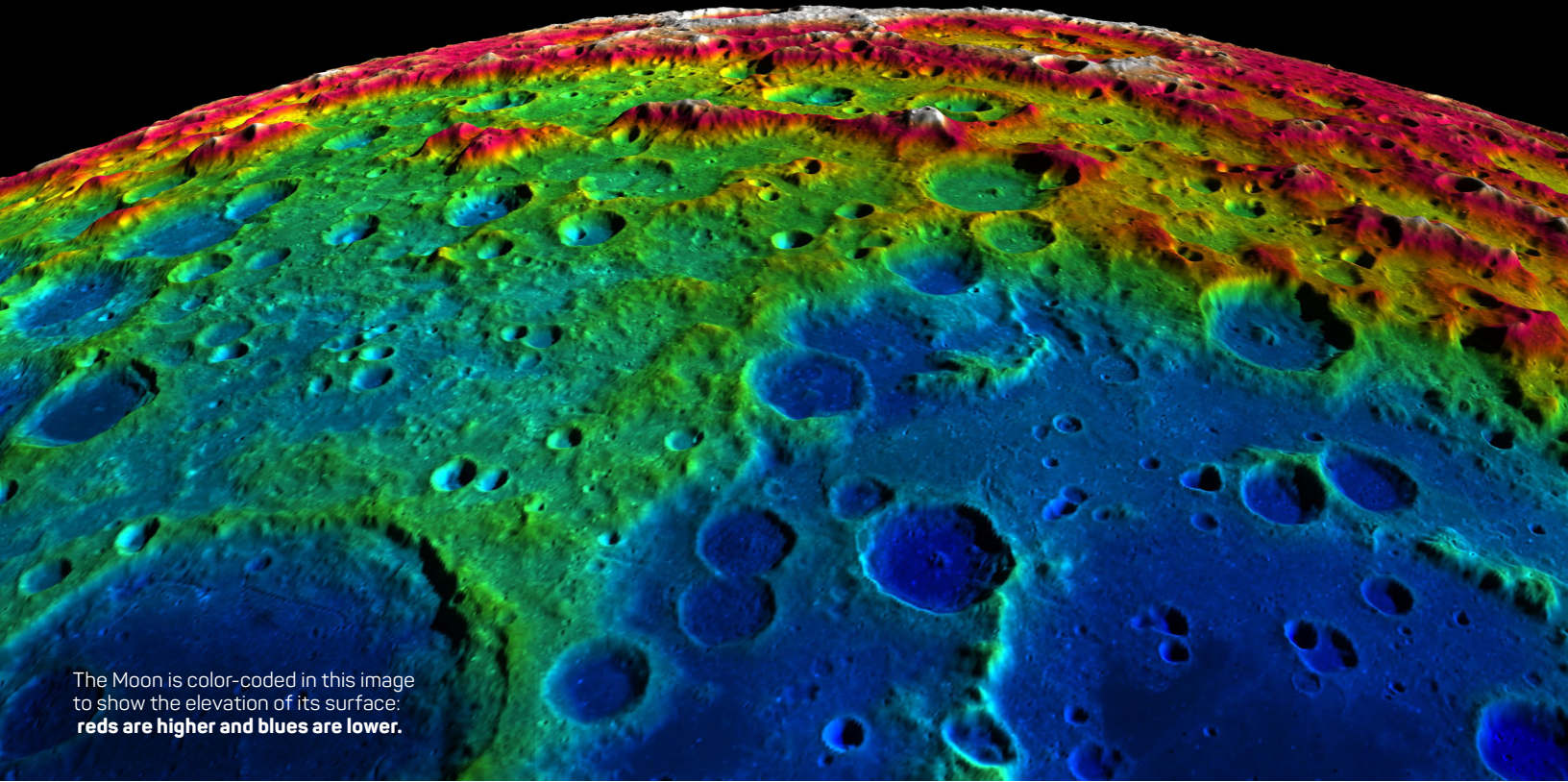


The Colors of Astronomy

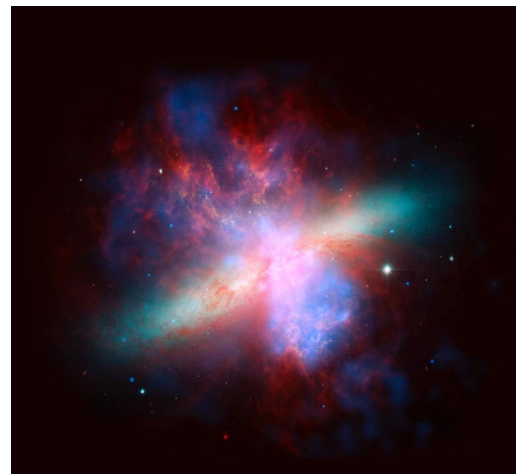
Scientists assign colors to astronomical images to convey more information.



