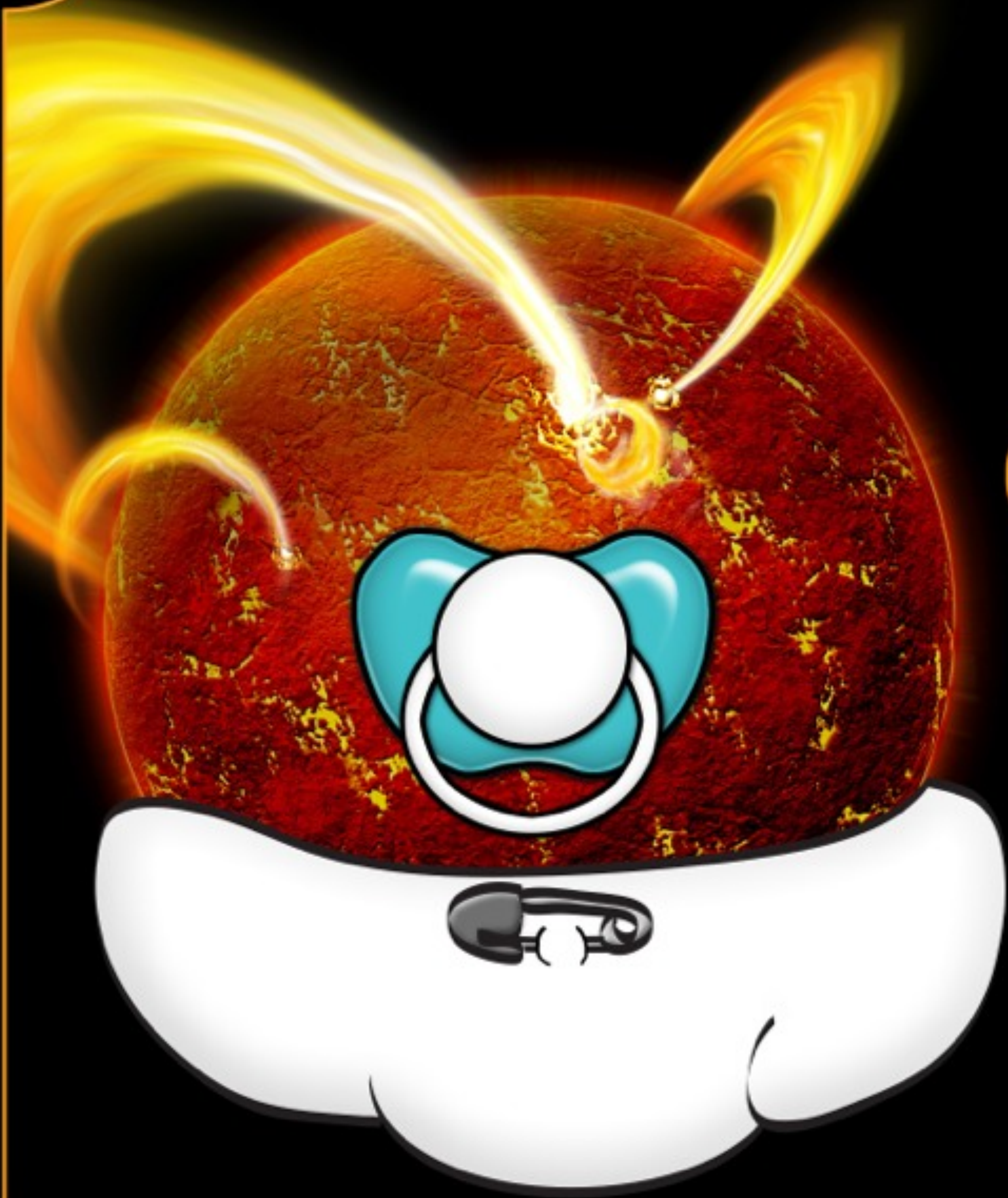
HOT STORIES OF COOL SCIENCE

STAR BIRTH EDITION

CHANDRA X-RAY OBSERVATORY

UNIVERSE AWARENESS

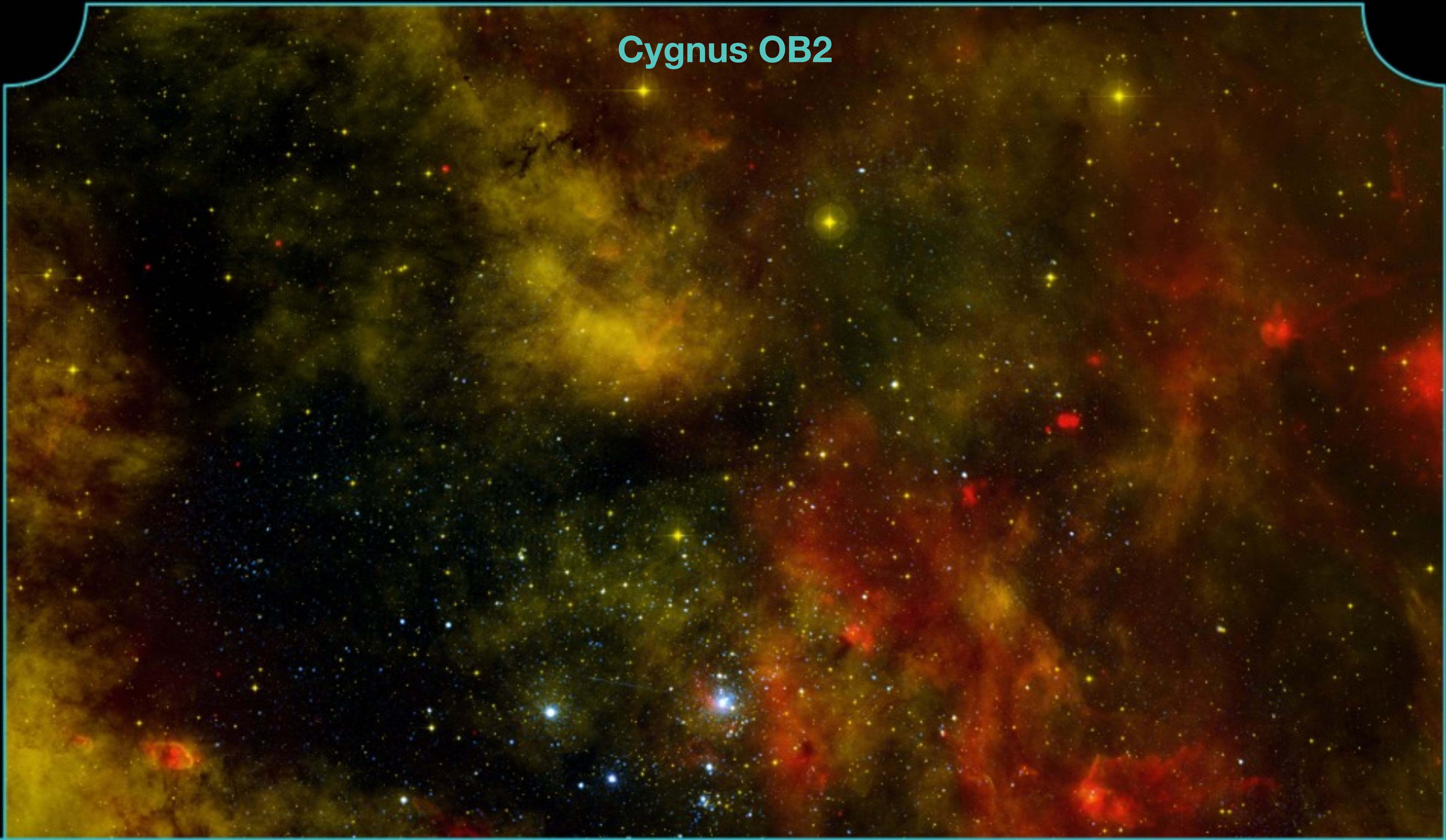


Stars are amazing. They look like tiny pinpoints of shining light that seem to last forever. However, that is not the case. Just like people, stars are born, live for a while, and then die. Let's find out more about baby stars.

