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Exploring Comet 67P through art and science

by Ekaterina Smirnova

67P

art project, Ekaterina Smirnova

/ **Rosetta**

space mission, ESA

In November 2014 for the first time in history a robotic probe was landed on a comet, 67P/Churyumov–Gerasimenko. The data received by the Rosetta mission of the European Space Agency inspired Ekaterina to create a set of artwork of the comet.

Enriching H2O with D2O via electrolysis

It was discovered that water on this comet (ice) is very different from the water on Earth. In her studio the artist generated water that is similar in composition to the water found on 67P by concentrating the level of HDO, using electrolysis (blog). She uses this water to paint the artwork.

Rosetta's ROSINA instrument finds Comet 67P/Churyumov-Gerasimenko's water vapour to have a significantly different composition to Earth's oceans.

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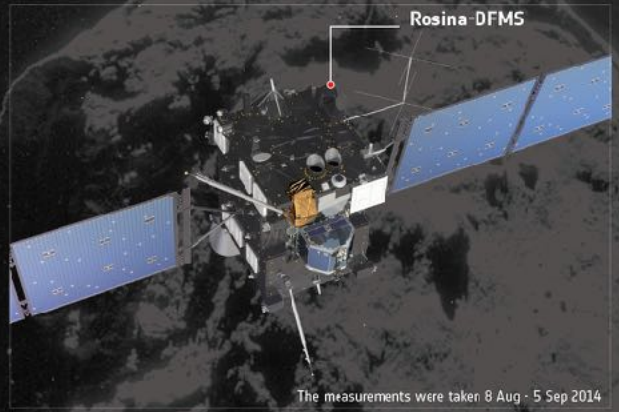
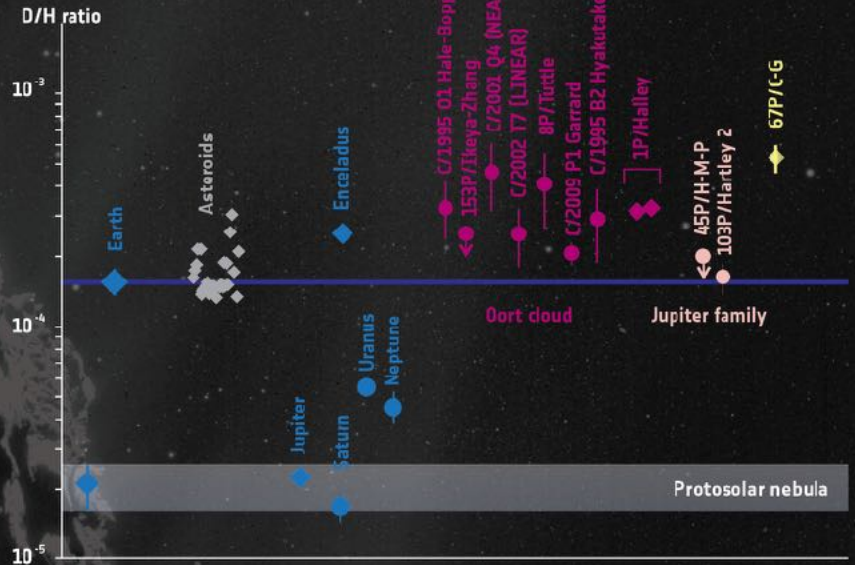
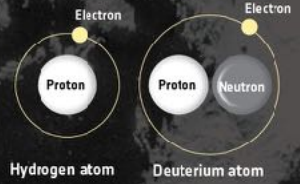




The ratio of deuterium to hydrogen in water is a key diagnostic to determining where in the Solar System an object originated and in what proportion asteroids and comets may have contributed to Earth's oceans

