



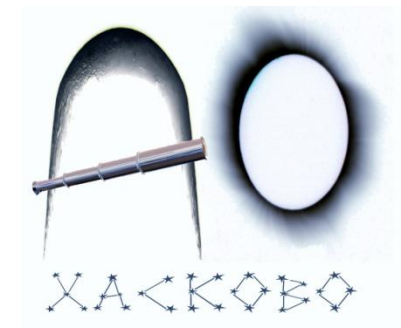
# “ROSETTA MISSION” IN OUR OBSERVATORY

**Author: Petya Dimitrova**

**Teacher: Yoanna Kokotaneckowa**

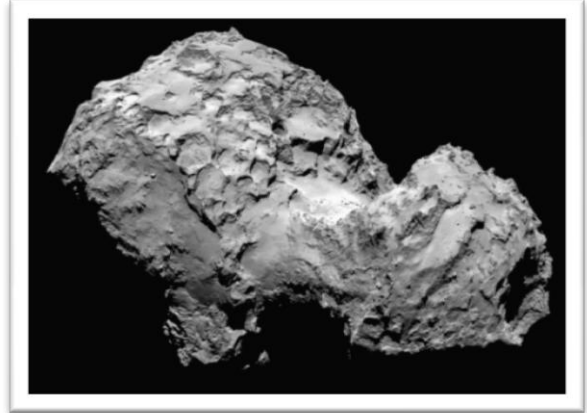
**Astronomical observatory by Youth center – Haskovo,  
Bulgaria**

**2015**

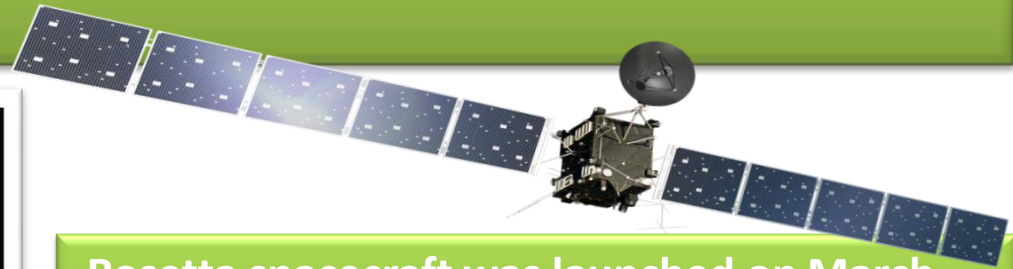


# Rosetta Mission

Rosetta is one of the most successful and unique space projects which we have the chance to witness. It is developed by ESA and its main task is to explore the comet 67P / Churyumov-Gerasimenko. That comet was discovered by Klim Churyumov and Svetlana Gerasimenko on 20 of September 1969. Even though it is believed that the comet came from the Kuiper belt, its current orbit radius is just 5.6 AU and its orbital period is only 6.45 years. The comet is 4.3 x 4.1 km in size.

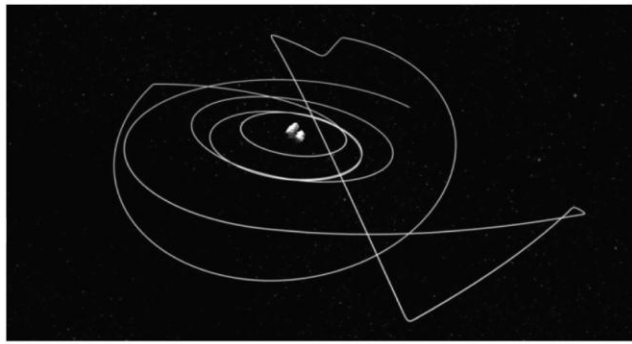


By studying 67P / Churyumov-Gerasimenko, scientists hope to find out how our Solar system looked before the planets formed. This is the reason why the Rosetta spacecraft was named after the Rosetta stone.