Birth of a Star

A Field Trip to Star School

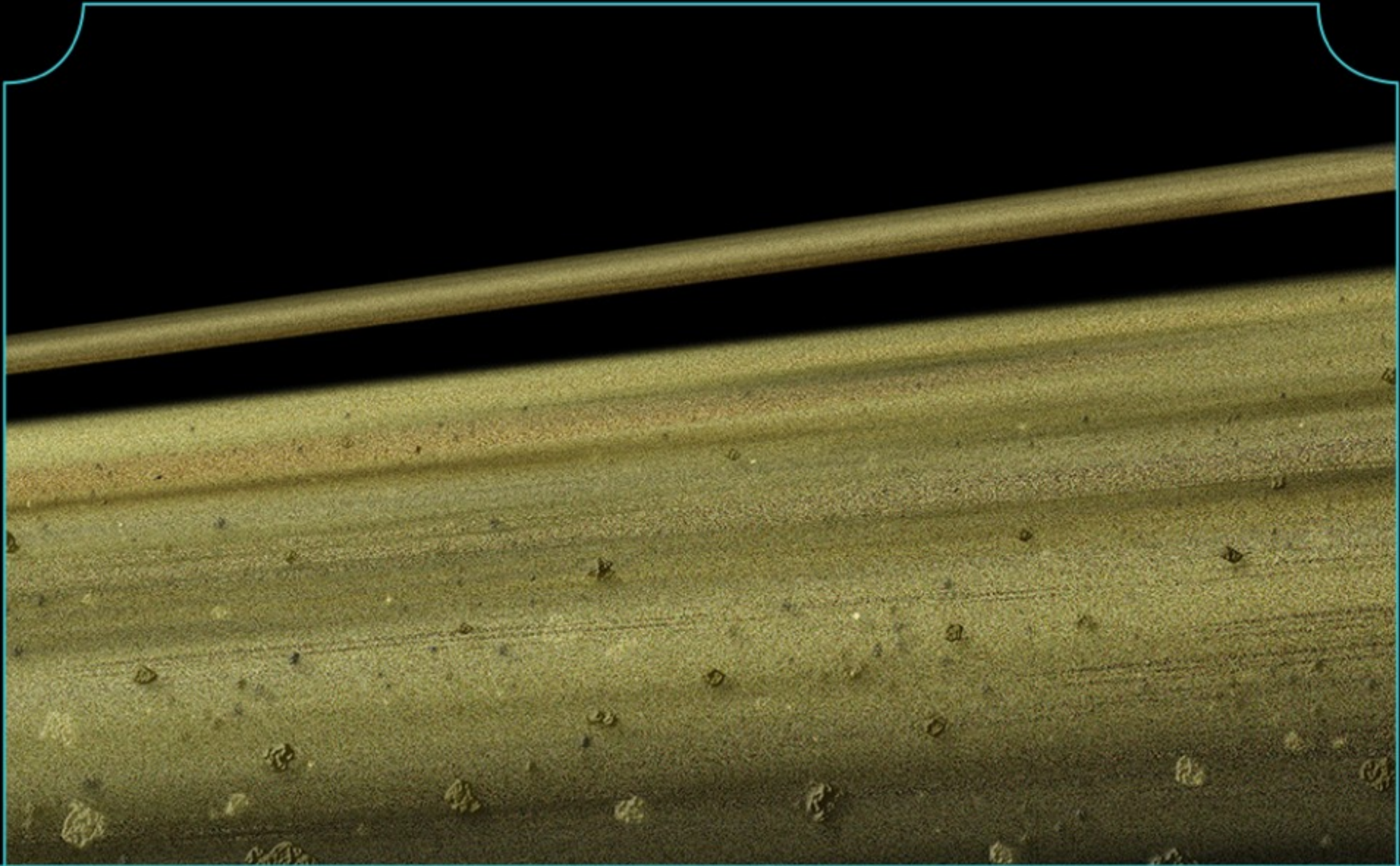
If you wanted to learn about young people, you would probably visit a school where there are lots of young people, right?



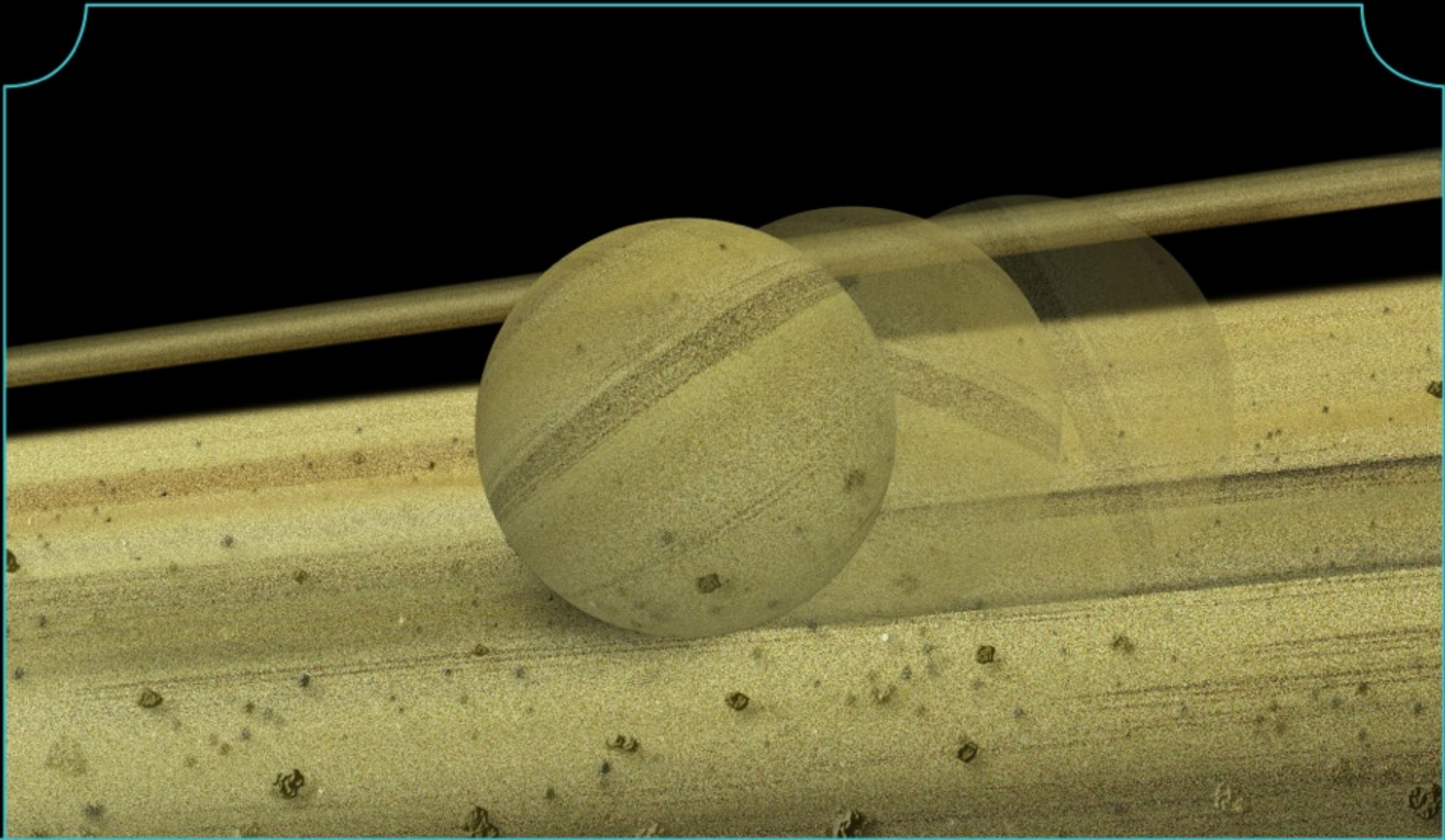
This photograph shows a star “school”—home to over a thousand of the biggest and brightest young stars in the sky. When astronomers want to study young stars, this cluster—called Cygnus OB2—is one of the first places they look.

Cygnus OB2 is the largest star cluster in the northern half of the sky, containing about 30,000 times as much material as the Sun. If the Sun was the size of a person, Cygnus OB2 would be the size of Los Angeles, California!