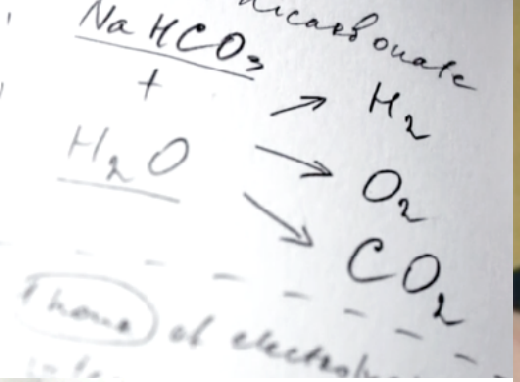


D/H ratio for different Solar System objects, grouped by colour as planets and moons (blue), chrondritic meteorites from the Asteroid Belt (grey), comets originating from the Oort cloud (purple) and Jupiter family comets (pink). Comet 67P/C-G, a Jupiter family comet, is highlighted in yellow. ◆ = data obtained in situ ● = data obtained by astronomical methods

www.esa.int

Spacecraft: ESA/ATG medialab; Comet: ESA/Rosetta/NAVCAM; Data: Altwegg et al. 2014 and references therein

European Space Agency


NaHCO3
+
H2O
H2
O2
CO2

Through art Ekaterina studies a relationship between humans and the Universe, understanding the connection, the influence and the effect on each other. She pays close attention to the achievements of scientists in Space study. That's why Rosetta mission is very important to Ekaterina.

The paintings are based on the photography taken by the instruments on board of the spacecraft (OSIRIS, Nav. cam.). The focus of these paintings is the water of the comet, which helps to understand how water came to Earth. To paint the comet’s jets of vapor Ekaterina uses a splashing technique, vaporizing watercolor paint before it hits the paper, this allows her to create an effect of mist, little droplets of water streaming with a strong force to the dark vacuum of space. Painting most of the work without touching paper with a brush, with 30 to 40 layers, helps to achieve complex textures on the painting.

50th ESLAB Symposium

"From Giotto to Rosetta"