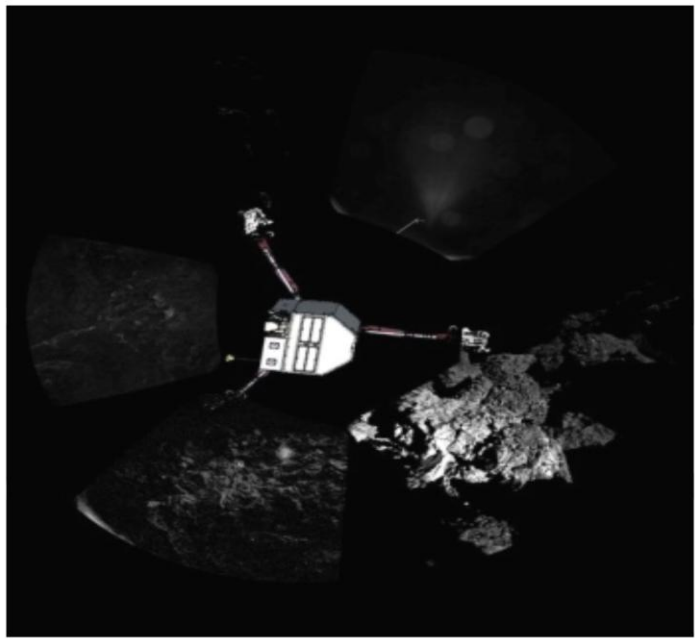
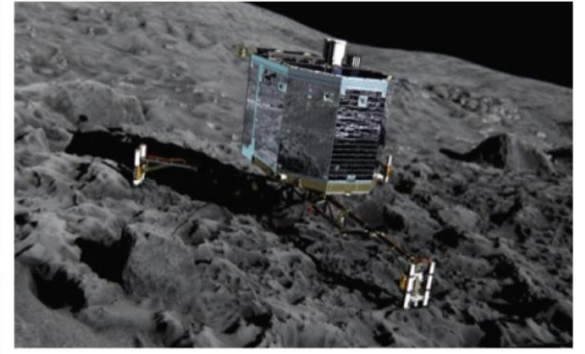
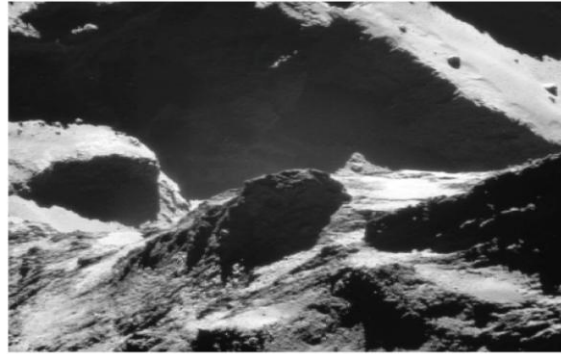
Rosetta spacecraft was launched on March 2<sup>nd</sup> 2004 with the “Arianna 5” rocket from “Koru” Space center in French Guiana. During its journey it flew near Mars and studied 2 asteroids - 21 Lutetia and 2867 Šteins.

On 6<sup>th</sup> August 2014, the spacecraft reached 67P / Churyumov-Gerasimenko and started to orbit around it. From this moment on, we started following all the news and photos with great interest. At first everybody was surprised by the comet's strange shape – it seemed to consist of two separate cores. That is why many people referred to it as the “rubber duck”. But the surprises did not end there. Gradually, the received data started to disprove many theories and to pose new questions.



On 12<sup>th</sup> November the European Space Agency “did the unthinkable” by landing on the comet. The lander named Philae was released by the Rosetta spacecraft and landed on 67P / Churyumov-Gerasimenko. “Philae” is named after an island in the Nile river, where the Rosetta stone was found. Both ESA scientist and we waited impatiently for this historical landing. The comet itself was moving with a speed 40 times faster than a bullet shot, greeting Philae with its surface cracks, rocks, sand and probably several layers of dust. Comet surfaces are different than those visited by any spacecraft and this is what makes this project unique and exciting.