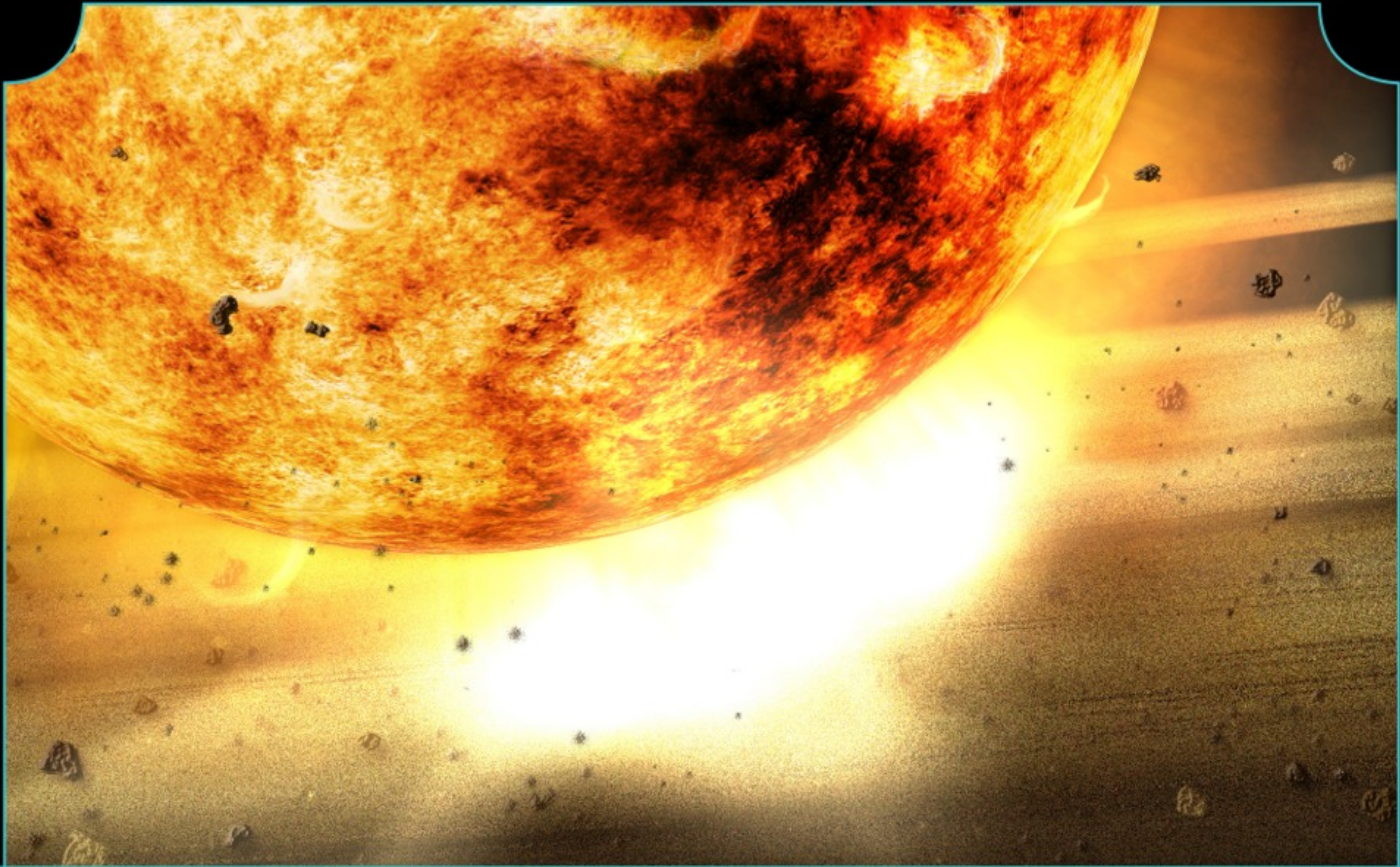
One of the most interesting—but unfortunate!—discoveries that astronomers made while studying the massive, young stars in this cluster is that most of them will host fewer planets than their brothers and sisters in less massive clusters. Some might not host planets at all!



When a star forms, there is always some material left over. This becomes a disk of dust and dirt, like a thicker version of Saturn's rings.



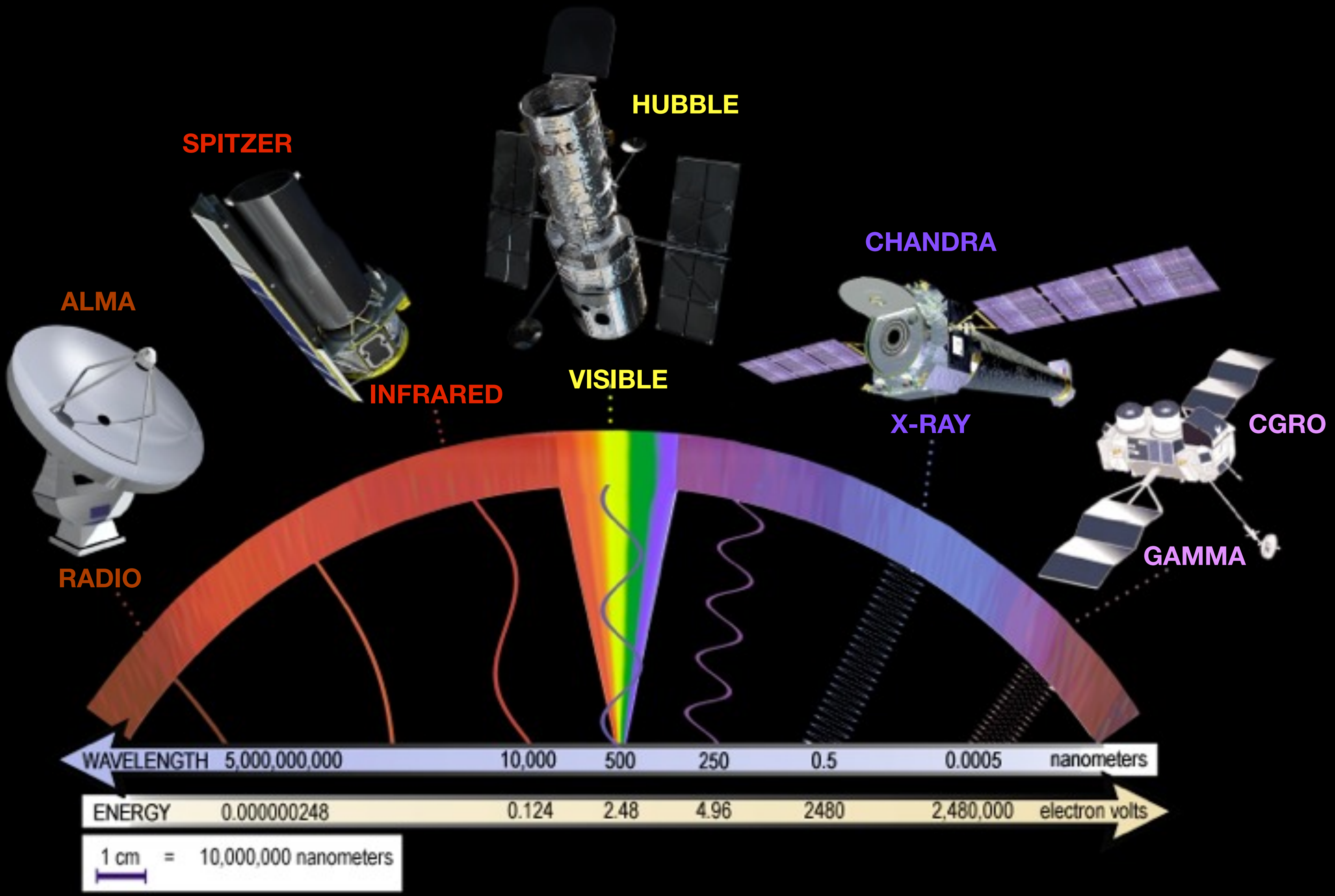
Within this disc, small dust grains made of rock and ice can form, and these sometimes merge together into larger and larger objects—imagine rolling a snowball around in the snow: it becomes bigger and bigger as it collects snow. This is similar to how planets are born.



Massive young stars, however, can destroy the dusty discs of their lower-mass neighbors with their intense energy spatting out, long before any planets might be born!

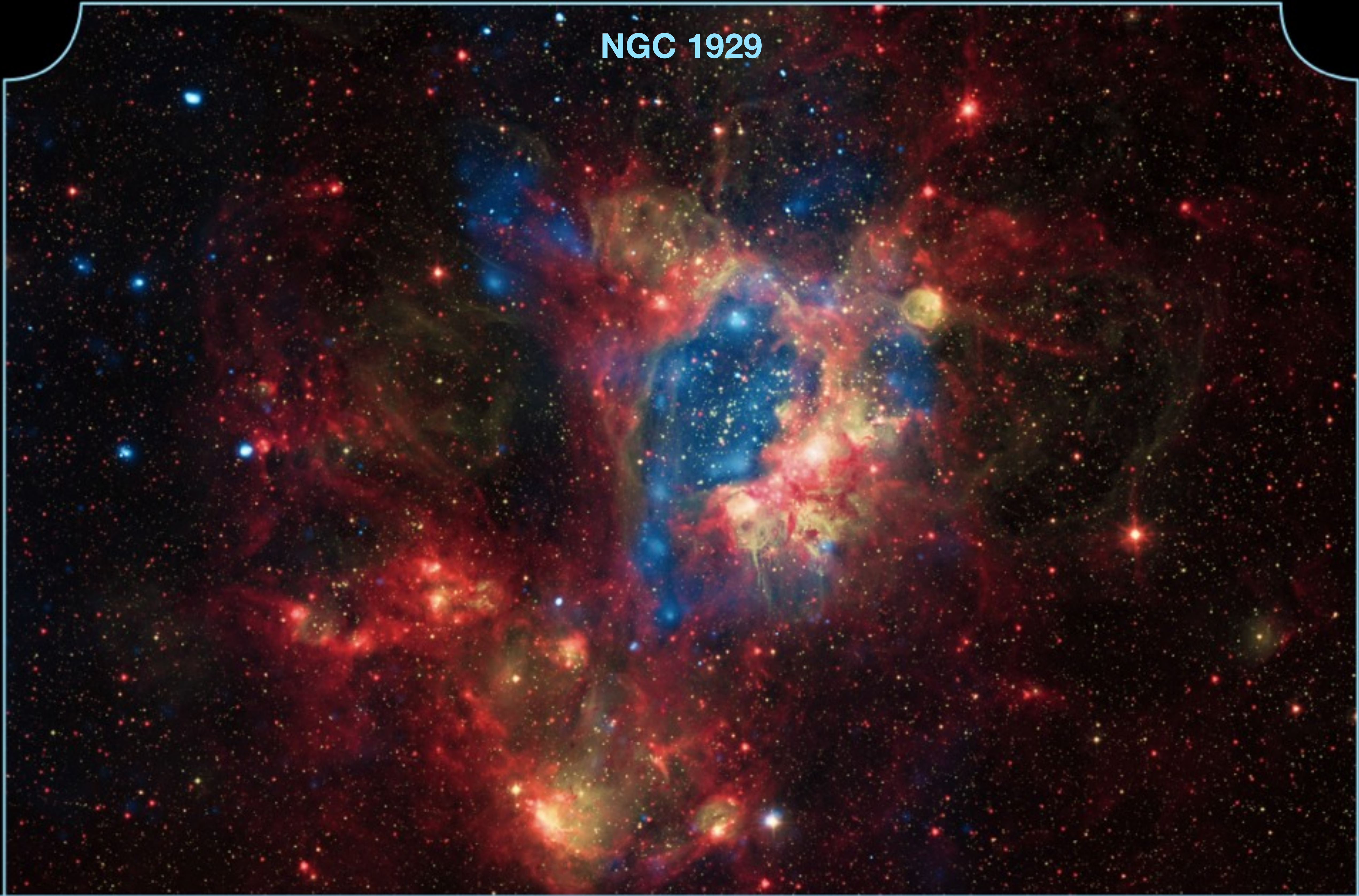
At the End of the Rainbow

Looking up at the night sky with our eyes, you can see lots of black with the stars appearing as simple white dots. But if we look deeper and with different kinds of telescopes, space and the stars that live there have a lot more to offer.

