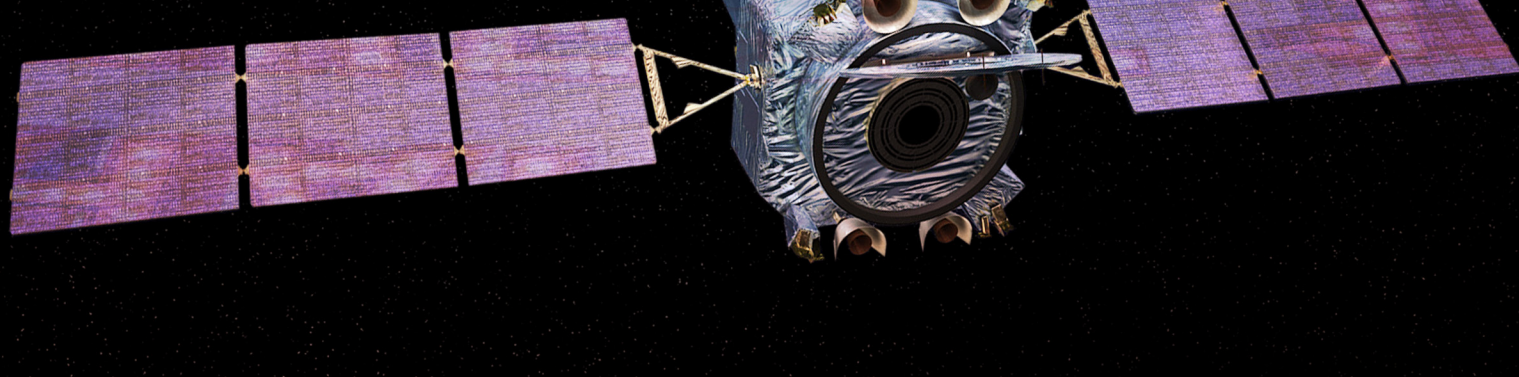


# CHANDRA'S SWEET 16



The number 16 can be pretty special. For many people, their 16th birthday is cause for celebration: perhaps an opportunity to drive a car, a time to think about the next steps of education, or simply accumulating more knowledge and information about the world around them.

In 2015, NASA's Chandra X-ray Observatory celebrated its own "sweet 16." July 23rd marked Chandra's birthday, as it was launched aboard the Space Shuttle Columbia and then deployed into space on this day sixteen years ago. In August 2015, Chandra passed the 16th anniversary of another milestone—the release of the "First Light" images from the telescope (see Cassiopeia A below).

To mark these coming-of-age moments for Chandra, we've assembled some facts about where Chandra and the scientists who use this Great Observatory find themselves on this auspicious birthday. For example, do you know how far Chandra has traveled during its lifetime? Or how many scientific papers its data have produced? What about how many objects this extraordinary X-ray telescope has looked at?

Thanks to all of the amazing discoveries Chandra has made over its first 16 years in orbit and operations, this birthday does seem exceptionally sweet.

## Chandra's First Light

Cassiopeia A

(1999)

Chandra has had its driver's license for a while now.

Chandra has covered a tremendous distance since launch.

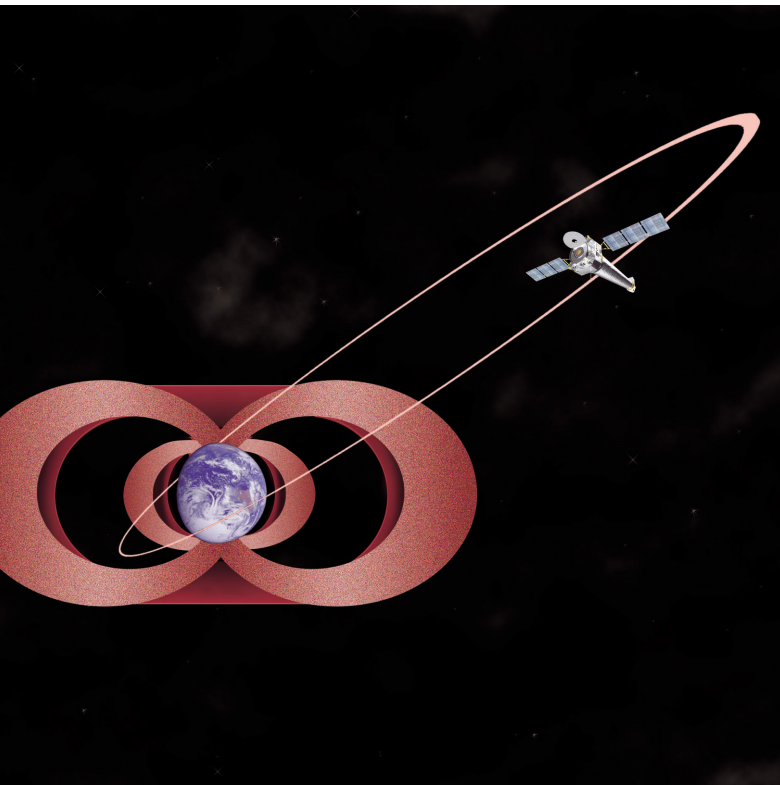
As of July 1st, 2015, Chandra has traveled over

