



The Mini Page

Betty Debnam, Founding Editor and Editor at Large

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Revealing the Wonders of the Universe

Happy 25th Birthday, Hubble!

On April 24, 1990, the Hubble Space Telescope was launched into orbit. It has transformed what we know about outer space, from our own solar system to the edges of the universe.

It has shown us some of the first galaxies ever formed and helped us learn the age of the universe.

Hubble is able to take awesome images because it orbits above the Earth's atmosphere. The atmosphere can blur images taken from Earth and block the light from space.

Hubble images of stardust and galaxies have united our planet in wonder.

The Mini Page talked with a senior project scientist at NASA to learn more about this amazing telescope.



photo courtesy NASA

Hubble was the first major optical, or *visual light*, telescope to be launched into space. It was named after astronomer Edwin Hubble. It orbits the Earth every 97 minutes and is about the size of a schoolbus. It is a joint project of NASA and the European Space Agency, or ESA.



photo courtesy NASA, ESA, and The Hubble Heritage Team (STScI/AURA)

Stars are forming inside these towering columns of gas and dust in the Eagle Nebula. This site, named the Pillars of Creation, is one of the Hubble's best-known images. Hubble has helped us understand how stars are born and how they die.

Hubble's past

NASA has sent astronauts to service the Hubble five times since its launch. The first images Hubble sent back were blurry, and scientists realized the telescope's main mirror had a flaw.

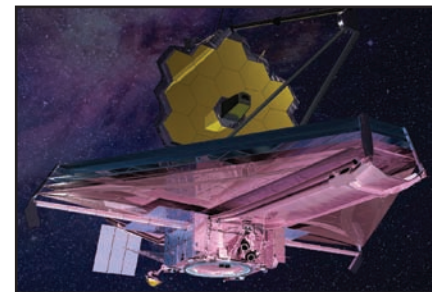
The first service mission, in 1993, was to install lenses to correct the blurriness. Astronauts last serviced Hubble in 2009. They installed new instruments and batteries.

Hubble's future

Hubble is at its best right now. NASA expects it will keep making great scientific discoveries until at least 2020, and hopefully beyond that. But when its instruments start to fail, NASA no longer has a way to fix them.

Hubble was designed to work hand-in-hand with the space shuttle, but shuttles are no longer flying. Newer vehicles such as Orion are not being designed to dock with Hubble to perform upgrades.

But for now, Hubble is still discovering wonders. For example, it recently found strong evidence of an underground saltwater sea on Ganymede, Jupiter's largest moon. Experts believe it has more water than all the water on the Earth's surface.



art courtesy Northrop Grumman

In 2018, NASA plans to launch Hubble's successor, the James Webb Telescope. This infrared telescope will be able to look even farther into space and time than Hubble. Scientists hope both telescopes' working lives will overlap.

Far, Far Away

Expanding universe

In 1925, Edwin Hubble observed that most galaxies appear to be moving away from all the other galaxies. This is because the universe is stretching out, or expanding.

Astronomers recently discovered, with the Hubble and other telescopes, that this expansion is actually speeding up. The entire universe is expanding faster now than in the past.

No one knows what is pushing the universe out like this. Scientists call the mysterious force **dark energy**.

Knowledge of the expanding universe helps prove the **Big Bang** theory. About 14 billion years ago, all the energy in the universe was jammed into a tiny spot smaller than a pinpoint. Then all of a sudden, the energy burst out as space began to expand super fast. Some of the energy changed into matter.



photo courtesy NASA/ESA/S. Beckwith(STScI) and The HUDF Team

This image shows close-ups of galaxies from Hubble’s Ultra Deep Field observations. Some are spiral-shaped, like our own Milky Way galaxy. Others are more round. The cross-shaped object is a nearby star in the field. Some galaxies are very distant, with their light taking billions of years to reach us.

Some of Hubble’s images show the oldest galaxies soon after they were born, when they were still taking shape. They look like links in a chain or like toothpicks. The closer galaxies have had more time to form the familiar spiral shapes. From the ground, the Deep Field region of space looks mostly empty. Hubble has discovered 10,000 galaxies in this area.

