A detailed image of Uranus reveals scalloped clouds around its equator and a stormy north pole.
OUR JOURNEY CONTINUES

Who doesn’t want to get more kids interested in science and math? www.KidsAstronomy.com is here to help!

EDITOR

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CONTACT

Questions, comments, submissions, photos or just to say ‘hello’:
ObjView at NoCoAstro dot org
NOCOAstro Meeting

Join us for our monthly awesomely-nerdy astro talk:

Date: Thursday November 3rd, 6:15pm
Location: Fort Collins Museum of Discovery

DID YOU KNOW...? All meetings are FREE & open to the public!
Just stop by the Fort Collins Museum of Discovery.

NOCOAstro Outreach*

4th, Friday
Fossil Creek Reservoir, 7:30pm

18th, Friday
Fossil Creek Reservoir, 7:30pm

* more details online at: NoCoAstro.org
Enter the Ice Giants

Origin of Name: Not visible to ancient civilizations, Uranus is the first planet discovered with the help of a telescope (13 March 1781). Discoverer William Herschel proposed the name “Georgian Sidus”, which is Latin for Georgian planet, to honor the king of England, George III. You may have guessed that this name didn’t appeal to the whole of the scientific community. Astronomer Johann Bode proposed Uranus, in the tradition of naming other planetary bodies after mythical gods, after the ancient Greek god Ouranos. Eventually the scientific community agreed.

Sharing of Name: The chemical element Uranium, discovered in 1789 (shortly after the discovery of Uranus), was named for the planet by its discoverer, German chemist Martin Heinrich Klaproth.

Atmosphere: What makes Uranus an ‘ice giant’? Like the gas giant planets, Uranus is large and contains a layer of hydrogen and helium gases. Unlike the gas giant planets, however, Uranus is actually composed mainly of ice rather than gas. Yet, it isn’t the typical ice we Earthlings know and love. Instead, it’s actually a hot, dense fluid consisting of water, ammonia and other volatiles. Most of the planet’s visible (upper) cloud layers are primarily methane and it is believed that the lower cloud layers are primarily water. Interesting, methane absorbs red light waves while reflecting blue and green. So, because the upper layers are methane, Uranus appears distinctly blue to us.

Magnetosphere: Yet another interesting characteristic of Uranus is its peculiar and intense magnetic field: it is tilted far off the planet’s rotational axis and does not actually originate in the planet’s geometric center [compare this to Earth’s axes which are only slightly separate, ~12 degrees].

Size:

Surface Area: over 3 billion square miles [15.85x Earth SA].
Equatorial Circumference: ~99k miles [3.98x Earth].
Volume: over 68 trillion cubic miles [63x Earth volume].
Mass: $8.681 \times 10^{25}$ kg [14.5x Earth mass]. This makes Uranus the least massive of the giant planets. Interestingly, scientists believe that between 9.3x and 13.5x of its mass comes from its ice!
Mean Density: ~1.27 g/cm cubed [23% Earth density]. Second least dense, after Jupiter.
Moons: 27 known moons orbit Uranus. This includes 13 inner, 5 major and 9 irregular satellites.

Rings: Uranus may have been discovered in 1781 but we didn’t know about its rings until 1977, some 200 years later!

Gravity: Amazingly, Uranus an 8.87 m/s squared [0.91x Earth’s surface gravity of 9.807 m/s squared or 1 g]

Distance From Sun: Uranus laps the sun only once every 84 Earth years. At roughly 19.189 AU, this is a distance of 2.87 billion km or 1.78 billion miles! [not surprisingly, this equals roughly 19.189x Earth distance from sun of 1 AU].

Rotation: Uranus makes one complete rotation on its axis every 17 hours and 14 minutes. Interestingly, it also has a retrograde rotation which is opposite that of all other planets, save Venus. [’equatorial inclination’ explains why this rotation rate doesn’t actually equal one day on Uranus].

Equatorial Inclination: Spinning at a roughly 98 degree angle, this extraordinary planet is rotating on its axis while sitting almost exactly on its side! (Picture Uranus’ north & south poles where Earth’s equator is located). Because Uranus is basically on its side as it orbits the sun, days and nights on Uranus last about 42 years or half of the orbital period! Despite this amazing tilt, Uranus’ equator is still warmer than its poles! Why?

Planetary Albedo: Like Earth, Uranus has a 0.30 bond albedo. Hopefully by now you know what this means! [Read about ‘visual geometric albedo’ values here].

Temperature Variation: Despite spinning on its side, with days lasting 42 Earth years and seasons that last over 20 years, neither the summer nor winter sides of the planet actually vary much in temperature because it is just so far from the sun. Near the cloud tops Uranus is about -216 degrees C or -357 degrees F. Uranus is definitely an ‘ice giant’! [compare this to Earth’s downright balmy average temperature of 59 degrees F or 15 degrees C].

Missions to Uranus:

Voyager 2: In 1986 the Voyager 2 mission, as part of the Voyager program to study the outer planets, snapped Uranus’ first ever photographs from a creditable 81,500 km or 50,642 mile distance. This mission returned our very first close-up photos of Uranus, its rings and its moons. Would you believe these photos are still being examined today?

Hubble Space Telescope: While not a ‘mission’ in the typical sense, Hubble’s amazing technology has provided astronomers with much more insight into the structure of Uranus’ atmosphere and inner workings (as well as so many other things).
A R E  I C E  G I A N T S  M A D E  O F  I C E ?

Not exactly.

We classify ice giants separately from the gas giants because their composition is dominated by ice rather than gas. Sounds simple enough, doesn’t it? Don’t be fooled.

Uranus itself consists of three layers: (1) an inner rocky core, (2) an icy mantle and (3) a gaseous hydrogen/helium outer layer.

Amazingly, the ‘icy mantle’ is actually a hot, dense fluid of mostly water, ammonia and other volatiles. Yes, hot.

H I D I N G  I N  P L A I N  S I G H T :

Does Uranus actually have 29 moons?

Yes, astronomers are still studying Voyager 2 photographs from 1986!

It is in these seemingly-old photos that scientists believe they’ve found the telltale wavy patterns created by moons within planetary rings.

P L A N E T A R Y  F O R M A T I O N :

Exosolar planets aren’t just numerous, they’re immensely varied.

Though many exosolar planets have been discovered recently, debate continues on how ice giants actually form.

To better understand, let’s take a closer look at the planet formation site around a young star that is a mere 10 millions years old!
**AMAZING EXOSOLAR PLANETS**

**OLDEST PLANET:** PSR B1620-26 b (2003). Guess how old... wrong!

**LAVA-COATED SUPER-EARTH:** COROT-7b (2009). Yes, lava.

**MOST SUNS:** 91 Aquarii b (2003). You’ll find it in the Aquarius constellation.

**‘HOT NEPTUNE’:** Gliese 436 b (2004). Hot ice?

**MIGHT HAVE ORBITED INSIDE ITS DYING STAR:** V391 Pegasi b (2007). Earth in the future?
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(...and does it matter?)
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