

STARDOME OBSERVATORY & PLANETARIUM FACTS, RESOURCES AND ACTIVITIES ON...

PLUTO REDISCOVERED

Pluto was identified as the ninth planet by Clyde Tombaugh in 1930.

It has remained a fuzzy starry blur ever since, despite huge improvements in telescope size and technology. Its large moon Charon was discovered in 1978, followed by the much smaller moons Nix and Hydra in 2005, Kerberos in 2011 and Styx in 2012. It was reclassified as a dwarf planet in 2006, along with Ceres, Haumea, Makemake and Eris.

Pluto can be regarded as a binary object, because its closest moon Charon is so large compared with Pluto itself. While our Moon is 1/81 the mass of the Earth, Charon is proportionally 10 times larger, at nearly 1/8 the mass of Pluto.

Where the Earth holds the same face of the Moon towards us, so we never see the [far side of the Moon](#) (it is tidally locked), Pluto and Charon always face each other, so neither sees the far side of the other (they are both tidally locked to each other).

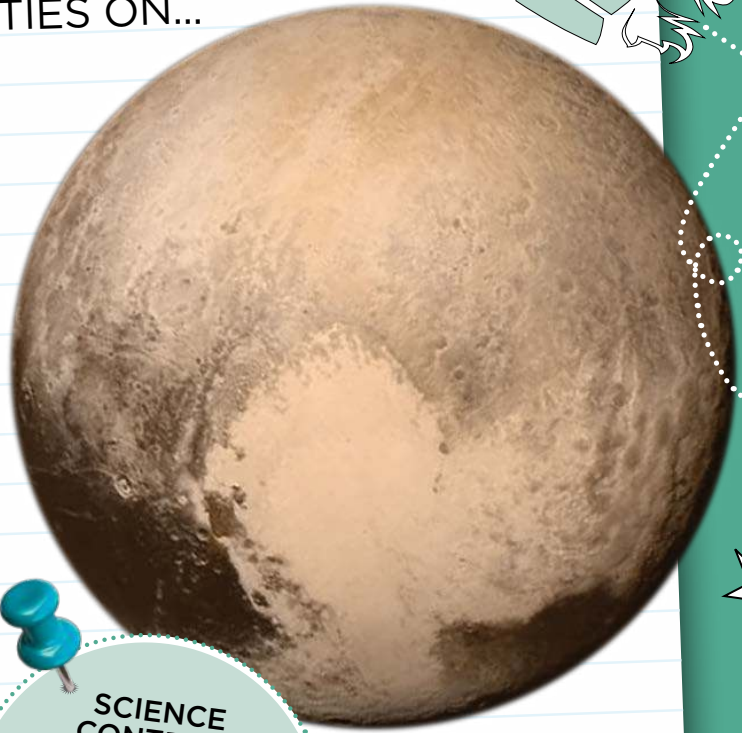
Pluto is the largest of the five dwarf planets. It has only gone a third around its orbit since discovery in 1930.

A day on Pluto is 6.4 Earth days long. Standing on the side facing Charon, the moon would stay in the same position in the sky, unchanging, neither rising nor setting, as the stars and Sun rise and set in the background.

Pluto's orbit around the Sun is tilted and not at all circular. It spends 20 years of its 248-year orbit closer to the Sun than Neptune.

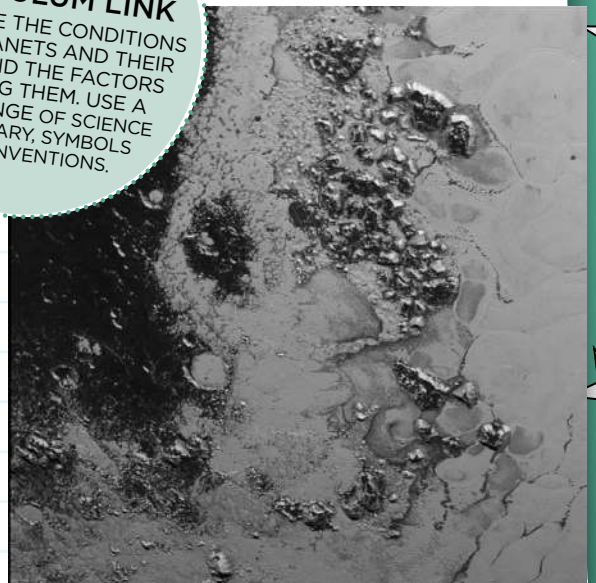
Observations made with the EWB Zeiss Telescope at Auckland Observatory in 1988 contributed to the discovery of an atmosphere at Pluto.