Looking back in time

Knowing how fast the universe is expanding helps astronomers figure out its age. Information from Hubble and other telescopes offers strong evidence that the universe formed about 13.8 billion years ago.

Hubble has taken pictures of some of the first galaxies formed after the Big Bang. These infant galaxies were born only about 400 million years after the universe burst into being.

Hubble is seeing light from galaxies as they existed 13 billion years ago. In other words, it is seeing objects more than 13 billion light-years away. It is seeing galaxies when they were babies.

The farthest galaxies are less well-formed than galaxies closer to Earth. They are usually smaller. As time passes, galaxies often merge, forming even larger galaxies. Hubble is seeing pictures of these galaxies when they were too young to have merged.

Ready Resources

The Mini Page provides ideas for websites, books or other resources that will help you learn more about this week’s topics.

On the Web:

- hubble25th.org
- nasa.gov/hubble

At the library:

- “Eye on the Universe: The Incredible Hubble Space Telescope” by Michael D. Cole
- “Space, Stars, and the Beginning of Time: What the Hubble Telescope Saw” by Elaine Scott
- “Space Exploration” by Carole Stott



Basset Brown's

Try 'n' Find

Hubble

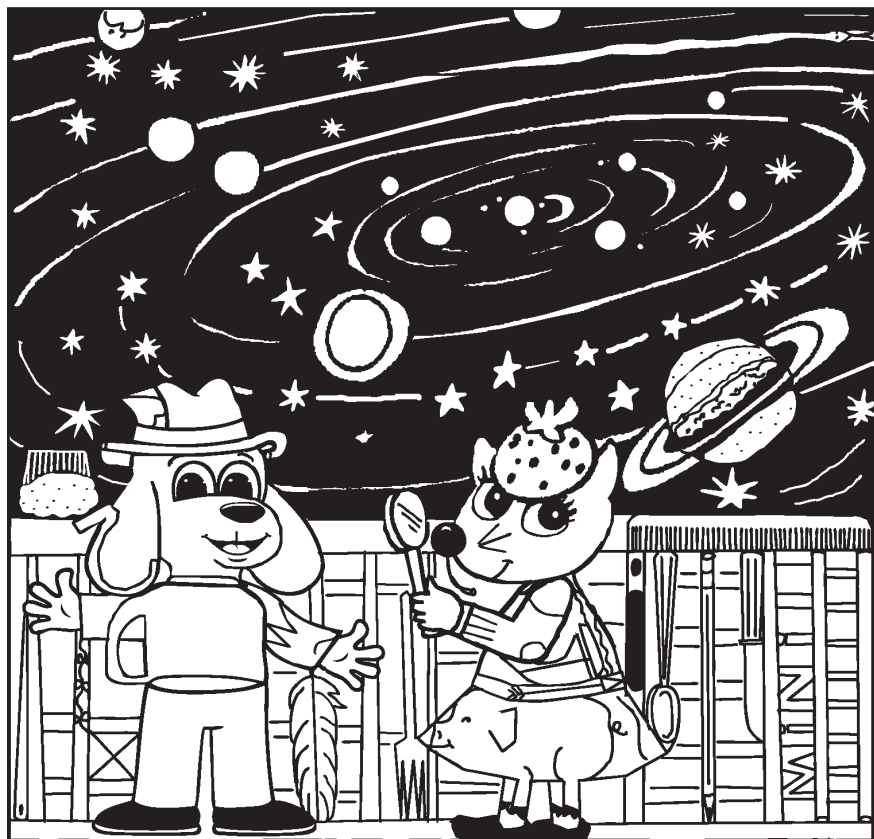
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E	T	H	G	I	L	T	S	U	D	R	A	T	S	M
R	A	L	O	S	R	E	M	O	N	O	R	T	S	A

Words that remind us of the Hubble Space Telescope are hidden in the block below. Some words are hidden backward or diagonally. See if you can find: AGE, ASTRONOMER, BIG, BANG, BLACK, EARTH, EXOPLANET, FAR, GALAXIES, GAS, HOLES, HUBBLE, LIGHT, NEBULA, ORBIT, SOLAR, SPACE, STARDUST, STARS, SYSTEM, TELESCOPE, WEBB, WONDER.



