ROSETTA FACTSHEET

"Rosetta is the sexiest space mission that has ever been."
Matt Taylor, ESA Rosetta mission scientist (August 2014)

After a decade long chase through the solar system… Rosetta has arrived!

- The Rosetta probe has chased its target comet for over six billion kilometres.
- Its journey involved three fly-bys of Earth, one of Mars and two close encounters with asteriods - Steins and Lutetia.
- It went into deep-space hibernation from July 2011 to 20th January 2014.
- On the 6th August 2014, Rosetta successfully began its manoeuvres to go into orbit just 100km above the surface of the comet.
- Rosetta is the first space probe that will follow a comet to see how it changes while approaching the Sun and soft land on the surface of a comet nucleus.

The Rosetta mission will unlock the mysteries of the oldest, most primitive building blocks of our Solar System - Comets.

- Rosetta is now mapping the surface using its NAVCAM and the high resolution OSIRIS narrow-angle camera, hunting for the best spot for landing.
- Rosetta's other instruments are measuring the gases and dust coming from the comet's surface and how the comet interacts with the solar wind
- The landing site has to balance terrain against being in good sunlight for its cameras and solar cells.
- Scheduled for 11th November, a small robot lander called Philae (pronounced "Fie - lie") will detach from Rosetta and descend onto the surface of the comet.
- Deployed 1km from the surface of the comet, the Philae lander will take 2 hours to gently reach the surface.
- The gravitational pull of the comet is several hundred thousand times weaker than on Earth. To avoid bouncing back into space after touch down, Philae has two harpoons that can reel it in and ice screws on each foot.
- Philae's engineers have had to allow for landing on a surface as hard as granite or as soft as shaving foam as we know so little about comet nuclei.

Comet 67P/Churyumov-Gerasimenko

Pronounced: "Churr- roo - mov - Gerra - see – menka" … or "Comet 67P/C-G"!

- Comet 67P/C-G is a short period comet 4 kilometres in diameter. It takes 6.6 years to orbit the Sun, moving at speeds up to 135,000 km per hour.
- It will pass through perihelion (come closest to the Sun) on 13th August 2015.
- The nucleus is a contact binary. Its shape has been likened to a rubber duck. It has been estimated that the comet shape originated when 2 smaller, unequally-sized objects came together at about 3 metres per second.

"It is the most crazy bonkers superstar comet in the solar system."
Professor Mark McCaughrean, Senior Advisor to ESA's Science Directorate (August 2014)

Why are we doing this?

- Comets have inspired and terrified humans for millennia.
- There are billions of comets in our Solar System but they are very poorly understood. We have only recently come to understand their origins.
- Those origins suggest that comets are time capsules, consisting of primordial chunks of ice and rock from when the solar system formed 4.6 billion years ago.
- To unlock the time capsule we need to look up close!

- In-depth analysis of the comet will provide information to understand the origin and evolution of the solar system.
- We will gain new insights into how planets (including Earth) form.
- The Philae lander has a unique ability to drill for samples below the comet surface. Its Ptolemy instrument, designed by The Open University and RAL Space, will take the samples and analyse the chemical composition and abundance of cometary ices. The Ptolemy instrument is an important UK contribution to the mission.
- The isotopic abundances in the cometary ices may provide evidence for the origins of our oceans. Detection of chirality in the organic substances may suggest possible origins of life on Earth.
- We don't expect to find life on the comet, but if we find complex organic molecules that played a crucial role in the evolution of life on Earth, perhaps life on Earth began with the help of comets? And if so…

where else might comets have seeded life !?

RESOURCES

Make a comet!

2 cups of crushed Dry ice	Large Mixing bowl
½ litre of Water	Large mixing spoon
½ cup of fine sand & coal dust	Thick plastic bin liner
a dash of ammonia	Tray to display final comet
a splash of Worcestershire sauce	Cryogenic gloves
Suitable containers for storage	Safety goggles
Mallet for crushing dry ice	Kitchen/Blue roll

Please produce your own risk assessments for this demonstration.

- Line a large mixing bowl with a large plastic sheet (cut from thick bin liner)
- Add the dirt (for example a mixture of fine sand and coal dust), Organic material (Worcestershire sauce or corn syrup) and a dash of ammonia to your bowl.
- Pour in at least half a litre of water and stir.
- Adds 2 cups of CRUSHED dry ice.
- Squeeze mixture together inside the bag. Allow any trapped gas to escape. As if forming a snowball, allow the comet to bind into a solid mass.
- As soon as the ball holds together, reveal to the audience. Point out any areas of outgassing. If you leave for investigation, the comet will become a crater-filled ice ball as the carbon dioxide sublimes.
- Remember – Rosetta will tell us so much more about real comet ingredients!