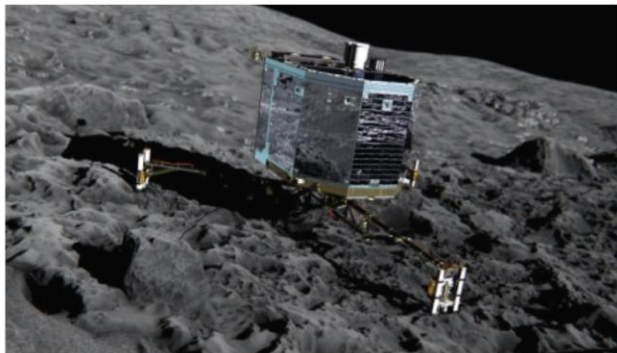
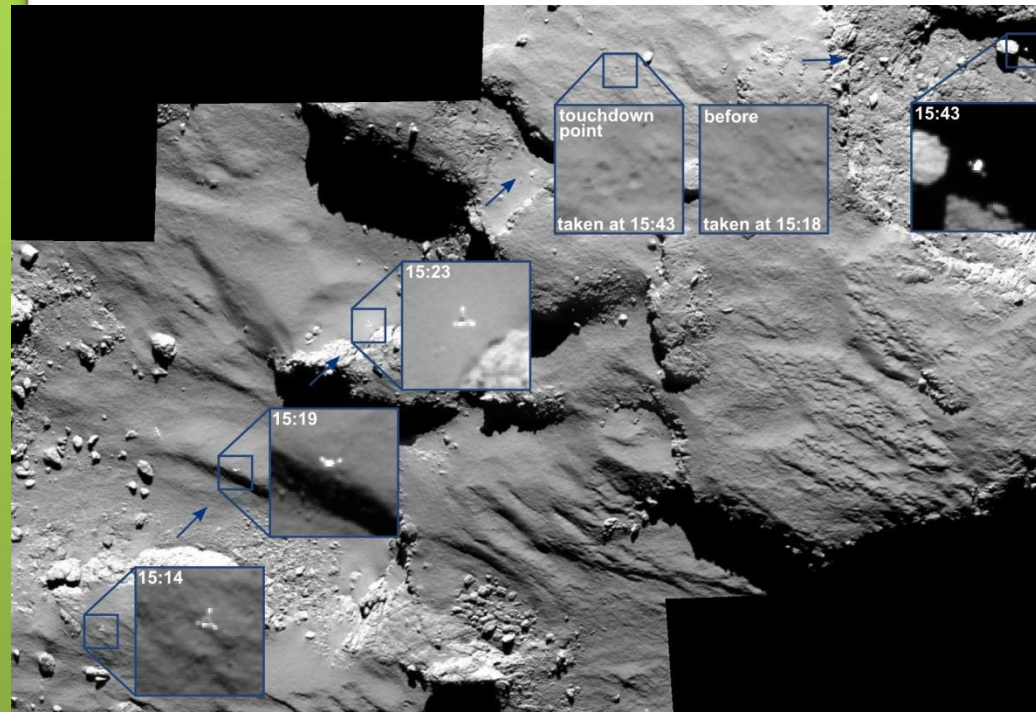
The landing of Philae took about 7 hours for the 22,5 kilometers route between Rosetta and the comet surface. Although the circumstances of the landing were not as predicted, the scientists still had hopes. Philae made a double leap from the surface and landed on a spot where it did not receive enough sunlight for its solar panels.



The oscillations in the radio signals suggest that Philae landed on some kind of a “sandbox” and then leaped from the surface before the final landing. In spite of that fact, the apparatus remained functional on the surface of the comet for 56 hours and sent measurements from its various instruments along with a few pictures before it lost its battery power and went into hibernation. Unfortunately the scientists are not exactly sure where Philae is situated now and are still trying to determine its exact location using images from Rosetta’s camera Osiris.