The Moon is color-coded in this image to show the elevation of its surface: **reds are higher and blues are lower.**

Our eyes only see visible light, but there's a lot more out there. There's also ultraviolet, infrared, microwaves, and X-rays, for instance. When scientists record information about space objects, they often capture many different energies of light that humans can't see. They might also measure quantities like temperature, magnetic field strength, and elevation. In order to show these types of data, scientists use *representational color*. That means creating images with colors that represent information other than visible light. These representational color images help scientists highlight and pay attention to certain features we normally could not perceive.

LEARN MORE:
astronomerswithoutborders.org/gam2019-news/gam-2019-blog/4928



An image of the M82 galaxy using representational color shows X-rays recorded by NASA's Chandra Observatory in blue and infrared light recorded by NASA's Spitzer Telescope in red. Our eyes can't see X-rays or infrared light without special equipment.

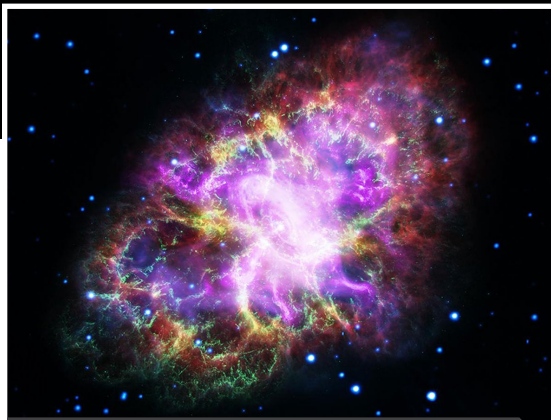
Planetary Nebula or Supernova?

Stars die in different ways depending on how massive they are.



This planetary nebula, the Ring Nebula, was formed when a Sun-sized star died.

LEARN MORE:
[map.gsfc.nasa.gov/
universe/rel_stars.html](http://map.gsfc.nasa.gov/universe/rel_stars.html)



This aftermath of a supernova, the Crab Nebula, was created by a supernova explosion witnessed by ancient cultures almost 1,000 years ago.

Stars don't live forever, and they die in different ways.

Many low-mass stars—the vast majority of stars in the universe—end their lives by losing their outermost layers of gas and dust. The expelled material moves away from the collapsing star, often creating beautiful, intricate patterns—called a *planetary nebula*—that can be viewed through a telescope. Using less-powerful telescopes in the past, these “fuzzy” objects resembled planets, resulting in their confusing name.

Rarer high-mass stars can die by exploding in violent events known as *supernovas*. A supernova is very different from the gentle shedding of gas and dust that characterizes the formation of a planetary nebula. These explosions occur much more quickly and emit a lot more energy—a supernova explosion can temporarily outshine the light from all of a galaxy's other stars put together. The resulting nebula is called a *supernova remnant*.

Beautiful Nebulas

A nebula is a giant cloud of gas and dust in space.

Nebulas are where stars are born and can be created when stars die. Using powerful telescopes, astronomers have shown that nebulas come in many different shapes and each one is unique.