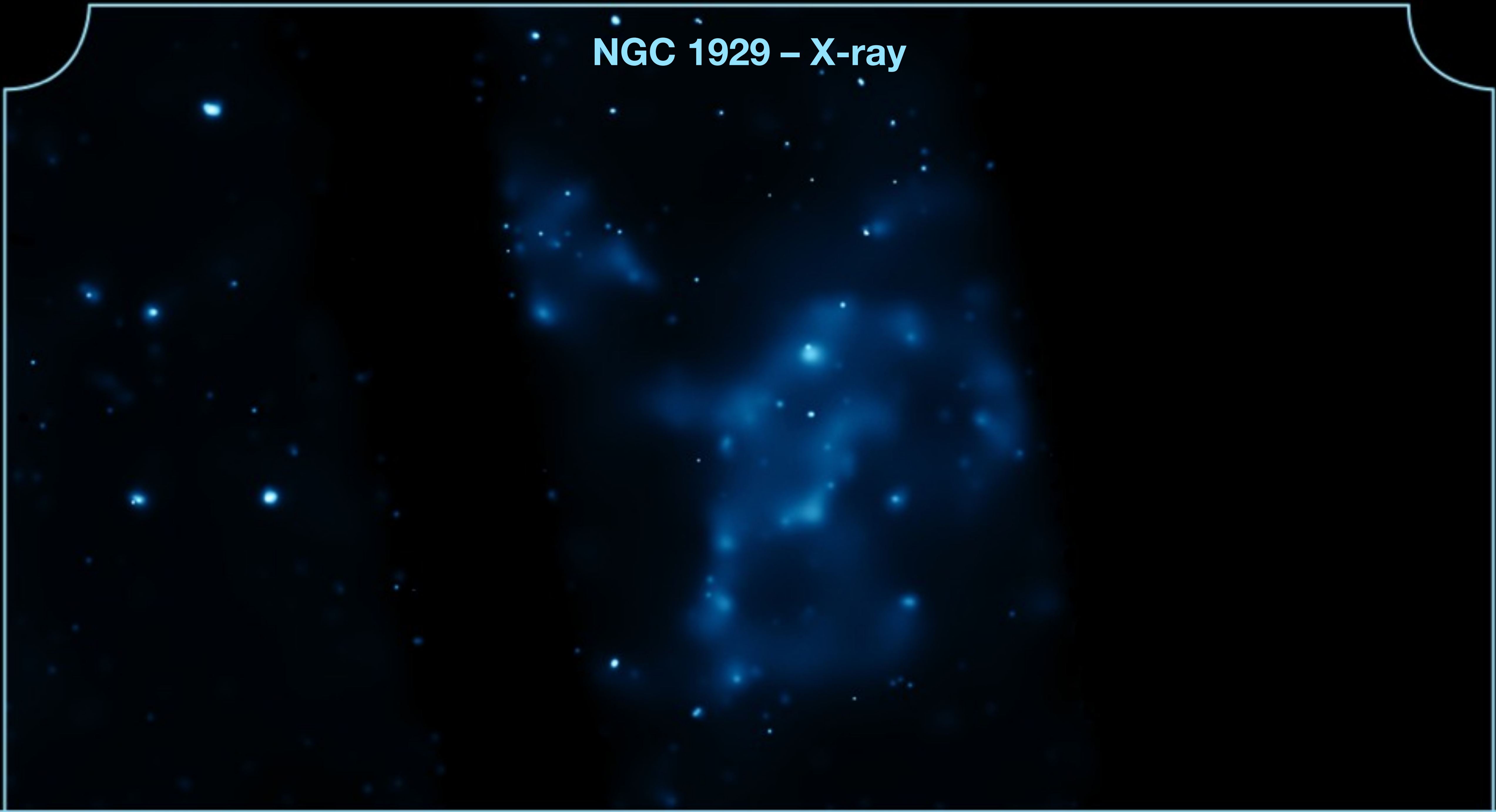


You've probably heard the phrase 'visible light'. This is what we call the range of colors that humans can see with their eyes. Visible light is just a tiny portion of all light. So astronomers have built special telescopes to see things that human eyes can't!

NGC 1929

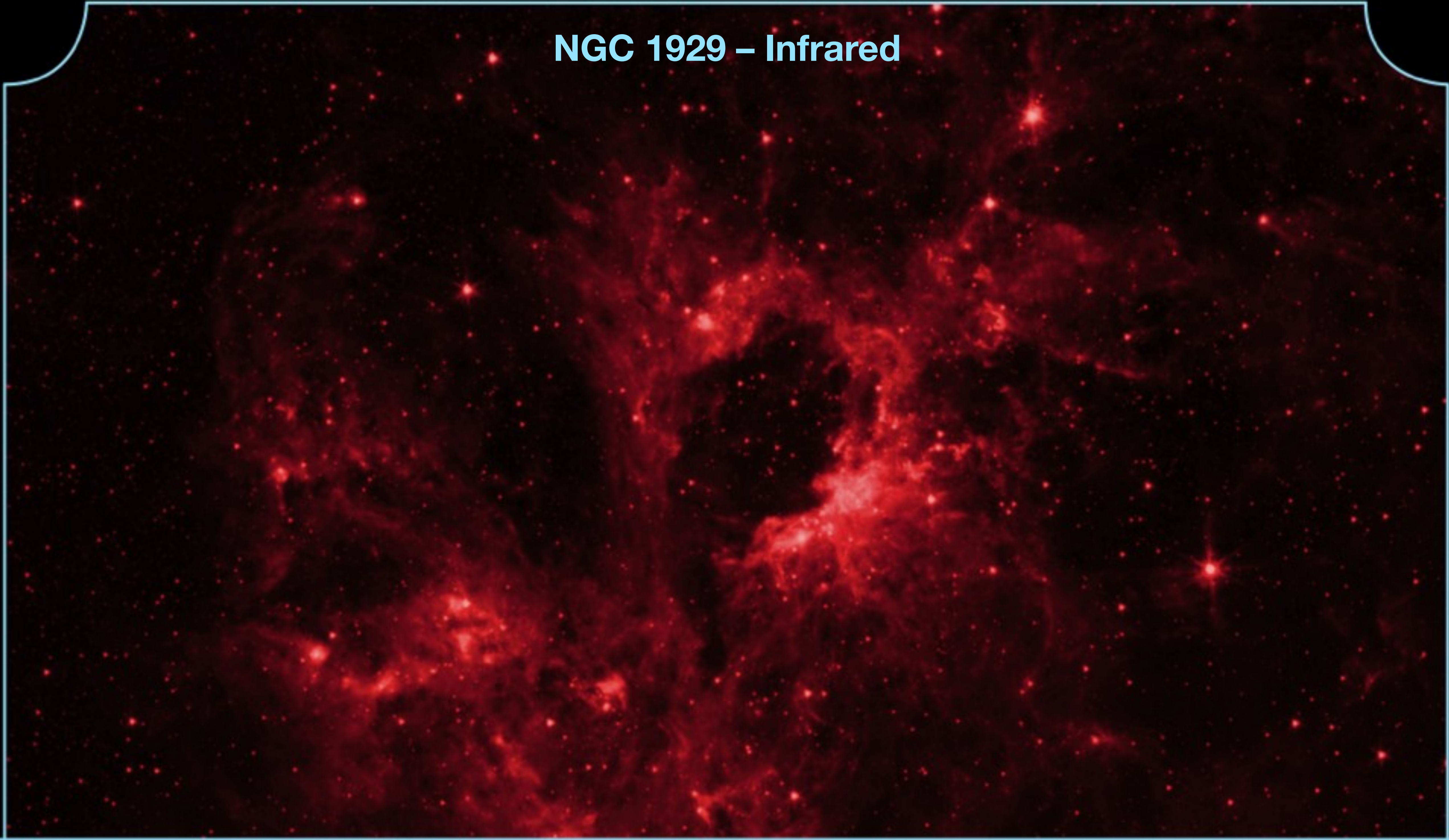


For this picture, three telescopes were used and each of which picks up a different type of light.