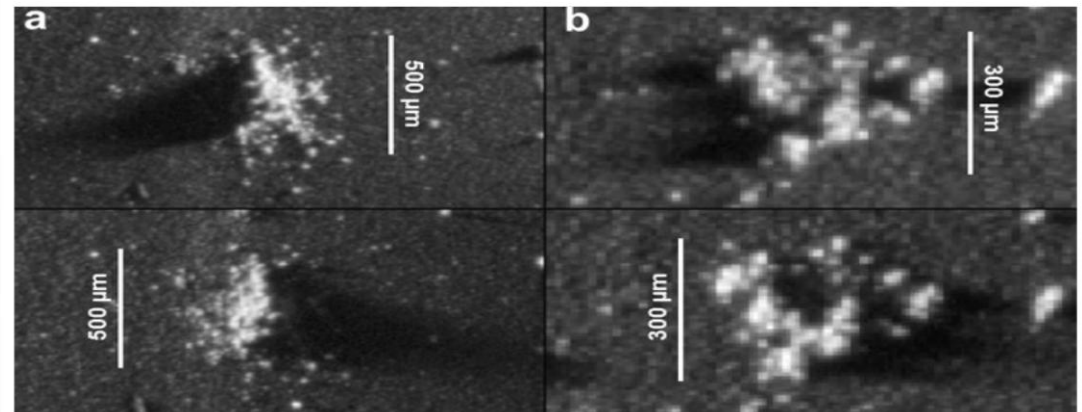
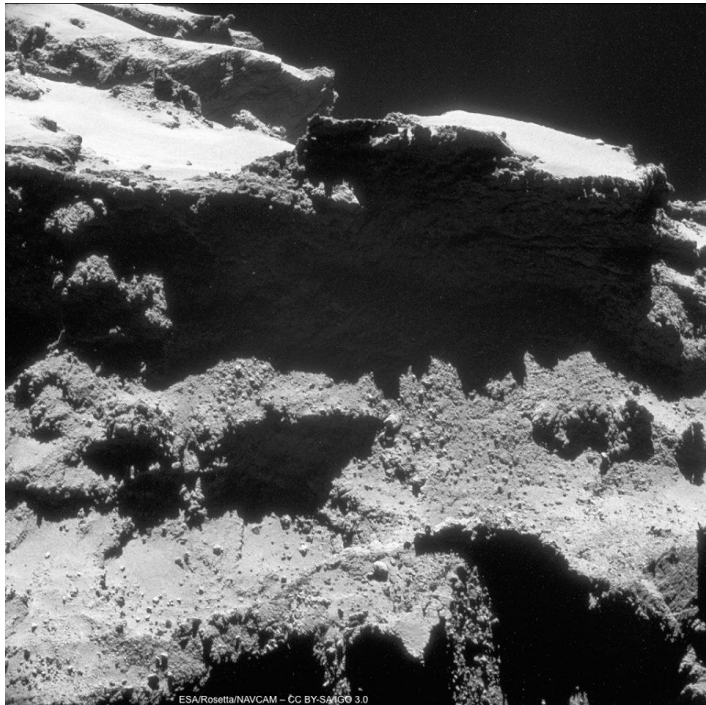
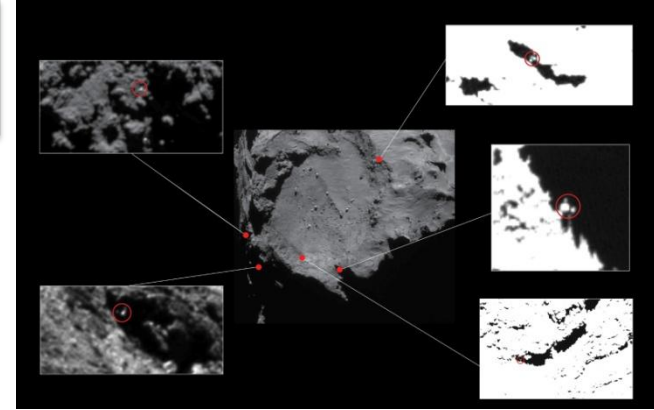
Here is the process of landing:  
It became clear that after the first contact of Philae with the surface of the comet Churyumov-Gerasimenko the apparatus made a leap. Its speed at that moment was 38 centimeters per second and the lander raised to 1 kilometer height. At the same time it travelled a horizontal distance of another kilometer sideways. After the leap Philae flew over the comet for a period of 7 minutes and made its final landing afterwards. Although this placed Philae on a big slope, the instruments managed to fulfill the major part of the planned initial scientific programme.



The lander has 3 legs and two of them ended up on a hard surface while one remained in the air. Moments later the scientific module Philae “wrote” its first message on its microblogger account on Twitter after landing on the core of the comet Churyumov-Gerasimenko:  
“My new address is: 67P! #CometLanding”.

"It is a remarkable address and we expect your pictures" was the answer of the European Space Agency in Twitter.

In spite of the elaborate choice of convenient and secure landing space for the lander, the plans of the scientist did not work very well. Despite this, they did not lose hope.



They expected that when the comet approaches the Sun, latest in August, there will be enough sunlight for Philae to charge its batteries and to start transmitting data again.