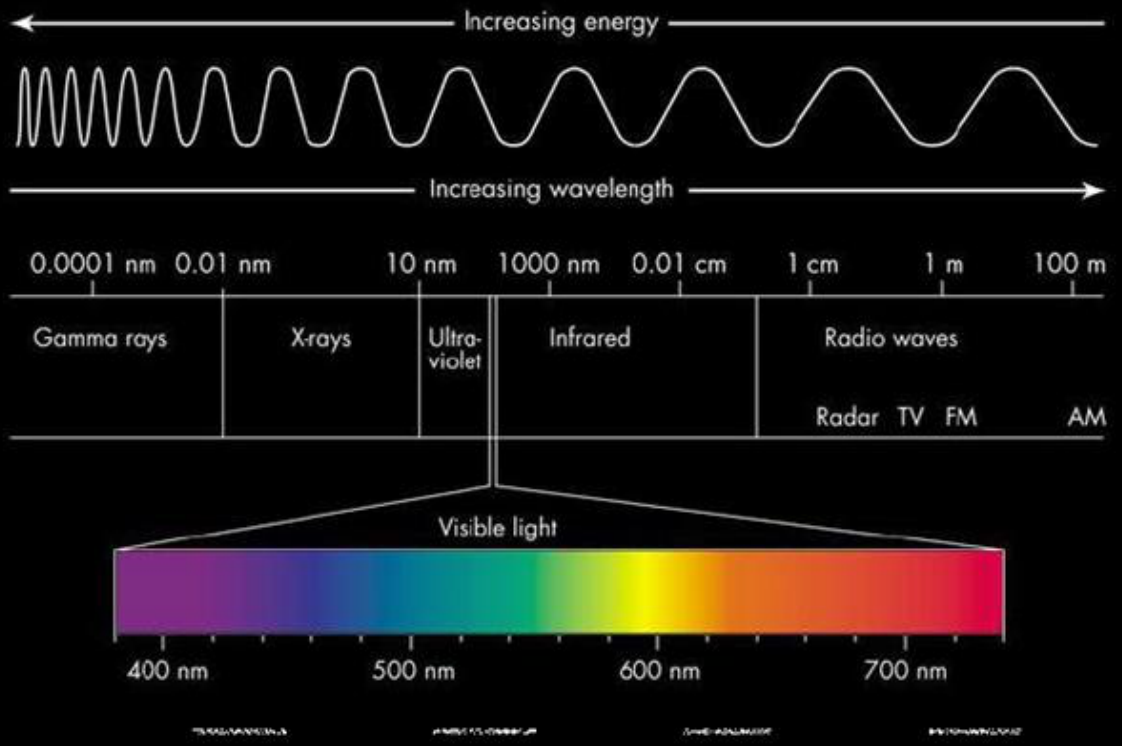
March 2016

Leiden, The Netherlands

Augmented Reality

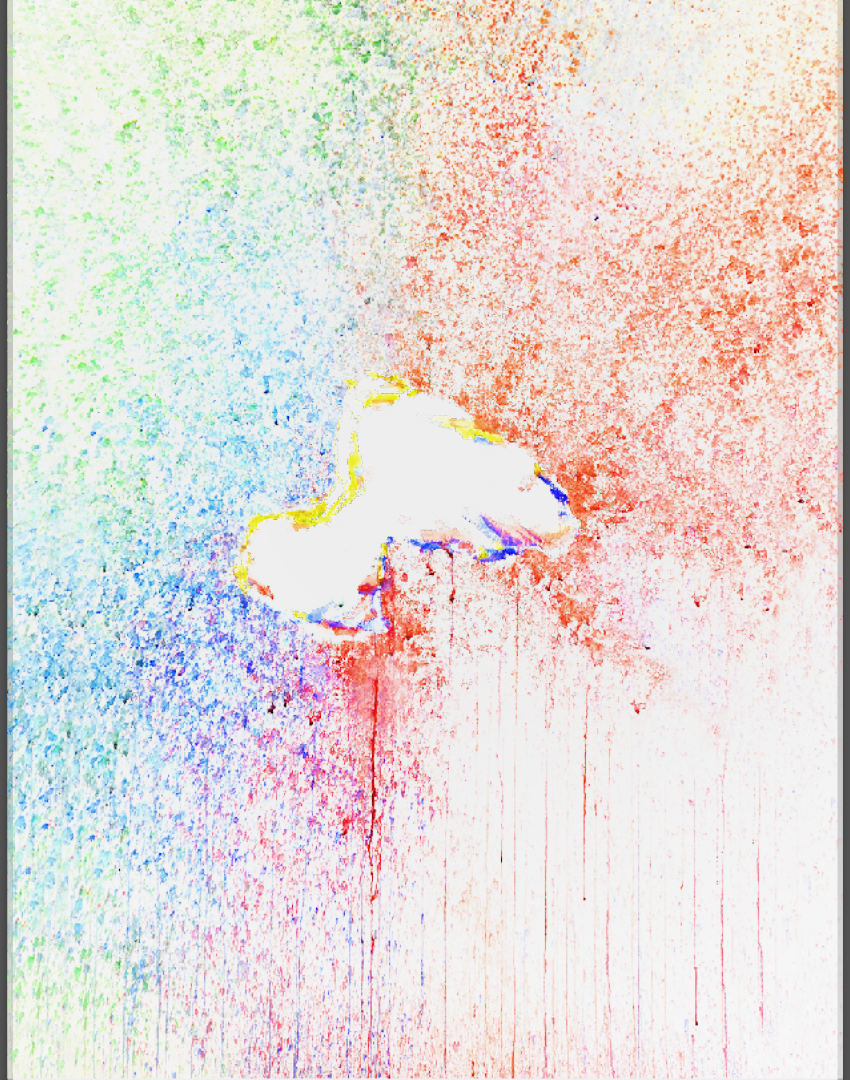
Ekaterina implemented augmented reality (AR) into the artwork. AR was inspired by the spectroscopic data of OSIRIS, an instrument onboard the Rosetta spacecraft. The viewers were invited to experience a virtual colorful layer on top of the paintings, representing RGB data. A special AR app could be uploaded for free to viewers smart device and by directing that device to the paintings viewers would be able to view an additional image, as well as to hear sound.

As an artist Ekaterina has a goal to represent the scientific research in an artistic way, while explaining to the audience the complexity and the vast variety of the data gathered during each mission. By including the AR into the project the artist was trying to show that some data could only be viewed via special instruments, in Rosetta's case it is the Optical, Spectroscopic, and Infrared Remote Imaging System (**OSIRIS**), in the viewer’s case it is a cellphone.