Mini Spy

Mini Spy and Basset Brown love to look at the stars. See if you can find: ☐ exclamation mark ☐ comb ☐ feather ☐ needle ☐ hamburger ☐ fork ☐ mug ☐ letter O ☐ spoon ☐ strawberry ☐ cherry ☐ pig ☐ ladder ☐ heart ☐ word MINI ☐ arrow ☐ kite ☐ tooth ☐ pencil ☐ muffin ☐ knife ☐ sock ☐ sailboat ☐ snake ☐ number 2 ☐ man in the moon



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Rookie Cookie's Recipe Nutty Creamy Dream

You'll need:

- 2 cups light coffee ice cream, softened
- 1 1/4 cups crumbled peanut brittle
- 1/2 cup chocolate fudge sauce
- 1 cup whipped cream or topping

What to do:

1. In a large bowl, combine ice cream and 1 cup of peanut brittle. Mix well. Refreeze until firm.
2. Warm fudge sauce in microwave. Spoon ice cream mixture into bowls and top with warm sauce, whipped topping and remaining peanut brittle. Serves 4.

You will need an adult's help with this recipe.

Adapted from "The Robin Takes 5 Cookbook for Busy Families" with permission from Andrews McMeel Publishing (andrewsmcmeel.com).

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Meet Matt Baron



photo by Jeff Sciorino

Matt Baron is a rock singer and songwriter and the leader of the band Future Hits. He is also an English as a Second Language (ESL) teacher.

The band's latest album for kids is "Today Is Forever/Hoy es para siempre." Each song on the album is performed in English and in Spanish. It comes out in May.

Matt said: "One day I came home from school, and there was a sweet electric guitar sitting on our dining room table. I was 6 at the time and was in complete, joyous shock." Matt's dad is a jazz musician, and the guitar was a loaner from one of his dad's friends. He taught Matt to play.

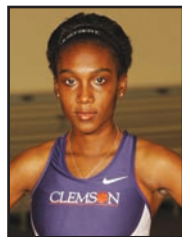
He started taking Spanish when he was in fifth grade. In college, he studied in Spain and lived in Ecuador as part of a program for teachers.

He and his band help artists with developmental or mental disabilities. They also help with a music workshop for underserved youth.

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Goldie
Goodsport's
Supersport



Height: 5-3
Age: 24
Hometown:
Clarendon,
Jamaica

Natoya Goule

from The Mini Page © 2015 Universal Uclick

The island nation of Jamaica has been home to many sprinters — runners who excel at relatively short-distance races, such as the 100, 200 and 400 meters. Natoya Goule, on the other hand, is a middle-distance runner in the 800 meters (twice around a standard running track).

Natoya attended Louisiana State University in 2013, where she claimed NCAA titles in the 800 meters during both the 2013 indoor and outdoor track seasons. When she transferred to Clemson University in South Carolina, Natoya had to sit out the entire 2014 season by rule.

By 2015, Natoya was back on the track. At the NCAA Indoor Track & Field Championships, she set a meet record in the 800 meters to claim her third NCAA title. It was also the first individual indoor championship by a Clemson female athlete. This spring, Natoya will look to reclaim her outdoor title, too!



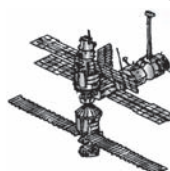
Mighty
Funny's

Mini Jokes

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All the following jokes have something in common. Can you guess the common theme or category?

Shelly: How do astronaut lambs travel?
Sam: In spacesheeps!



Stuart: How do you park at the space station?
Sue: At a parking meteor!

Steve: How do you organize a flight to the Space Station?

Sonny: You need to plan-et carefully!



Discoveries Far and Near

Black holes

With the Hubble telescope, astronomers were able to prove that supermassive black holes are at the centers of galaxies.