'Hook up with Rosetta' campaign.

Ecsite Space Groups has sent an invitation to all museums and science centres to organise activities and events for the Rosetta Mission.

Participants are provided with a ready to use kit which includes exhibition modules and children's workshops (free for Ecsite members).

http://www.ecsite.eu/activities_and_resources/resources/join-european-campaign-esas-rosetta-mission

Build 3D models

- Build your own paper model of Rosetta: http://www.esa.int/spaceinimages/Images/2014/07/Build_a_Rosetta_model
- Build a model of the Rosetta spacecraft with details of its different instruments: http://sci.esa.int/rosetta/31389-3d-model/
- If you have access to a 3D printer, here is a model of Rosetta for 3D printing: http://nasa3d.arc.nasa.gov/detail/eoss-rosetta

Images / Video suggestions for Download

Please click on image to visit download page

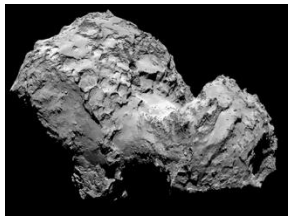
Exhibition panels

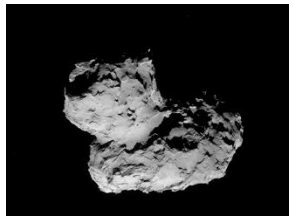
A set of nine panels and one backdrop give an overview of the Rosetta mission.

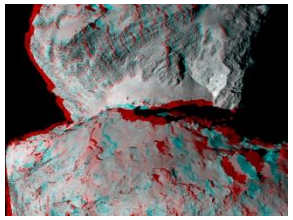
A mini-exhibition can be produced from the high-resolution pdf files:

New Comet images – visit the link for up-to-date images! *Credit: (as specified)*

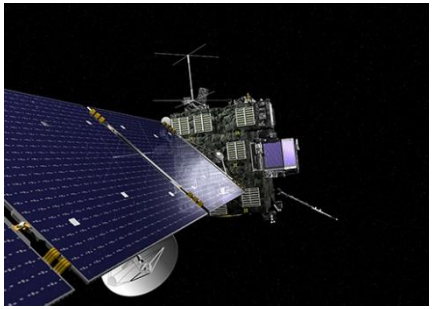
http://www.esa.int/spaceinimages/Missions/Rosetta/(class)/image

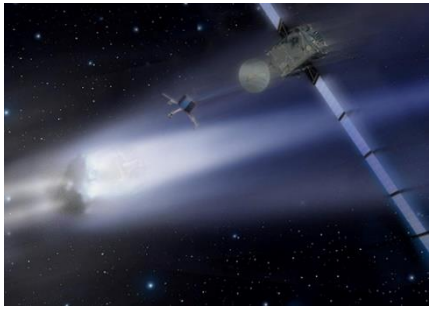






Artist Impressions of Rosetta and Philae *Credit: (as specified)*





Philae Touchdown (mp4) *Credit: ESA/ATG medialab*

The ESA animation shows the expected touch-down process.

Links to further information

- Beautiful short animations for the Rosetta Mission: http://www.open.ac.uk/science/research/rosetta/multimedia/once-upon-time
- Future outreach resources plus a 20min film using LEGO to describe the mission: *http://www.open.ac.uk/science/research/rosetta/outreach*
- "Comet-chasing Rosetta's Interplanetary Travel Diary is Awesome" (Attila Nagy) A useful summary with great images selected by ESA of the journey. http://space.io9.com/comet-chasing-rosettas-interplanetary-travel-diary-is-1443966429/@AnnaleeNewitz
- A good review of the rendezvous by the Planetary Society: http://www.planetary.org/blogs/emily-lakdawalla/2014/08060249-were-at-the-comet-rosetta.html
- A nice article by Phil Plaitt on the structure, with interesting speculation: http://www.slate.com/blogs/bad_astronomy/2014/08/14/close_up_of_67_p_has_rosetta_found_evidence_for_a_calving_event.html
- The National Space Academy are due to produce Rosetta resources for teachers for September. Keep an eye on: http://www.open.ac.uk/science/research/rosetta/uk-contribution/educators/national-space-academy
- Showcasing and celebrating the UK's involvement http://rosetta.ac.uk
- ESA sites for Rosetta and 'Rosetta. Rendezvous with a comet' http://sci.esa.int/rosetta/
- http://rosetta.esa.int/
- http://blogs.esa.int/rosetta/
- https://twitter.com/ESA_Rosetta
- www.facebook.com/rosettamission