OSIRIS spectroscopy:

R=882nm G=649 nm B=480nm




DPS/EPSC 2016

Ceramic sculptures

A series of ceramic sculptures were created as a part of the 67P project.

The white cones represent the water on the comet found in the shape of ice. The cones also represent the water vapor when the comet gets into the active stage while approaching Sun.

67P. Singing Comet

Music/video/art collaboration

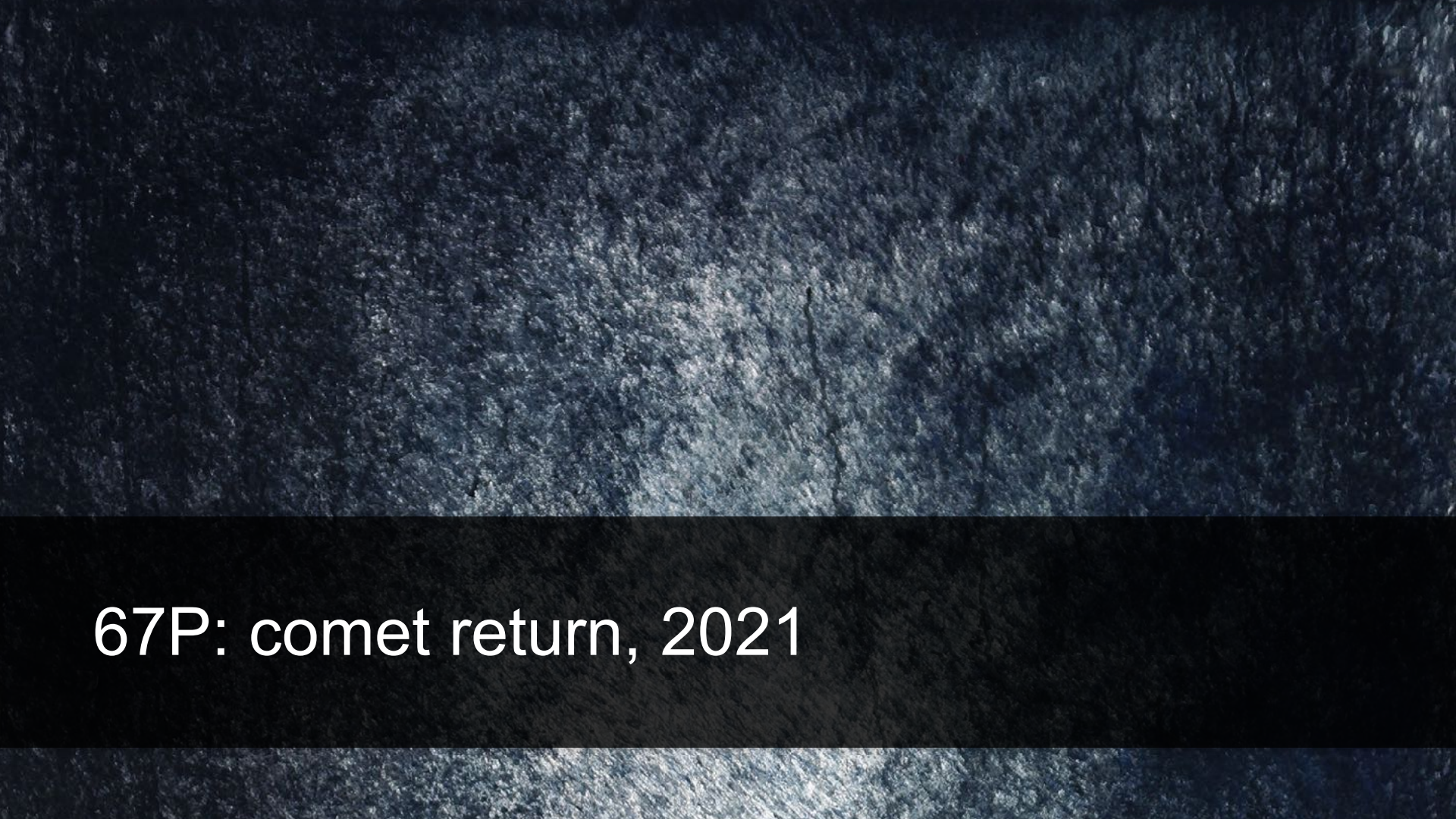
In collaboration with Lee Mottram (clarinetist, Wales), Takuto Fukuda (composer, Japan) and Brian Hekker (video editor, New York) a unique atmospheric piece was created. The music composition is both abstract and representational. At the end of the arrangement they present you the sound of the ocean tide, suggesting the importance of water to us, as living creatures, which possibly arrived on our planet via comets. Ekaterina invited Lee Mottram to her art studio to play clarinet at the same time that she was painting the 67P series. They extemporaneously created independent works, feeding off of each other's expression of sound and color. In the sound studio, Takuto Fukuda created an Electro-Acoustic composition, electronically manipulating the performance by the clarinetist and fusing it with other sounds such as the artist's heartbeat and water. With their music piece, they tell the story of comets visiting our Solar System, repeating their cycle, curving around the Sun and releasing water to form their tails. The video piece, edited by Brian Hekker and synchronized to the music, invites you to enter the world of creative thinking, spontaneity, repetitions and reverses.


