

## Chapter 1 : Table of contents for Let's explore Pluto and beyond

*Let's Explore Pluto and Beyond (Space Launch!) [Helen Orme, David Orme] on [www.nxgvision.com](http://www.nxgvision.com) \*FREE\* shipping on qualifying offers. Describes the characteristics of and latest discoveries about the dwarf planet Pluto, the Kuiper Belt.*

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**Chapter 2 : Star Chart Virtual Reality App Puts Planetarium on Your Smartphone**

*Let's Explore Pluto and Beyond investigates the latest discoveries about Pluto, explains its change in classification from planet to dwarf planet, and describes the other space objects found beyond Pluto's orbit.*

This made its official status as a planet controversial, with many questioning whether Pluto should be considered together with or separately from its surrounding population. Museum and planetarium directors occasionally created controversy by omitting Pluto from planetary models of the Solar System. The Hayden Planetarium reopened in February , after renovation with a model of only eight planets, which made headlines almost a year later. On July 29, , astronomers at Caltech announced the discovery of a new trans-Neptunian object , Eris , which was substantially more massive than Pluto and the most massive object discovered in the Solar System since Triton in . Its discoverers and the press initially called it the tenth planet , although there was no official consensus at the time on whether to call it a planet. IAU definition of planet The debate came to a head in August , with an IAU resolution that created an official definition for the term "planet". According to this resolution, there are three conditions for an object in the Solar System to be considered a planet: The object must be in orbit around the Sun. The object must be massive enough to be rounded by its own gravity. More specifically, its own gravity should pull it into a shape defined by hydrostatic equilibrium. It must have cleared the neighborhood around its orbit. Its mass is substantially less than the combined mass of the other objects in its orbit: Buie , then at the Lowell Observatory petitioned against the definition. Mike Brown , the astronomer who discovered Eris, said "through this whole crazy circus-like procedure, somehow the right answer was stumbled on. Science is self-correcting eventually, even when strong emotions are involved. Many accepted the reclassification, but some sought to overturn the decision with online petitions urging the IAU to consider reinstatement. A resolution introduced by some members of the California State Assembly facetiously called the IAU decision a "scientific heresy". To "pluto" is to "demote or devalue someone or something". Pluto moves about 7 degrees east per decade with small apparent retrograde motion as seen from Earth. Pluto was closer to the Sun than Neptune between and . Its orbital characteristics are substantially different from those of the planets, which follow nearly circular orbits around the Sun close to a flat reference plane called the ecliptic. The Pluto-Charon barycenter came to perihelion on September 5, , [2] [i] and was last closer to the Sun than Neptune between February 7, , and February 11, . Computer simulations can be used to predict its position for several million years both forward and backward in time , but after intervals longer than the Lyapunov time of 10-20 million years, calculations become speculative: The semi-major axis and period are presently getting longer. The darker sections of both orbits show where they pass below the plane of the ecliptic. The two orbits do not intersect. However, Pluto is also protected by its 2: Each cycle lasts about years. After many such repetitions, Pluto is sufficiently slowed, and Neptune sufficiently sped up, that Pluto orbit relative to Neptune drifts in the opposite direction until the process is reversed. The whole process takes about 20, years to complete. These arise principally from two additional mechanisms besides the 2: This is a consequence of the Kozai mechanism , [77] which relates the eccentricity of an orbit to its inclination to a larger perturbing body in this case Neptune. The closest such angular separation occurs every 10, years. This is known as the 1: All the Jovian planets , particularly Jupiter, play a role in the creation of the superresonance. This could mean a body reorienting itself to put extraneous mass near the equator and regions lacking mass tend towards the poles. This is called polar wander. The same effect seen on Pluto would be observed on Earth if the Antarctic ice sheet was several times larger. The variation in density with none found in Sputnik Planitia indicates a long history of varying geological activity. Geologic map of Sputnik Planitia and surroundings context , with convection cell margins outlined in black.