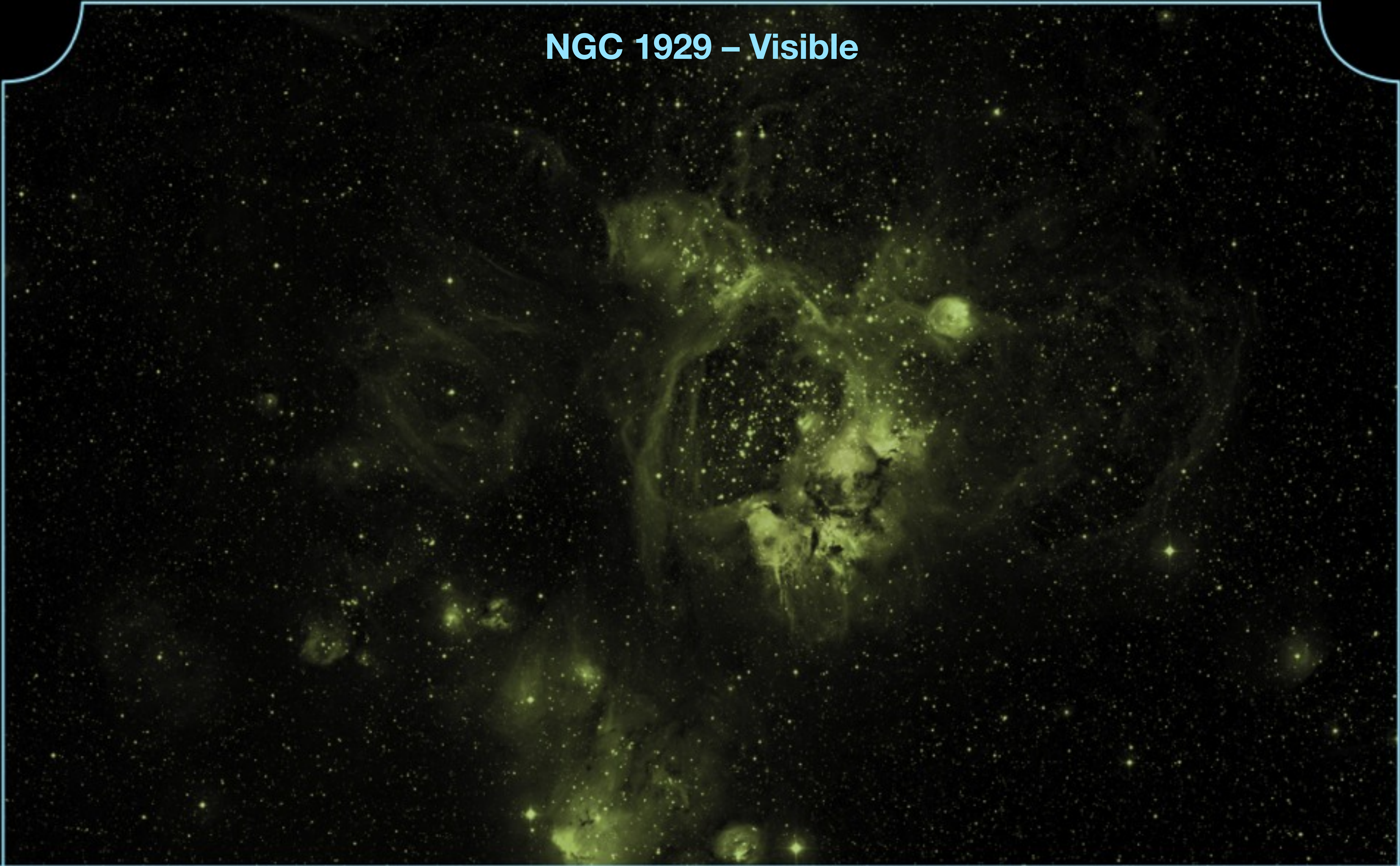
This is a 'superbubble', a cloud of hot gas blown away from bright, young stars at its center. The superbubble has been captured with one of the telescopes in X-ray light, which has been colored blue. X-rays have a lot of energy, so when we look at the Universe in X-ray light, we see some of the hottest gas and most powerful explosions.

NGC 1929 – Infrared

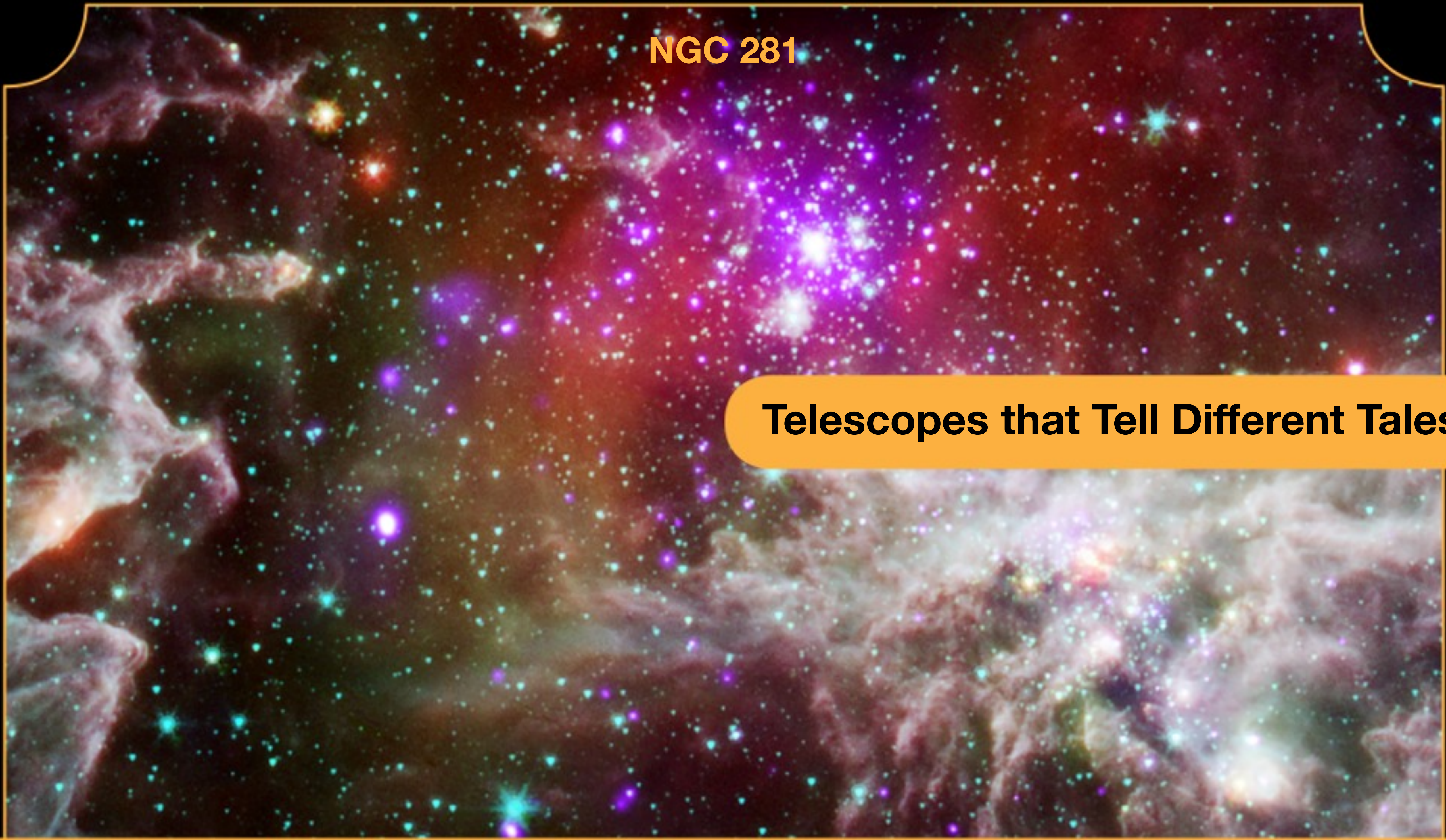


Infrared light is given off by much cooler objects than stars. For example, humans give off infrared light of our own! In this picture, infrared shows us the colder gas and dust of the superbubble, colored in red. This part of the picture was taken with the second telescope.