Also see our ['Introduction to Dawn and Ceres'](#) resource sheet.



Pluto. Image credit: NASA

**SCIENCE CONTENT/
CURRICULUM LINK**
INVESTIGATE THE CONDITIONS ON THE PLANETS AND THEIR MOONS, AND THE FACTORS AFFECTING THEM. USE A WIDER RANGE OF SCIENCE VOCABULARY, SYMBOLS AND CONVENTIONS.



Check out this other resource...

<http://pluto.jhuapl.edu/>

DISCUSSION POINTS

A Pluto day and month are the same length. How?

Is Pluto bigger than our Moon?

What is the very special cargo on board 'New Horizons'?



STARDOME OBSERVATORY & PLANETARIUM

SPACE INSPECTION

PDF examples

The Earth and the Moon are the only places in the Solar System visited by humans. Space vehicles have landed on just five other Solar System bodies, i.e. Venus, Mars, the asteroids Eros (NEAR Shoemaker) and Itokawa (Hayabusa), and comet Churyumov-Gerasimenko (Rosetta) – giving us close-up views of their surfaces.

All the other objects that have been visited (either a fly-by or in orbit) have given us just views from high above. The New Horizons fly-by of Pluto was the fastest of any spacecraft, the main encounter phase lasting less than a day!

Scientists have become very good at interpreting views of planets, moons etc. from space, without the aid of images or other data from the surface.

Objective...

This activity aims to encourage detailed observation of space images, and stimulate discussion on interpreting what the images contain.

Instructions...

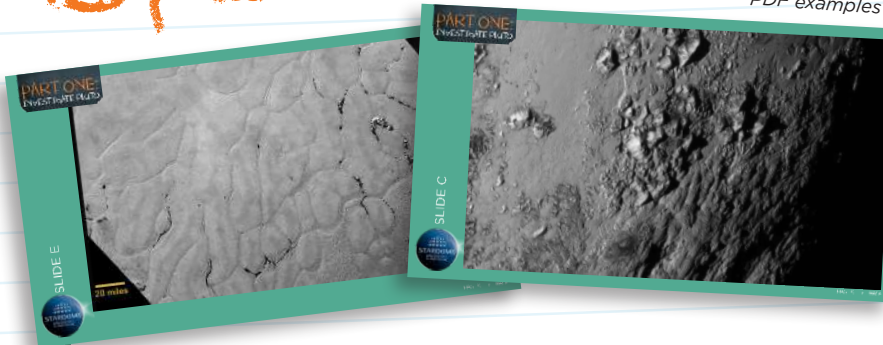
Using the 'Space Inspection: Part One' and 'Space Inspection: Part Two' presentations your class will learn more about Pluto and other astronomical objects using just photos.

Part one shows recent New Horizons images of Pluto. Use the information on this sheet to talk about the features of Pluto in the images.

In part two you will engage in discussion about the landscapes of other astronomical objects and try to identify locations and features.

The accompanying PDFs are a starting point and can be used as is, or printed out for distribution. The order can be changed and the photos skipped or added to for variety or to change the difficulty as needed for each class.

Use the images for student internet time and see what else they can discover about these locations.



PART ONE: INVESTIGATE PLUTO

PLUTO - SLIDE A

- This was the best view of Pluto before the arrival of New Horizons in July 2015. It is a composite of an image of Pluto and Charon plus images of the much fainter outer moons.
- The apparent sizes of the moons and Pluto are incorrect because of the different exposure times for the different objects (e.g. Hydra is only 55km vs Pluto 2372km diameter)
- Pluto's rotation and the orbits of the moons are very tilted (axial tilt $\sim 120^\circ$), so it looks a bit like a target.

PLUTO - SLIDE B

- The last image taken before New Horizons entered the Encounter Phase.
- Pluto is tilted towards the viewer, with the equator below the middle and the north pole below the top of the picture.
- The large 'heart'-shaped feature in the middle southern portion attracted a lot of interest. It is very smooth and the left side is brighter and more consistent than the right side.
- This is thought to be a plain of nitrogen ice.
- Craters can be seen clearly in the lower left, and less distinctly elsewhere on the surface.