Lee Mottram, Wales

Comet smell cards

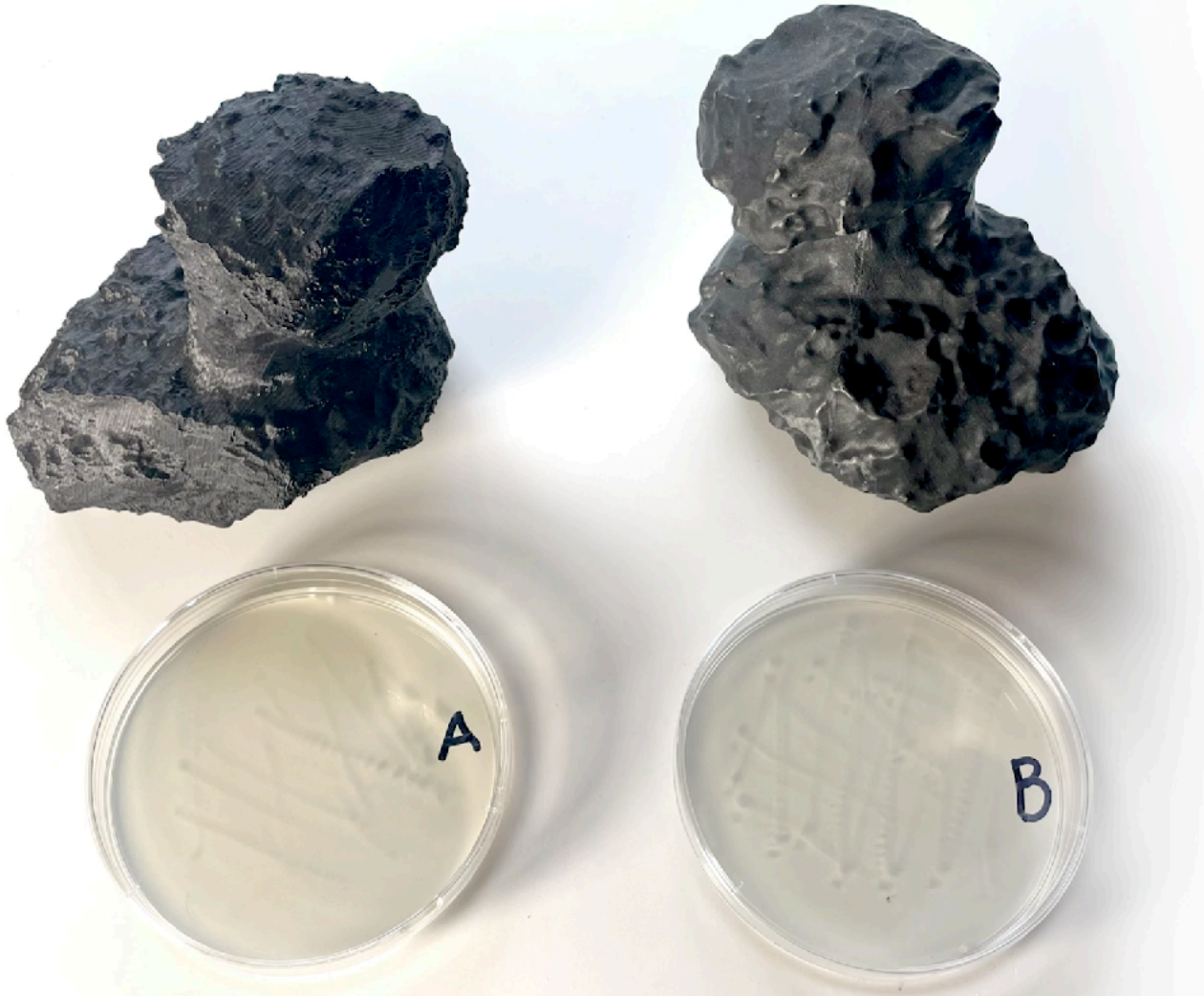
A set of unique postcards were developed in collaboration with The Open University, UK. These cards smelled like the comet 67P! The cards included the chemicals found on the comet, including the stinky ones like:

