scientifically it is an opportune moment because it is during a comet's brush with the solar fires that it lights up and becomes most chemically active."

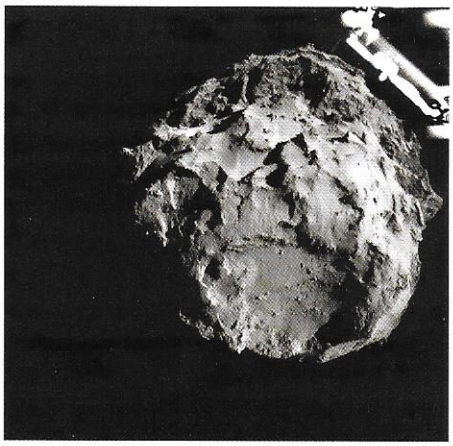
But even if Philae goes silent again, it will have already done its job. It made an improbable journey, landed in an improbable place and has sent home at least some of the scientific knowledge it was built to collect. No matter what Philae does next, it is destined to be a permanent part of the comet.

The mission has now been extended to September 2016, when the Rosetta orbiter will most likely land on the surface of the comet, the ESA says. →



Using the Compact Infrared and Visible Analyzer (CIVA) camera on Rosetta's Philae lander, the spacecraft has snapped a 'selfie' at comet 67P at a distance of about 50 km from the comet, and captures the side of the Rosetta spacecraft, and one of Rosetta's 14 m-long solar wings, with 67P in the background. Photo: ESA/Rosetta/Philae/CIVA

This image was taken by Philae's Lander Imaging System, ROLIS, 3,1 km from Comet 67P at 14:38:53 GMT on November 12, 2014. The image measures 3,4 km across and the image scale is 3,3 m/pixel. Part of Philae's landing gear can be seen at top right.



This detailed image reveals the granular texture of the comet's surface down to the cm scale, with fragments of material of diverse shapes, and random orientations seen in clusters or alone. The regolith in this region is thought to extend to a depth of 2 m in places, but seems to be free from very fine-grained dust deposits at the resolution of the images.