PLUTO - SLIDE C

- This is the first photo sent back after the Encounter Phase. Huge ice mountains up to 3.5km high can be seen protruding from the surrounding area.
- There is a distinct lack of craters.

PLUTO - SLIDE D

- This is part of the left side of the 'heart' feature.
- Mountains up to 1.5km high, craters and a sharp contrast between light and dark regions are visible.
- Tongues of icy material appear to have flowed in this image, and filled in some more ancient craters.

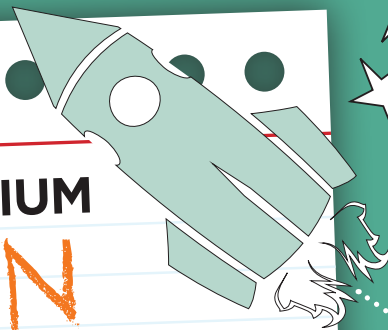
PLUTO - SLIDE E

- The centre of the 'heart' region shows polygonal ice segments.
- Small hills protrude through some of the adjoining grooves.

PLUTO - SLIDE F

- New Horizons looked back as it left Pluto to capture this image of a solar eclipse!
- Although an atmosphere was expected, the haze extends far higher than anticipated for an object that is smaller than Earth's Moon.





STARDOME OBSERVATORY & PLANETARIUM

SPACE INSPECTION

PART TWO: ALIEN LANDSCAPES WHAT CAN WE LEARN FROM THESE SPACE IMAGES?

1. This looks like the Moon but it isn't. It is a planet: which one? *This is planet Mercury.*
2. You can see craters and mountains on the Moon, but in the lefthand image what is the winding line called that looks like a dried up river? *These grooves are called 'rilles'. They can be a few kilometres wide and hundreds of kilometres long. In the smallest image you see the Rutherford Crater (named after Sir Ernest Rutherford), situated on the far side of the Moon.*
3. This also looks like the Moon but is another planet. There's a clue if you look carefully at the strange mountain just above and to the right of centre. *The planet is Mars and the feature is dubbed the 'Mars Face'. It is just an eroded mesa (flat-topped mountain).*
4. This volcano is on Mars and you could fit the entire North Island of New Zealand on top of it. What is its name? *Olympus Mons. It is the highest mountain in the Solar System (27km).*
5. This gigantic valley on Mars could fit across the entire United States. What is it called? *Vallis Marinaris.*
6. What is the name of this Moon, which has these 'Tiger Stripes' on its surface? *This is Saturn's moon Enceladus.*
7. What material is erupting out of these geysers into space? *These geysers are erupting water ice out into the rings of Saturn.*
8. This is often called the 'Pizza Moon'. Which planet does it orbit, and what are the two blue lights in the shadow at top right? *This is Io. Io orbits Jupiter and is the most volcanic object in the Solar System. The two volcanic plumes of sulphurous ash and gas rise over a hundred kilometres.*
9. This moon is thought to have a liquid ocean of water beneath its thick ice crust. *Slightly smaller than our Moon, Europa is the sixth largest moon in the Solar System.*
10. The largest moon in the whole Solar System is Jupiter's largest moon Ganymede. It is even larger than the planets Pluto and Mercury. How much larger is it than our Moon? *Ganymede (5,268km) is about 50% (1.52x) larger than Earth's Moon (3,474km).*
11. What is the name of this moon of Saturn, which looks like a giant sponge? *Hyperion is one of the largest Solar System objects that isn't round (360km).*
12. These radar images reveal the surface of Saturn's largest moon Titan. It is far too cold for liquid water, so what flows in these rivers and lakes? *Titan's frigid atmosphere and surface (-180 °C) has methane rivers, lakes and rain.*
13. Neptune's largest moon is named Triton. What is erupting from the volcanoes (the mountains with black deposits facing to the right) at the bottom of the picture? *Triton's cryovolcanoes erupt dust and nitrogen gas.*
14. Which planet are these mountains and glaciers found on? *Earth!*
15. This alien-looking vista is actually found much closer to home. *Richat structure in Africa. The full image at right reveals Earth's atmosphere.*
16. Water can be seen across this photo of volcanoes on Earth. What are the three forms of water? *Solid, liquid and gas: water ice, water in rivers and oceans, water vapour in the clouds.*
17. Where is this very familiar place? *This is Auckland at night as viewed from the ISS (International Space Station).*
18. Can you find your school in this photo taken from space?

PDF examples