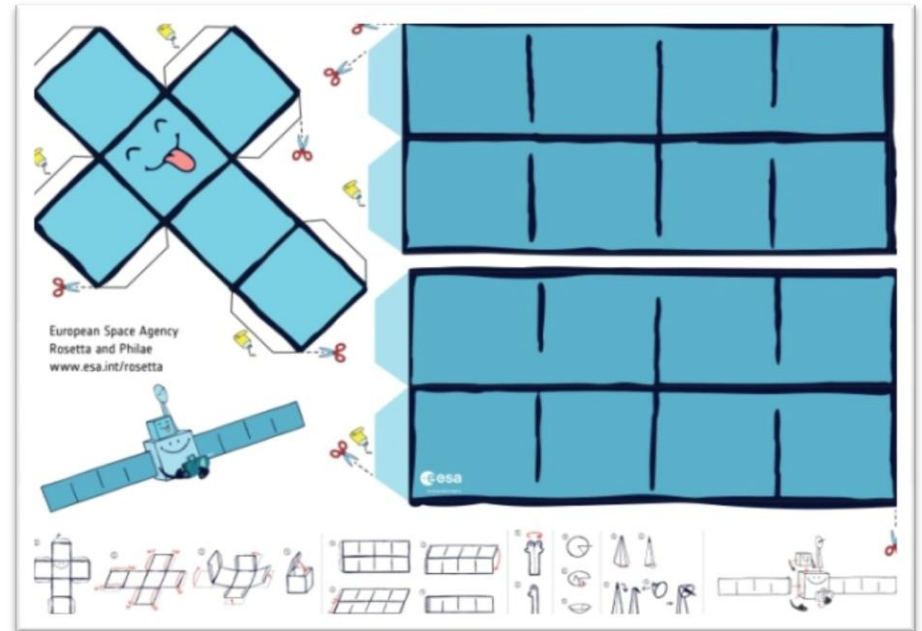
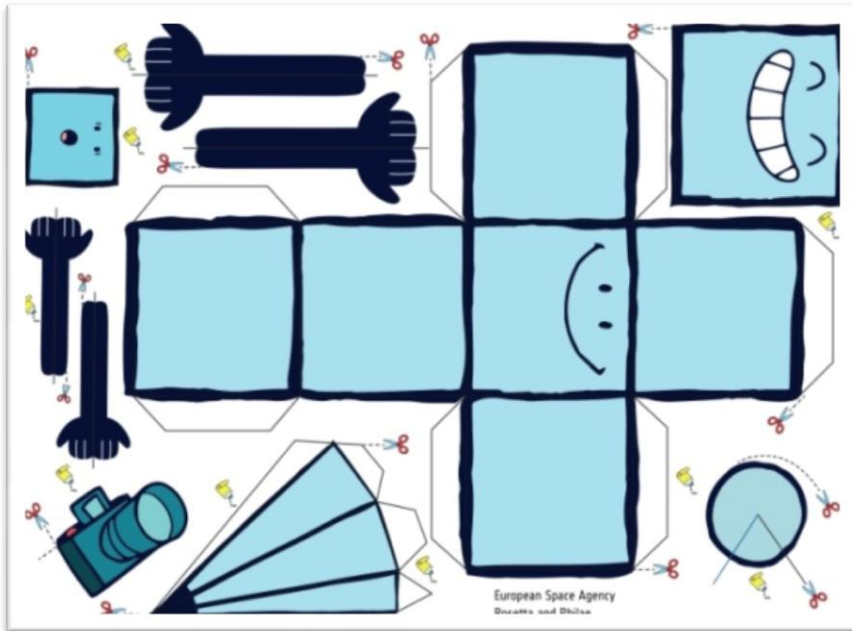
They hoped to find Philae even earlier and started to search for it on the photos taken by Rosettas camera. Eventually, on 13<sup>th</sup> June this year, Philae sent a signal. It was "alive".! The news spread all over the world and everybody is now waiting impatiently to see new pictures and data to be sent by Philae.

# Our Activities

This topic was of great interest for us,  
so we decided to take part also in the practical session.

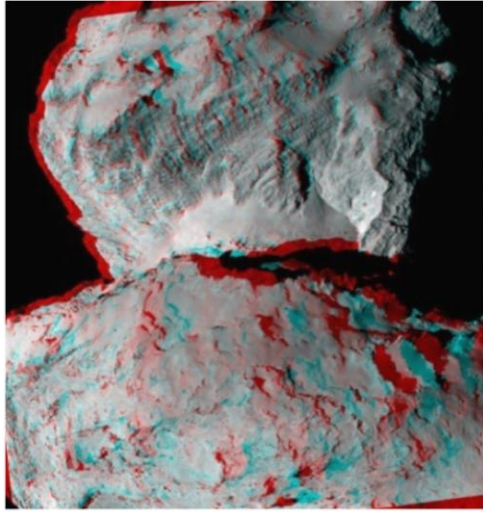
During our annual summer school at National Astronomical Observatory – Rozhen, 2014 (20<sup>th</sup> – 30<sup>th</sup> June) we took part in the competition organized by ESA called „RosettaAreWeThereYet”.

We had to print and build a paper model of Philae taken from Rosetta's website. Then, we had to take a photo with it while we were travelling somewhere and to submit the picture for the contest.





During our Christmas party “Astro Christmas” we played many games related to variety of astronomical topics. All of the students from Astronomical Observatory Haskovo attended that party.