**17 billion miles** while completing about

**2,200 orbits** of the Earth.

To put that number in context, the farthest distance between

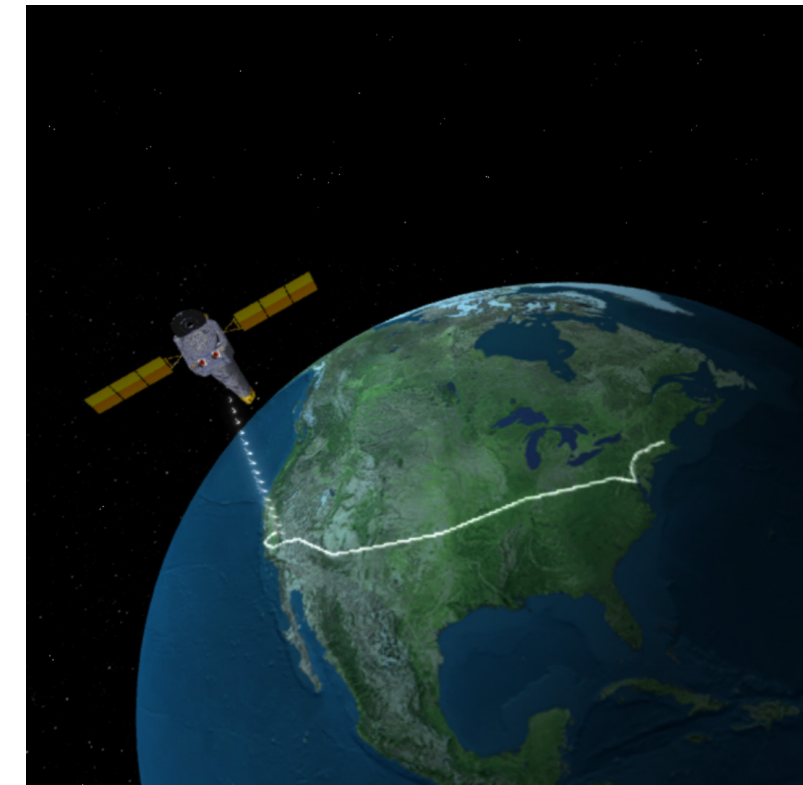
Pluto and the Earth is about 4.6 billion miles.



Chandra's orbit goes about 1/3 of the way to the Moon. This schematic side view of Chandra's orbit, shows the inner and outer radiation belts.  
(Illustration: NASA/CXC/M.Weiss)



This image of NASA's Chandra X-ray Observatory following deployment from the Space Shuttle Columbia was shot by Columbia Astronaut Mission Specialist Cady Coleman, during the STS-93 mission.  
(Photo: NASA)



Chandra uses NASA's Deep Space Network, a series of radio dishes located around the world, in order to call home.  
(Illustration: CXC/D.Berry)

## A 3-Color View

Cassiopeia A

(2000)

Chandra has been marking educational milestones.