**Chapter 3 : Pluto - Wikipedia**

*Let's Explore Pluto and Beyond by David Orme, Helen Orme starting at \$ Let's Explore Pluto and Beyond has 1 available editions to buy at Alibris.*

Pluto, an icy dwarf planet, three-billion miles from Earth. Our most powerful telescopes see only a blur, until now. A space probe, called New Horizons, is on its way, This is an epic journey. Astronomer, Columbia University Astrobiology Center: Are there going to be surprises? But not all the surprises are good. Could it be we hit something? But a last minute rescue saves the day, as Pluto comes into focus, revealing a world stranger than we ever imagined. It was one of those days where you say to yourself, "This is it. Project succeeds or fails today. T minus five, four, three, two, one. We have ignition and liftoff of the New Horizons spacecraft, on a voyage to visit the planet Pluto and beyond. New Horizons needs all the speed it can muster, on a journey that will take it clear across the solar system, to attempt something unique in the history of spaceflight: And so, they wait. Everything is a concern. Almost an hour passes, and then mission ops receives the first signal from New Horizons. Scientists turn to each other and go, "I love you man. This is just the first of many challenges to come, on a journey that will take almost a decade. Just nine hours after leaving the launch pad, it was already crossing the orbit of the moon. A trip that took Apollo astronauts three days. Mars, with its rocky red surface; the gas giant, Jupiter, with its raging storm; and Saturn, with its stunning rings; Uranus, where turbulent winds blow over miles an hour; and Neptune, a planet so far from the sun it takes years to complete just one orbit. Finally, New Horizons will arrive at Pluto, a world we can only picture with the help of artwork, like this, at least for now. Who can tell us about more about the planets? Back in the s, every grade-schooler was taught there were nine planets, Pluto being the last and loneliest. Everybody loved Pluto, because it was this, this funny, oddball, sitting out there, at the very edge. What makes Pluto so popular? It may have something to do with a playful bloodhound named "Pluto the Pup. The truth is Pluto and its moons have only been observed from billions of miles away, our best images, nothing more than a blur. But even at this resolution, they suggest something intriguing. Using these precious pixels, a computer-generated image reveals Pluto has a surprisingly varied surface. The light areas could be miles and miles of ice. We also know that Pluto has a rather bizarre atmosphere. During its year orbit, as Pluto gets closer to the sun, its frozen surface starts to thaw, and its atmosphere slowly emerges. What we see in the atmosphere is gases that are coming off the surface, creating a temporary atmosphere, perhaps. And it is enormous. Billions of miles from the sun, the Kuiper Belt is filled with hundreds of thousands of icy objects. These are basically frozen remnants of the early part of the solar system that are still in the freezer. You can start to read this fossil record of how the solar system evolved, by looking at these objects. How do you design a spacecraft that can survive a three-billion-mile journey to parts unknown? The New Horizons mission faced a huge number of challenges. And so, in order to get there in a reasonable amount of time, we had to build the lightest possible spacecraft that we could, put it on the largest rocket we could. There was no opportunity to fly big solar arrays, because the sunlight is just too faint, so we carry a nuclear-powered source. We have a suite of instruments, seven instruments, to do very different things. And they weigh less than about 70 pounds, all of them, together. Two are named after the lead characters in the s television show *The Honeymooners*, Ralph and Alice. The Kuiper Airborne Observatory is not built for comfort. But by flying a telescope above the weather, they had a chance to capture a rare event called a "stellar occultation. If the object has an atmosphere, the light gradually fades out, then slowly fades back up again. This is a recording of what happened on board the Kuiper Airborne Observatory the night of June 9th, , when a group of researchers were determined to find out if Pluto has an atmosphere. I think that thing has atmosphere, guys. The light behind Pluto slowly faded, and the crew made history. I was fortunate enough to be involved. I would call that the beginning of my being an astronomer. This model is an actual-size model of Alice. Alice is an ultraviolet spectrometer. Every chemical element reflects and absorbs light in a unique way, creating a pattern as distinct as a fingerprint. As the spacecraft flies just a few thousand miles above Pluto, Alice will search for those fingerprints. We can use the sun as our light source, to probe the atmosphere and look for those fingerprints of