One of the most interesting game was related to the Rosetta mission. It represented a 3D image of a comet attached to the dartboard. Thus while looking through the 3D glasses, we had to hit Philae's initial landing site of the comet with a dart. Each sector of the dartboard gave certain points. Each player was allowed to shoot 3 times.

Of course, not everyone managed. Throwing the dart, every student hit different part of the dartboard. We had to imagine that the dart was Philae and we all had to predict where it was going to land. Sometimes the dart did not manage to hit the board.



By doing this we realized how hard it had been for the scientists to find and land on a convenient place on the comet.

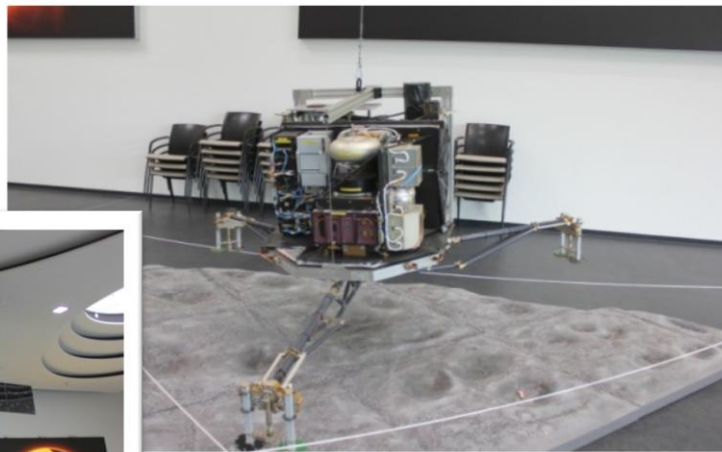


We also made a model of the comet, the lander and the decelerator. With this model we took part in the competition organized by Foundation “Evrika” named “Space – present and future of the human race”. The model is approximately 10 000 times smaller. The basic materials that we used were paper and styrofoam.

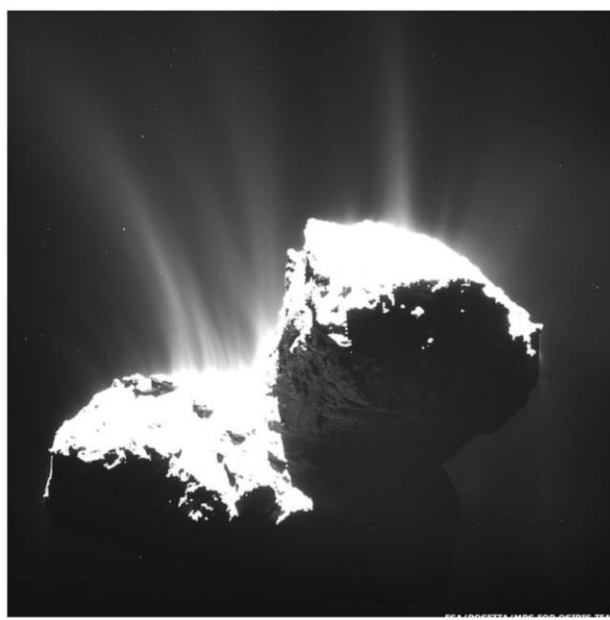


Our teacher Yoanna Kokotanekova had the opportunity to visit Max Plank Institute in Göttingen, Germany, from where she returned with a lot of interesting information and pictures.

The Institute has constructed a model of the comet in a 1:1500 scale, which has “Philae” attached to the surface. Also some larger models of the lander and the decelerator have been developed.



In this project we present only part of the activities which all of the students at Astronomical Observatory at Youth center, Haskovo participated in.



The great success of the mission is the main reason why we impatiently wait for articles and photos related to this unique project. We hope to get much more information and to finally understand what secrets the comets are hiding.

## Bibliography

<http://www.fromquarkstoquasars.com/astonomers-find-asteroid-with-negative-gravity/>

<http://www.space.com/27662-rosetta-comet-landing-site-agilkia.html?cmpid=558600>

<http://www.space.com/24333-rosetta-spacecraft-comet-landing-explained-infographic.html?cmpid=514630> 20140806 29170586

<http://spaceweather.com/archive.php?day=05&month=11&year=2014&view=view>

[https://www.facebook.com/RosettaMission?fref=ts&mref=message\\_bubble](https://www.facebook.com/RosettaMission?fref=ts&mref=message_bubble)

[http://www.esa.int/Our\\_Activities/Space\\_Science/Rosetta](http://www.esa.int/Our_Activities/Space_Science/Rosetta)