Tarantula Nebula
Nebulosa de la Tarántula



Clownface Nebula
Nebulosa Cara de Payaso



NGC 6210 Nebula
Nebulosa NGC 6210



Stingray Nebula
Nebulosa de la Mantarraya



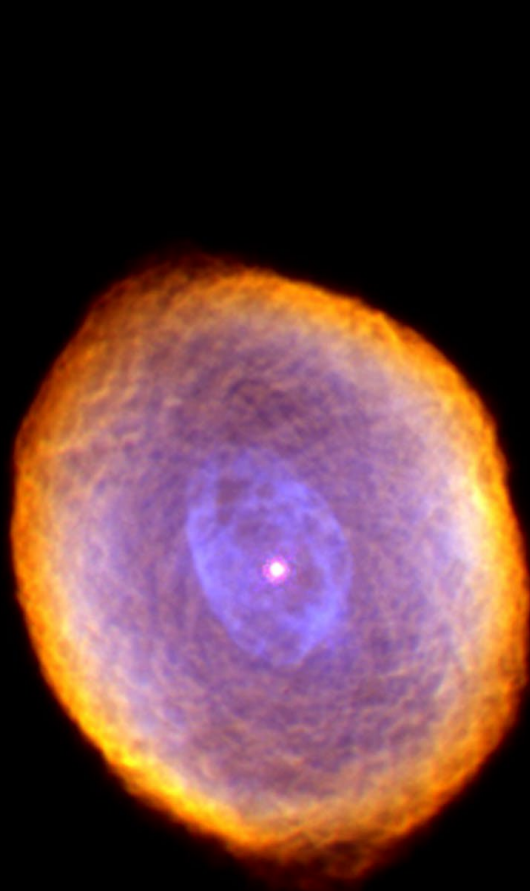
Crab Nebula
Nebulosa del Cangrejo



Cat's Eye Nebula
Nebulosa Ojo de Gato



Supernova Remnant N49
Remanente de la Supernova N49



Spirograph Nebula
Nebulosa del Espirógrafo



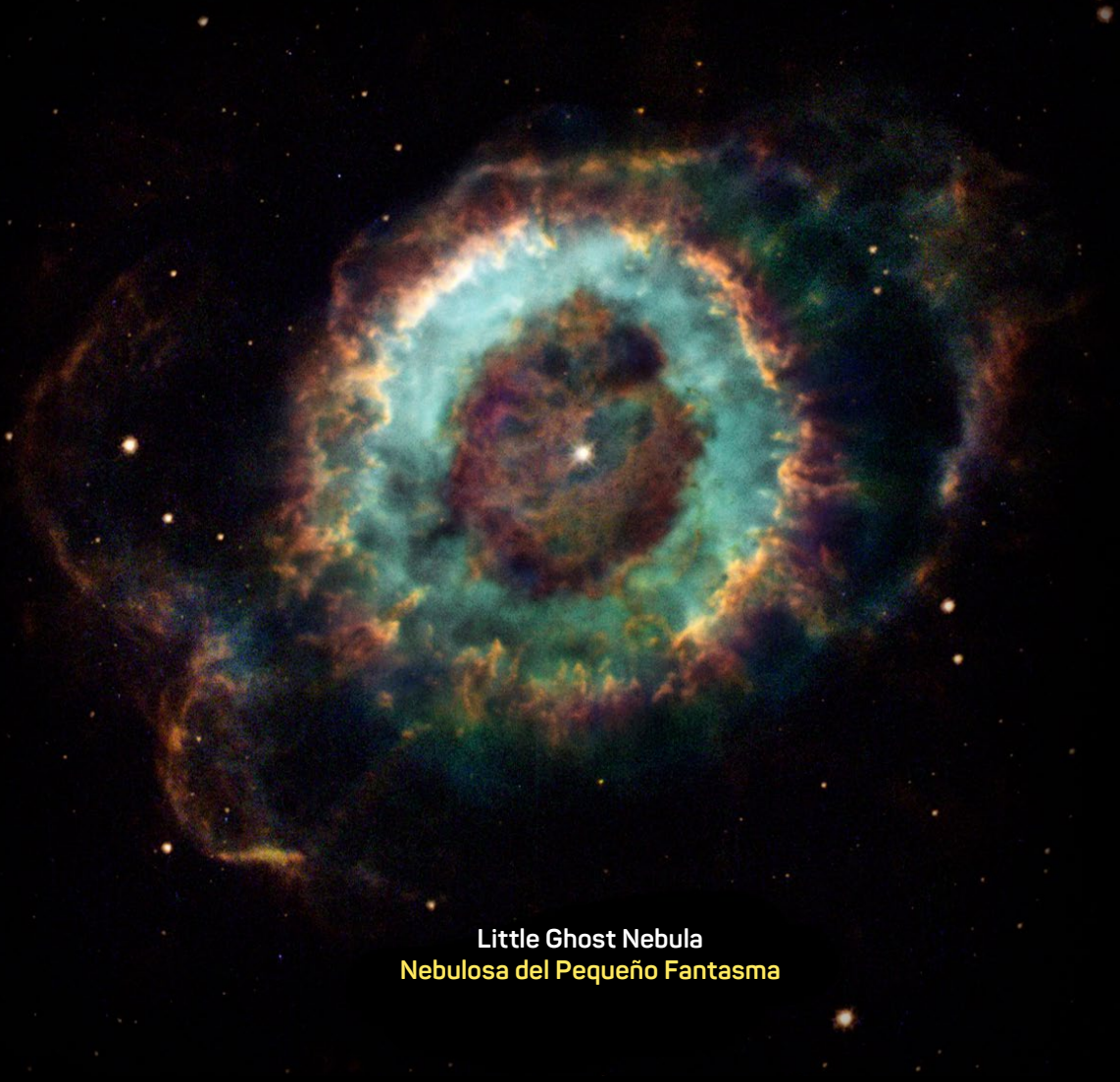
Hourglass Nebula
Nebulosa Reloj de Arena



Butterfly Nebula
Nebulosa de la Mariposa



Little Gem Nebula
Nebulosa la Pequeña Gema



Little Ghost Nebula
Nebulosa del Pequeño Fantasma

Nebulosas hermosas

Una nebulosa es una nube gigante de gas y de polvo en el espacio.