Working days and nights and over weekends, Chandra has made over

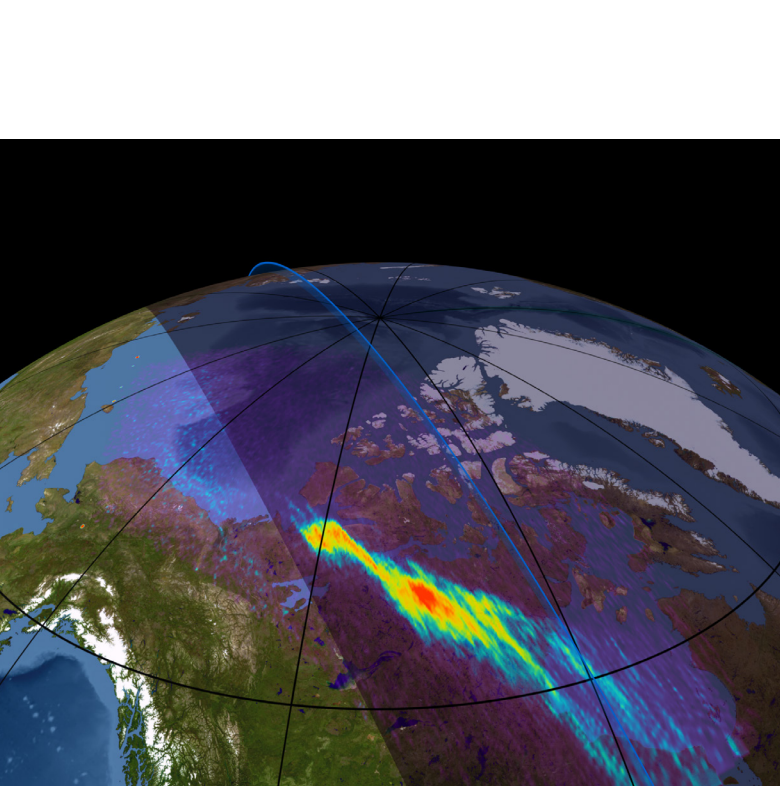
**14,000 observations** over the last 16 years.

The targets include objects as close as the Earth and as distant as black holes near

the edge of the observable Universe. These observations have resulted in more

than **6,000 research papers** in science journals, an average

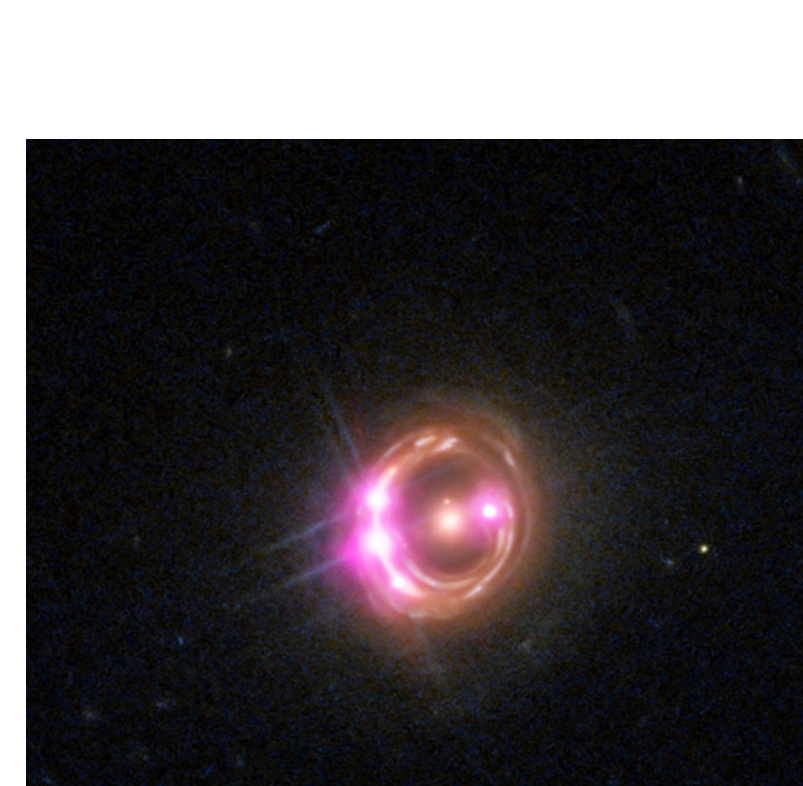
rate of about a paper a day, a good reward for all of that hard work.



On February 15, 2004, Chandra observed X-rays produced by an aurora in the north-polar region of Earth.  
(Photo: X-ray: NASA/MSFC/CXC/A.Bhardwaj & R.Elsner, et al.; Earth model: NASA/GSFC/L.Perkins & G.Shirah)



Chandra's image of M82 shows a galaxy undergoing a burst of star formation.  
(Photo: NASA/CXC/SAO/R.Margutti et al)



Chandra & Hubble data show quasar RX J1131-1231 which hosts a supermassive black hole spinning extremely rapidly.  
(Photo: Credit: X-ray: NASA/CXC/Univ of Michigan/R.C.Reis et al; Optical: NASA/STScI)