NGC 1929 – Visible

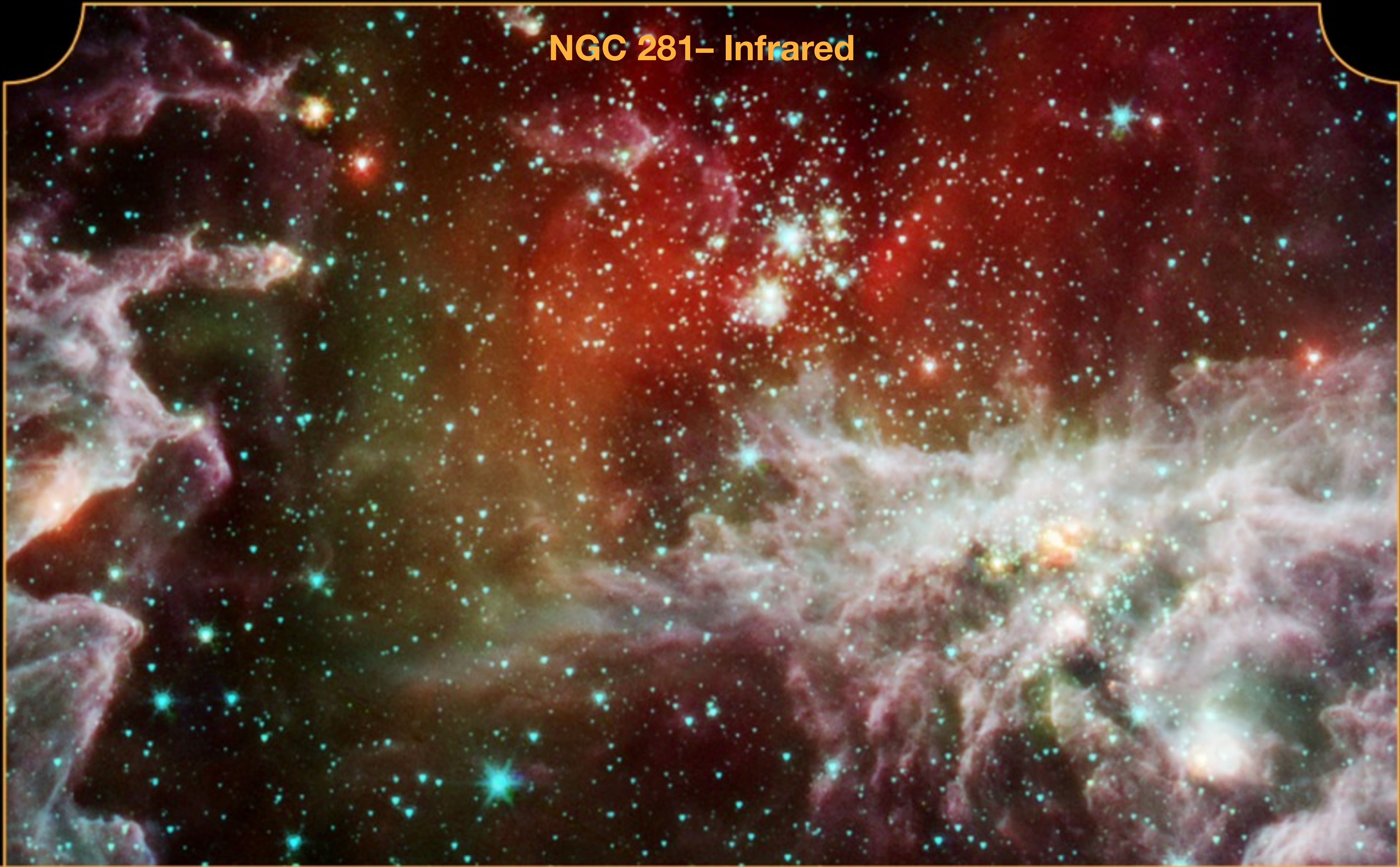


The rest of the picture is yellow, showing us visible light. These are the parts of the image that we could see with our own eyes, if they were strong enough!



Telescopes that Tell Different Tales

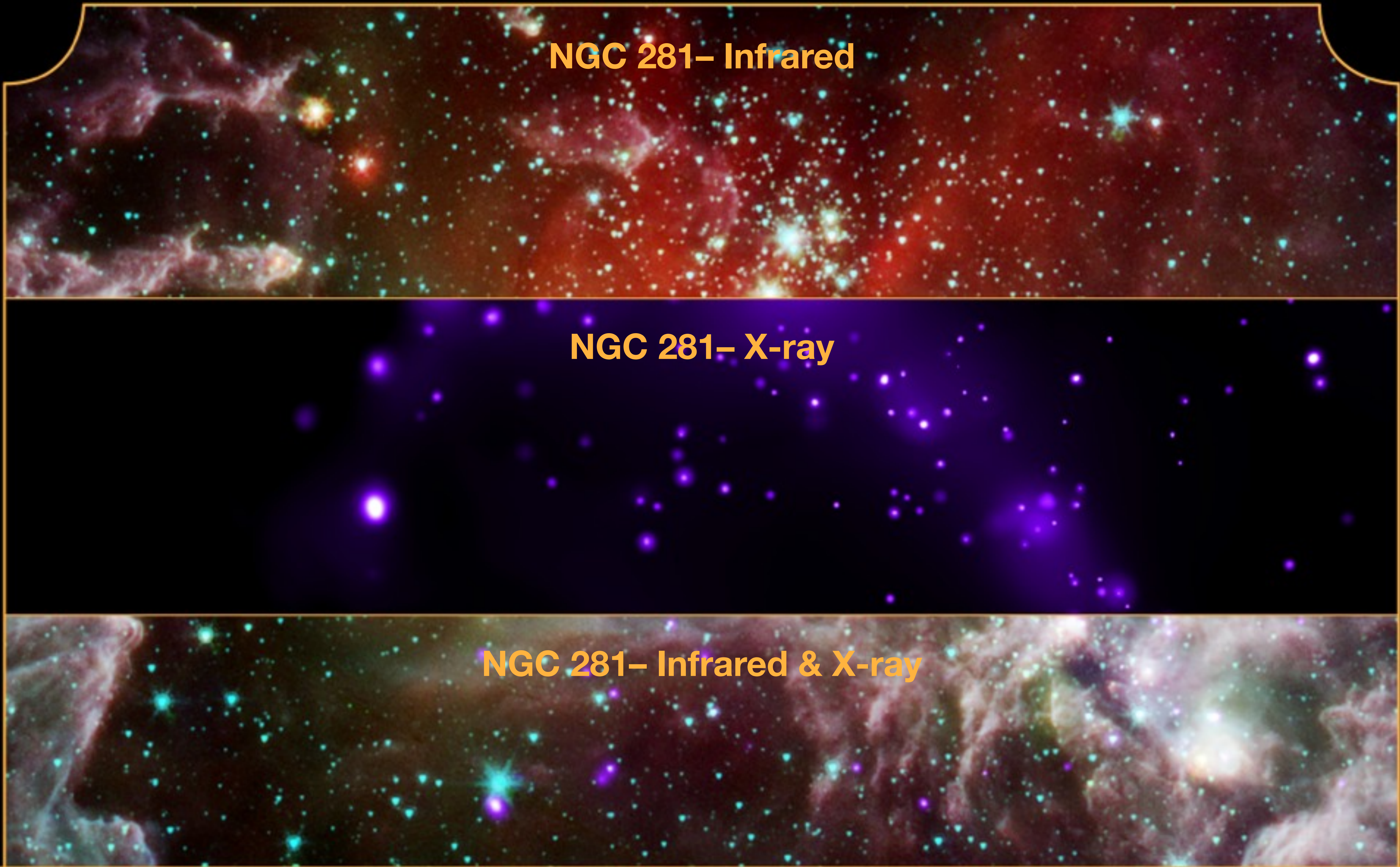
To see the Universe in full, astronomers have to get creative. As we pointed out before, they combine multiple photos taken by different cameras to make one colorful picture. This is another example of a star-forming cloud taken by NASA's Chandra X-ray Observatory and the Spitzer Space Telescope.



The Spitzer telescope detects infrared light. Spitzer is perfect for observing dusty star-forming regions, as infrared light can travel through the dust.