certain types of atoms and molecules. But there are other regions that seem to be devoid of those snowflakes and are probably much redder, darker hydrocarbon deposits. Ralph will finally reveal what these strange, dark regions are made of. But to get up close and personal images of Pluto, requires an instrument with a one-of-a-kind telephoto lens. To put this in perspective, this image of the Big Apple was taken by a satellite traveling about miles above Earth. LORRI is so powerful it could capture the same amount of detail from more than 7, miles above Earth. But sending a telescope with a lens like this into the grueling subzero temperatures of the Kuiper Belt is risky business. And you can end up with pictures that look like this. To solve this problem, they turn to a material found in bulletproof vests. What makes vests like this so strong is a compound called silicon carbide. LORRI is made out of a special version of it, which is able to tolerate temperature gradients without distorting its shape. In the end, it just, you know, you just have to sit there and wait. For the New Horizons team, waiting to find out if all their hard work will pay off just may be the toughest challenge of all. Adjust your sights a little bit to the left. If something went wrong, it would be more than nine hours before we could tell it to do something. The most important science is happening, really, only over about a hour period. The timing has to be precise, because the onboard commands all have a predetermined time that this is supposed to happen. New Horizons has been en route for a little over a year. At that point it will be traveling a lot faster. Think of it like a clever maneuver used in roller derby, called the whip. One skater pulls another, propelling her forward with greater velocity. At mission operations, the tension is palpable, especially for the mission operations manager, Alice Bowman, also known as "M-O-M" She has spent years preparing for this moment, and she knows all too well what it means if this maneuver should fail. It would take years longer to get to Pluto, if you did not have that flyby. If you think nine years is a long time, adding another couple years onto that, that would have been intolerable. The clock is ticking. MOM, along with the mission ops team, waits to receive telemetry from the spacecraft. This data will reveal whether New Horizons successfully pulled off the gravity assist or not. Finally they hear from the spacecraft. Spacecraft telemetry for all subsystems is nominal. So far, so great. By stealing some momentum from Jupiter, along the way to Pluto, we can actually increase the speed of the spacecraft by about 20 percent and cut three years off the travel time. And at the same time, because in order to do the Jupiter flyby, you end up coming fairly close to it, it gives you an opportunity to do some great science. It was the only time we were going to have large objects for the cameras to actually point to and say, "Okay, are we doing this right? And we got both of them; we got both of them. It was the first time that time lapse had ever been made of any volcano anywhere in the universe off the earth, so it was really unique. We were extremely lucky we got these fantastic movies. It made all those sleepless nights and all that hard work very much worth it. After the gravity assist, New Horizons goes into hibernation. Only essential systems are up and running. This limits the amount of wear and tear on the equipment. For most of its nine-year journey it will be asleep, but once a week, the spacecraft phones home to MOM.

### Chapter 4 : Consent Form | Popular Science

*Image: NASA's New Horizons mission made the first exploration of Pluto-Charon and its system of small moons in The scientific discoveries led the science community to push for a return to Pluto with an orbiter or to explore other dwarf planets in the Kuiper Belt.*

### Chapter 5 : Search Results for " Page 5 " Pluto New Horizons

*Let's Explore Pluto and Beyond + Add to Wishlist This series will ignite young readers' interest in science by presenting facts about our solar system in a dynamic and colorful format.*

### Chapter 6 : Explore All Channels | Pluto TV

*Table of Contents for Let's explore Pluto and beyond / Helen and David Orme, available from the Library of Congress.*

### Chapter 7 : Star Chart: The Virtual Reality Planetarium App (Images)

*Pluto is so far away from Earth that it is a mere pinprick of light in our powerful telescopes. Learn what it would take for humans to journey to the uncharted limits of our solar neighborhood and.*

### Chapter 8 : Pluto & Beyond/ Tarot & Witchcraft - Shows

*NASA's New Horizons flew past Pluto in July â€”sending back the first clear, close-up images of the tiny worldâ€”and is now on its way to a Jan. 1, flyby of MU This flyby will be the most distant in the history of space exploration, a billion miles beyond Pluto.*

### Chapter 9 : Pluto Simulation Takes You To The Dwarf Planet (VIDEO) | HuffPost

*A new virtual reality app lets users explore the solar system up close, from scorching-hot Mercury to faraway Pluto and beyond. Take a look at some views from the Star Chart program here.*