Early in its mission, Hubble detected a cloud of gas rotating very quickly around the core of a galaxy. The only thing that would keep that speeding gas in orbit was the gravity from a supermassive black hole.

The black hole was several billion times the mass of our sun, but squeezed into a space only about as big as our solar system. This find, in galaxy M87, was the evidence astronomers had been looking for.

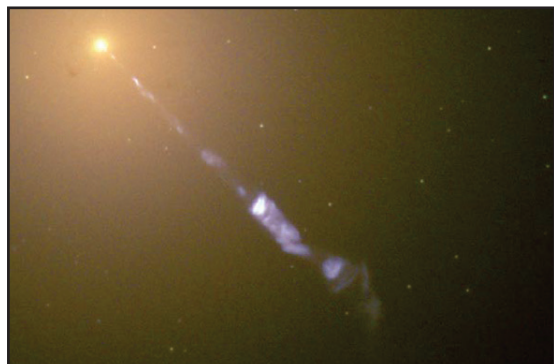


photo courtesy J. A. Biretta et al., Hubble Heritage Team (STScI/AURA), NASA

Black holes are so massive that their gravity sucks in everything that is very close, including light. Material farther out can orbit the black hole very fast. However, sometimes strong magnetic fields form around the black hole. They catch gases near the black hole and push them away. This gas jet is being pushed from the black hole in the M87 galaxy.

The Mini Page thanks Dr. Jennifer J. Wiseman, Hubble Space Telescope senior project scientist, NASA, for help with this issue.

Next week, The Mini Page is about horse racing.

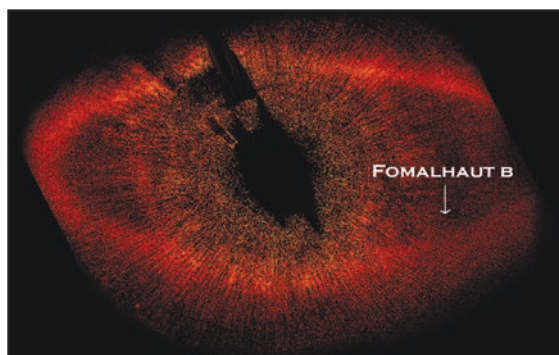


photo courtesy NASA, ESA

Hubble took the first visible-light image of an exoplanet, Fomalhaut b. It orbits the star Fomalhaut (FOME-uh-lot) in the constellation Piscis Australis. Fomalhaut b is in a disk of stardust orbiting the star (in center, but not visible in this image).

Milky Way discoveries

Hubble has made many discoveries in our own Milky Way galaxy. For example, it has detected flattened disks of stardust orbiting newborn stars. It found evidence that planets form in these dusty disks.

It has confirmed the existence of many **exoplanets**, or planets outside our solar system. It is analyzing their atmospheres and has detected water vapor within some of them. It is helping us learn if exoplanets resemble the ones in our solar system.



photo courtesy NASA, ESA, and the Hubble Heritage Team (STScI/AURA)

The Horsehead Nebula in the constellation Orion stands out against the stars when shot in infrared. A **nebula** is a cloud of gas and dust in space.



photo courtesy NASA, ESA, R. O'Connell (University of Virginia), F. Paresce (National Institute for Astrophysics, Bologna, Italy), E. Young (Universities Space Research Association/Ames Research Center), the WFC3 Science Oversight Committee, and the Hubble Heritage Team

Giant clusters of young stars shine in the star-forming nebula in the Carina constellation.

Discoveries in our backyard

Astronomers have also pointed Hubble toward comets, asteroids and planets in our own solar system. Its many discoveries include: unknown moons orbiting Pluto, aurorae on planets besides Earth, and clues about how our solar system began and planets were formed.



photo courtesy NASA, ESA, and A. Simon

Over the years, Hubble images have shown that Jupiter's giant storm, the Great Red Spot, is growing smaller.

Look through your newspaper for pictures and stories about outer space.

The Mini Page Staff

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