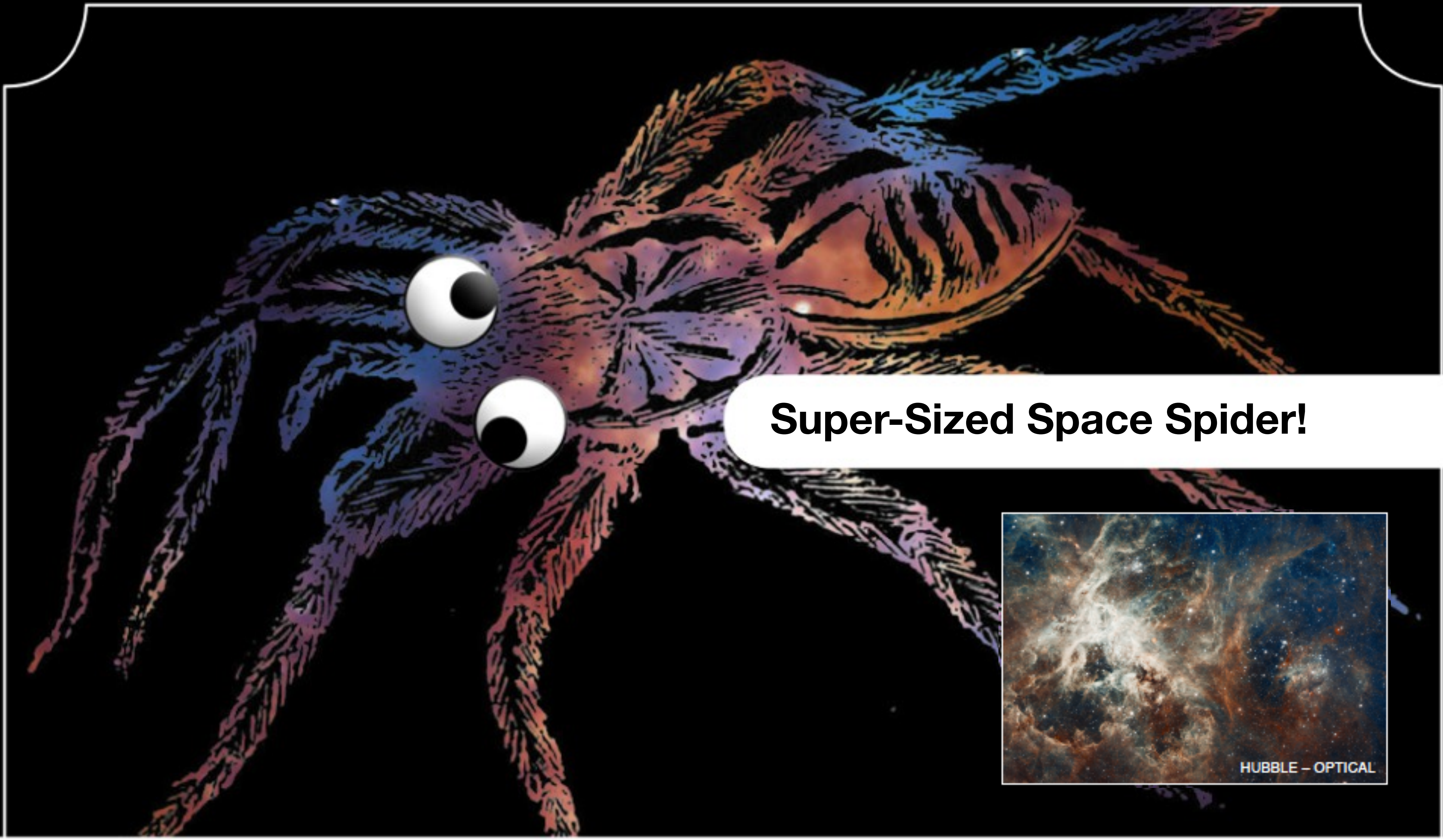
NGC 281– X-ray

The Chandra telescope, however, can't see infrared light. Instead, Chandra can detect the X-ray light that is given off by gas when it is heated to incredibly high temperatures by hot, young stars.

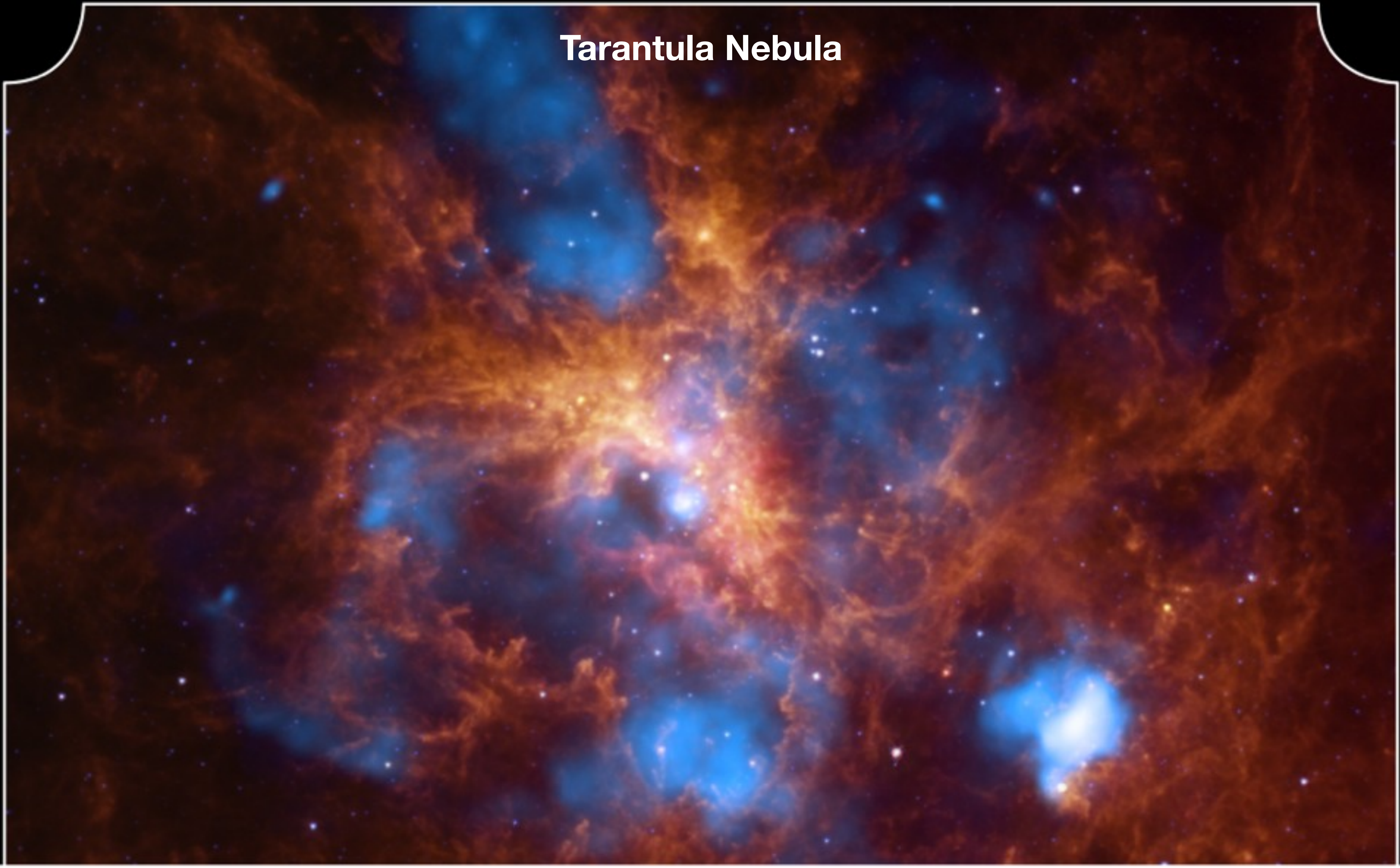


So, although the two telescopes give a different tale about what they see, they’re both telling the truth!

Super-Sized Space Spider!