Las nebulosas son el lugar donde nacen las estrellas y pueden ser creadas cuando éstas mueren. Utilizando potentes telescopios, los astrónomos han mostrado que las nebulosas tienen formas muy variadas y que cada una es única.



Nebula Color Art

The instructions and photo demonstrations on the following page require you to have a salad spinner at home. If you don't, experiment with other containers (make sure they have a lid)

- Shoe box or any small cardboard box – just tape the lid closed
- Old Tupperware or plastic storage container
- Food containers ie: butter tubs, large yogurt containers, etc
- Get creative but make sure you check with an adult in the house to make sure it is ok to use

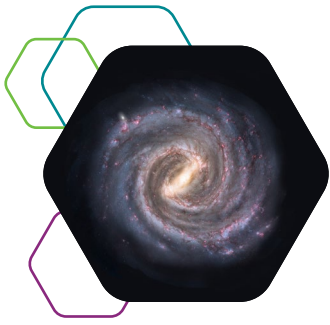
Cut the paper to fit the size of the container then place it inside

Seal lid tightly

Wrap the container in a large towel (like a tootsie roll)

Grab each end of the towel then try to spin it really fast in front of you

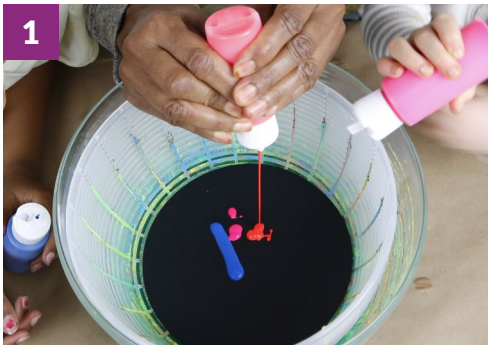
Use the nebula poster for inspiration to pick your colors!



EXPLORING THE UNIVERSE

Nebula Spin Art

Try this!



Place a black paper circle in the bottom of the spinner and choose at least 3 colors of paint. Squirt 5–10 drops of each color *into the center* of the paper circle so that all the drops are touching.



Before spinning, lift up the spinner and tilt it back and forth to start spreading the paint equally in all directions. (This will be your star with its mix of elements!)



Cover the spinner with the lid and use the hand pump to spin everything for several seconds. Open it up and look inside. What happened to your star? Where did the star's elements go as it became a nebula?

Now try this! Can you make another nebula with a different pattern or color mixture? Use a gel pen to add the name of your nebula or your own name to the paper.

A nebula is a large cloud of gas and dust in space that can be created by a dying star.

Nebulas are responsible for mixing up and spreading out elements in space. In this activity, the spreading paint represents a dying star ejecting its matter into space. Out in the universe, a dying star pushes out gas and dust, forming rays, rings, and other features of nebulas just like the ones you can make with the paint. Some giant stars, much larger than the Sun, die with a violent explosion called a *supernova*. But many stars slowly shed their contents into space to form *planetary nebulas*. Planetary nebulas aren't actually planets, but these fuzzy objects resembled planets through old telescopes. Many nebulas are round, but strange shapes are also possible depending on what's nearby the dying star. No matter the final shape, the messy process of creating a nebula stirs up elements in nearby space—just like mixing paint colors in the spinner. Elements from stars that died a long time ago spread throughout space and contributed matter to the solar system, Earth, and even us. The oxygen you breathe, the calcium in your bones, and the precious metals in jewelry are all elements that came from dying stars!



An image of the Clown Face Nebula shows rays and rings similar to your spin art creation.

NASA scientists can assign colors in nebula images to represent different elements and other characteristics we can't see with our eyes. In this activity, you've made an artistic representation or model of a nebula. Objects in space emit light over the full *electromagnetic spectrum*—not just the colors we can see. Often, images captured by space telescopes include types of energy beyond visible light, such as X-rays, infrared, and ultraviolet light. Scientists translate these types of energy into visible colors in the final images to share more information. For example, scientists used NASA's Chandra X-ray Observatory to observe the area around the central collapsed star in the Cat's Eye Nebula and discovered a hot cloud of gas emitting X-rays. Because X-rays are invisible to our eyes, scientists used blue to represent them in this image. Scientists also use colors to represent the unique mix of elements in each nebula. For example, red usually indicates hydrogen gas.



Like many nebula images, this representational color image of the Cat's Eye Nebula combines data from multiple telescopes.