## Evolution of an Image

Cassiopeia A

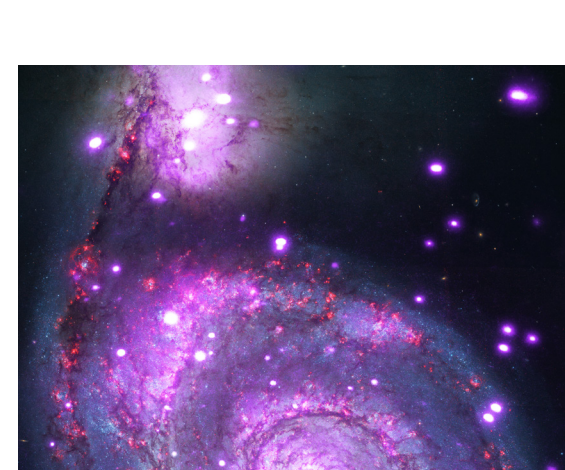
(2013)

Chandra has been busy hanging out with friends.

One thing that is often true about teenagers: they enjoy being with their friends and socializing. The Chandra X-ray Observatory is no exception. While Chandra doesn't physically hang out with its telescopic buddies—some of which are orbiting in different parts of space and others that are found on the ground—they do get together virtually. This means that Chandra's data are often combined with those from other telescopes to both make scientific discoveries and generate some spectacular images.



**NGC 6388**  
Chandra X-Ray Observatory & Hubble Space Telescope



**M51**  
Chandra X-Ray Observatory & Hubble Space Telescope



**PSR B1509-58**  
Chandra X-Ray Observatory & WISE telescope



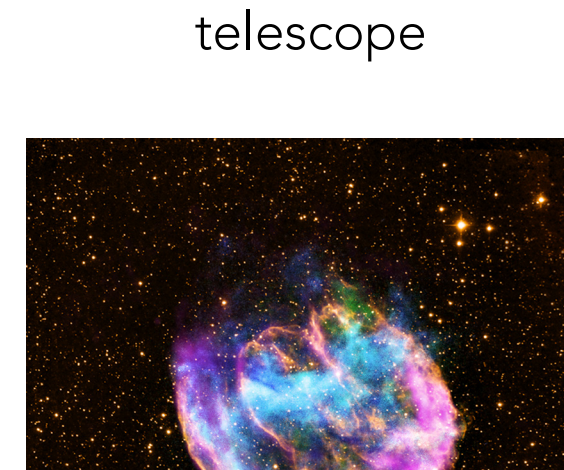
**Hercules A**  
Chandra X-Ray Observatory, STScI, NSF/NRAO/VLA



**M106**  
Chandra X-Ray Observatory, Hubble & Spitzer Space Telescope



**NGC 602**  
Chandra X-Ray Observatory, Hubble & Spitzer Space Telescope



**W49B**  
Chandra X-Ray Observatory, VLA & Palomar Observatory



**MACS J0416.1-2403**  
Chandra X-Ray Observatory & Hubble Space Telescope

Image Credits: **NGC 6388** – X-ray: NASA/CXC/IASF Palermo/M.Del Santo et al, Optical: NASA/STScI; **M51** – X-ray: NASA/CXC/Wesleyan Univ./R.Kilgard, et al, Optical: NASA/STScI; **PSR B1509-58** – X-ray: NASA/CXC/SAO, Infrared: NASA/JPL-Caltech; **Hercules A** – X-ray: NASA/CXC/SAO, Optical: NASA/STScI, Radio: NSF/NRAO/VLA; **M106** – X-ray: NASA/CXC/Caltech/P.Ogle et al, Optical: NASA/STScI & R.Gendler, IR: NASA/JPL-Caltech, Radio: NSF/NRAO/VLA; **NGC 602** – X-ray: NASA/CXC/Univ.Potsdam/L.Oskinova et al, Optical: NASA/STScI, Infrared: NASA/JPL-Caltech; **W49B** – X-ray: NASA/CXC/MIT/L.Lopez et al., Infrared: Palomar, Radio: NSF/NRAO/VLA; **MACS J0416.1-2403** – X-ray: NASA/CXC/Ecole Polytechnique Federale de Lausanne, Switzerland/D.Harvey & NASA/CXC/Durham Univ/R.Massey, Optical & Lensing Map: NASA, ESA, D. Harvey (Ecole Polytechnique Federale de Lausanne, Switzerland) and R. Massey (Durham University, UK)