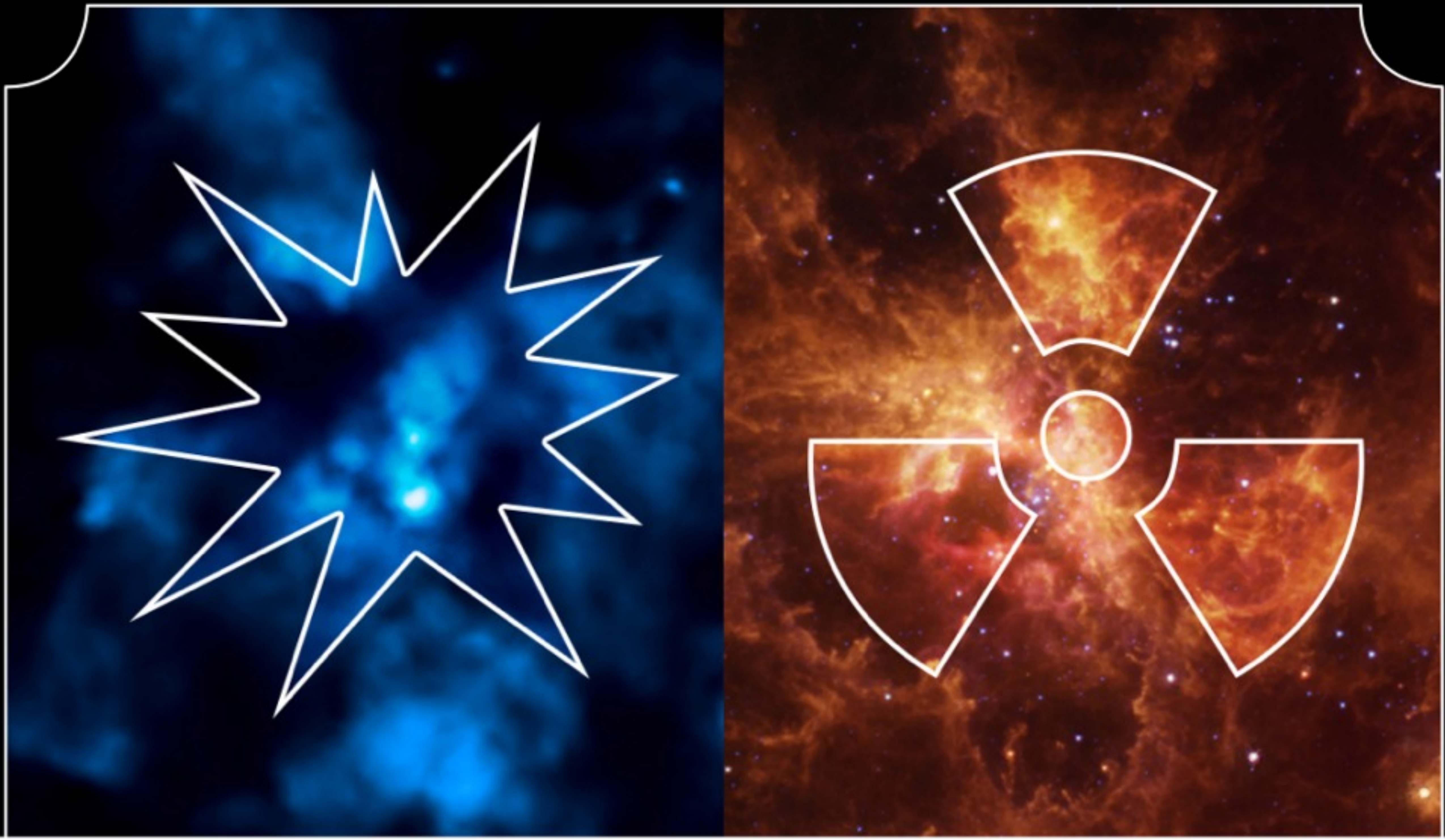


Don’t worry if you have a phobia of spiders, it is safe to keep reading! That’s because a wonderful picture of a star-forming region called the Tarantula Nebula doesn’t show the bright lines of gas that usually make it look like it has the legs of a spider.

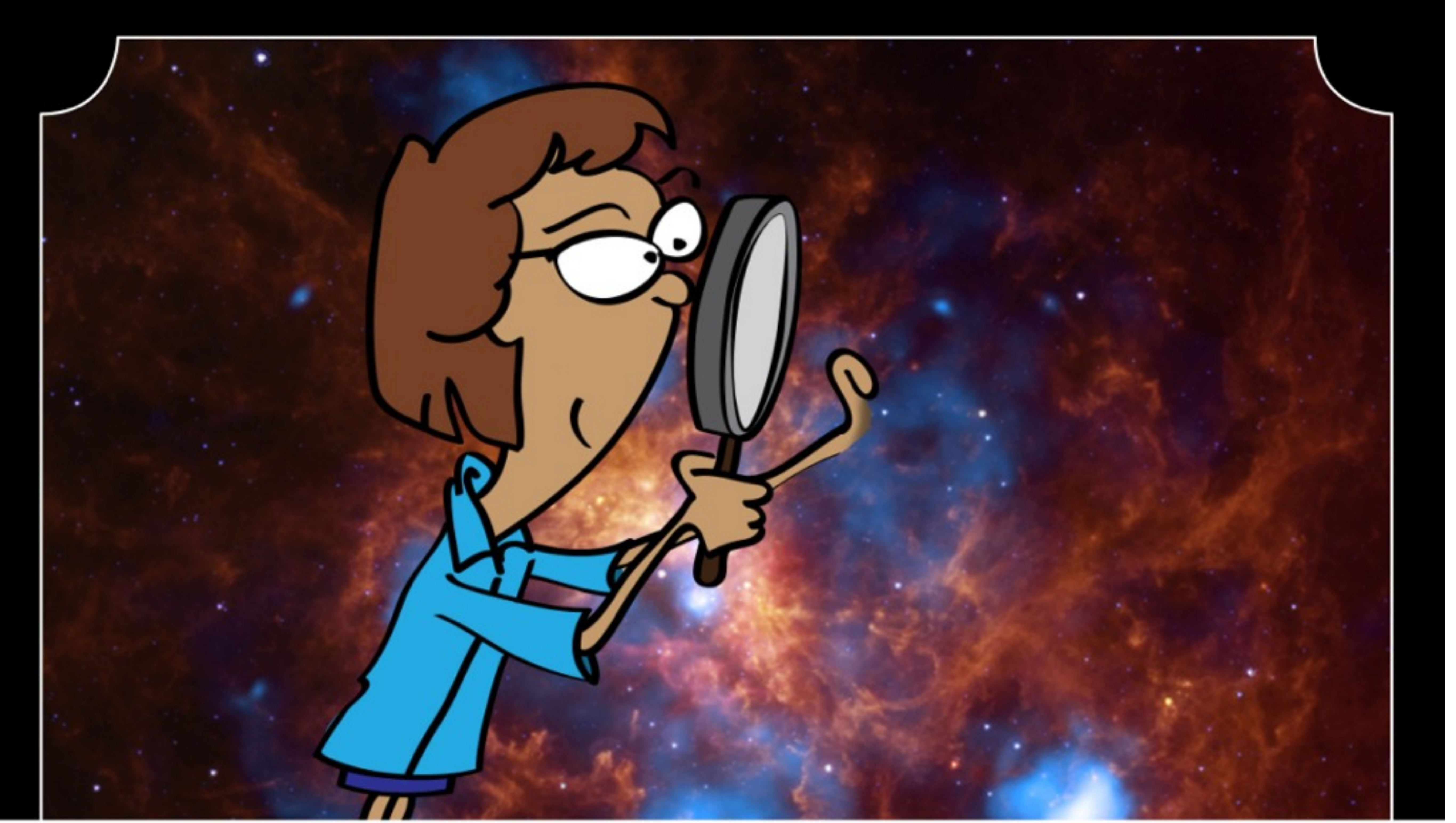


Instead, this picture gives us an unusual view of the Tarantula Nebula. It shows the X-ray radiation given off by very hot gas (the blue parts) and the cooler gas that surrounds it (the orange parts).

The Tarantula Nebula is already big—it would take light about 650 years to cross from one end to the other —but it's getting even bigger!



Astronomers have two ideas about what is causing the Tarantula's growth: Some astronomers think that explosions of the hot gas (shown in blue) are making it bigger, while others think that radiation from massive stars is causing the gas in the nebula to expand.



When astronomers observe the Tarantula Nebula again, they won’t be looking to prove their own ideas right. All they can do is look at what their observations tell them—even if it means acknowledging that they had been wrong.

Credits

COVER, INTRO, CREDITS, BACKCOVER

Page 1, 2, 25, 26 – Illustration: M.Weiss

FIELD TRIP TO STAR SCHOOL

Page 3 – Cygnus OB2: X-ray: NASA/CXC/SAO/J.Drake et al, Optical: Univ. of Hertfordshire/INT/IPHAS, Infrared: NASA/JPL-Caltech; Illustration: M.Weiss

Page 4 – Cygnus OB2: X-ray: NASA/CXC/SAO/J.Drake et al, Optical: Univ. of Hertfordshire/INT/IPHAS, Infrared: NASA/JPL-Caltech

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Page 6, 7, 9 – Illustration: M. Weiss

AT THE END OF THE RAINBOW

Page 10, 11 – Illustration: M. Weiss

Page 12 – NGC 1929: X-ray: NASA/CXC/U.Mich./S.Oey, Infrared: NASA/JPL,

Optical: ESO/WFI/2.2-m

Page 13 – NGC 1929: X-ray: NASA/CXC/U.Mich./S.Oey

Page 14 – NGC 1929: Infrared: NASA/JPL

Page 15 – NGC 1929: Optical: ESO/WFI/2.2-m

TELESCOPES THAT TELL DIFFERENT TALES

Page 16 – NGC 281: X-ray: NASA/CXC/CfA/S.Wolk; Infrared: NASA/JPL/CfA/S.Wolk

Page 17 – NGC 281: Infrared: NASA/JPL/CfA/S.Wolk

Page 18 – NGC 281: X-ray: NASA/CXC/CfA/S.Wolk

Page 19 – NGC 281: X-ray: NASA/CXC/CfA/S.Wolk; Infrared: NASA/JPL/CfA/S.Wolk

SUPER-SIZED SPACE SPIDER

Page 20 – Illustration: M. Weiss; Tarantula Nebula: NASA, ESA, D. Lennon and E. Sabbi (ESA/STScI), J. Anderson, S. E. de Mink, R. van der Marel, T. Sohn,and N. Walborn (STScI), N. Bastian (Excellence Cluster, Munich), L. Bedin (INAF, Padua), E. Bressert (ESO), P. Crowther (University of Sheffield), A. de Koter (University of Amsterdam), C. Evans (UKATC/STFC, Edinburgh), A. Herrero (IAC, Tenerife), N. Langer (AifA, Bonn), I. Platais (JHU), and H. Sana (University of Amsterdam)

Page 21 – Tarantula Nebula: X-ray: NASA/CXC/PSU/L.Townsley et al.;

Infrared: NASA/JPL/PSU/L.Townsley et al.

Page 22, 24 – Tarantula Nebula: X-ray: NASA/CXC/PSU/L.Townsley et al.;

Infrared: NASA/JPL/PSU/L.Townsley et al.; Illustration: M. Weiss

Page 23 – Tarantula Nebula (left): X-ray: NASA/CXC/PSU/L.Townsley et al.;

Tarantula Nebula (right): Infrared: NASA/JPL/PSU/L.Townsley et al.;

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