NH3 (Ammonia)
H2S (Hydrogen sulphide)
CH1O (Formaldehyde)
CH3OH (Methanol)
SO2 (Sulphur dioxide)


67P: comet return, 2021

Colonizing the comet

For the return of the comet in 2021 Ekaterina has created two new paintings but this time she “colonized the comet”. Comets played a big role for our planet. They delivered most of the water to Earth, as comets are mostly made of ice and dust. Comets also brought very important ingredients that living beings are made of. In the case of Comet 67P it is Phosphorus (essential for the creation of DNA), a multitude of organic molecules (methylamine and ethylamine) and most importantly amino acid like glycine (DNA is made of amino acids). To represent earlier life in its primitive form the artist grew colonies of bacteria in petri dishes. The bacteria was sampled from the 3D models of the comet. Only water enriched with bacteria and D2O was used to paint the artwork.

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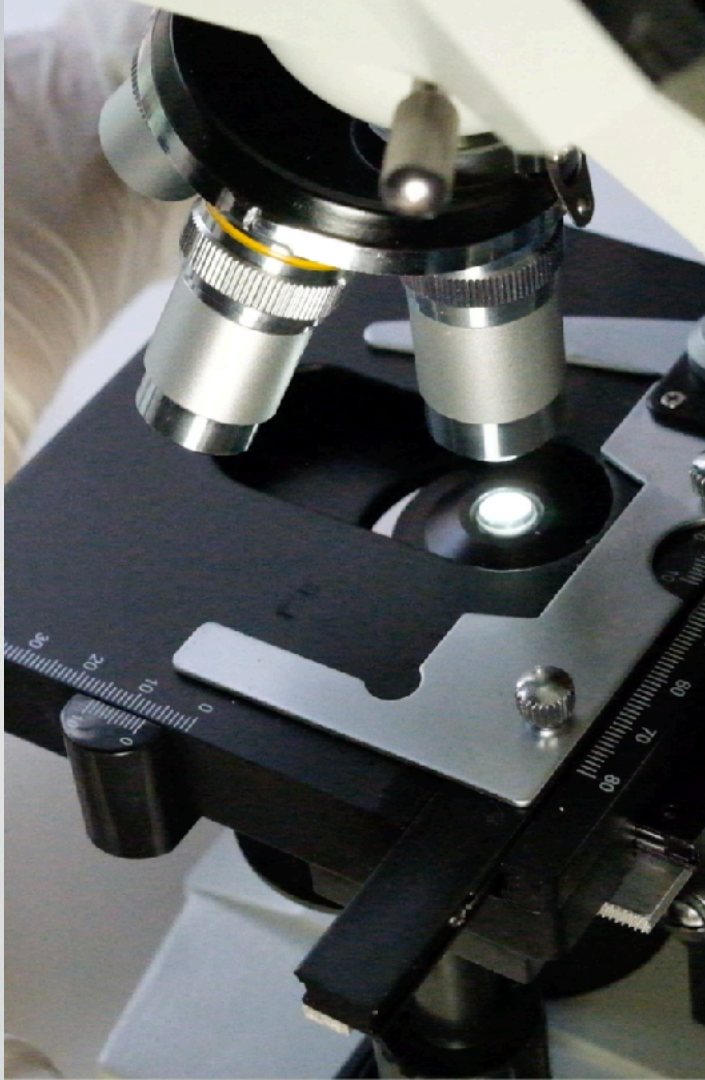

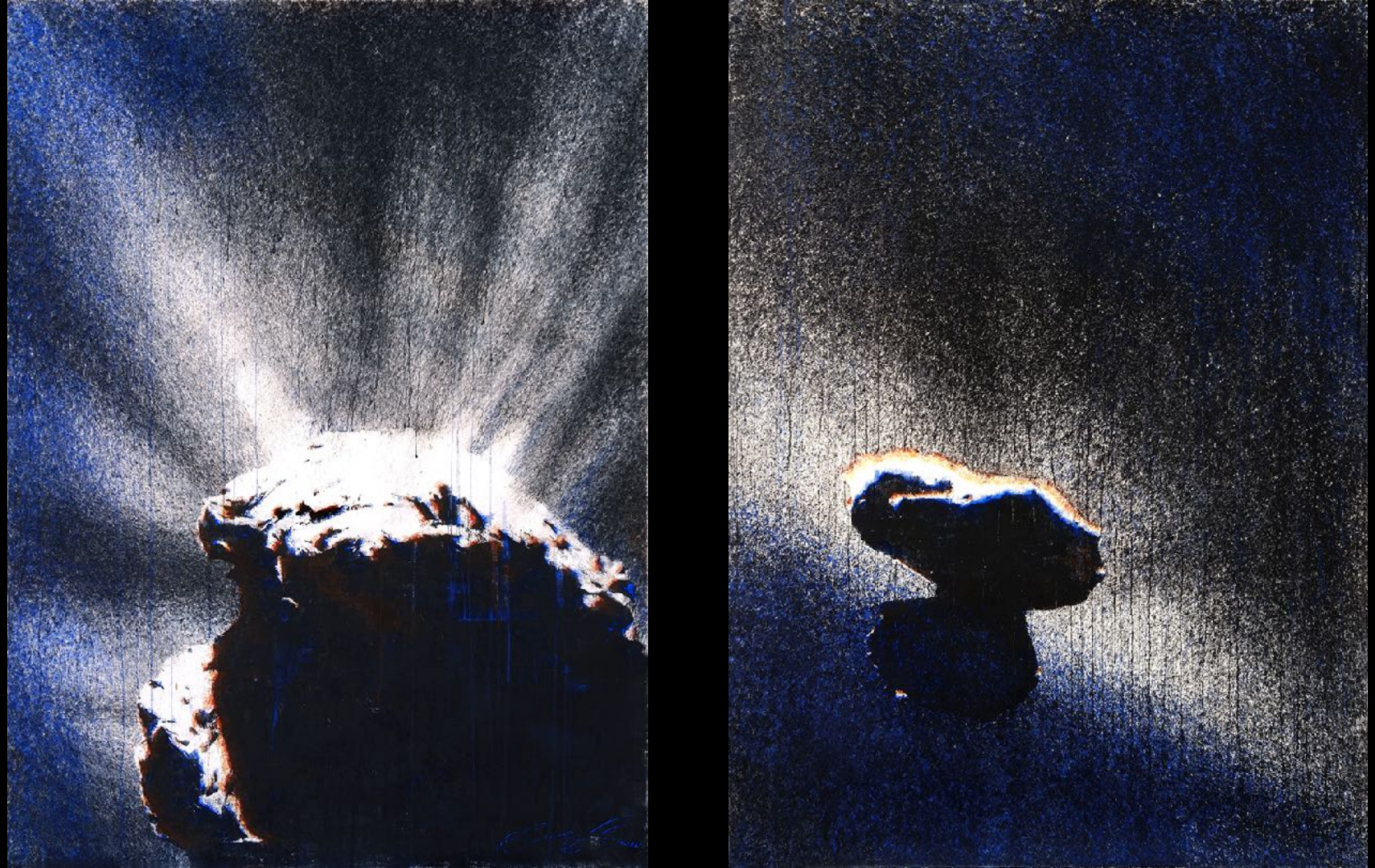

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