

Computing  
does not  
end with  
computers!

COLORING THE UNIVERSE

4th - 12th grade\*

\*no prior coding experience necessary

Students can learn how astronomers use computers to create images and understand their data.

# COLORING THE UNIVERSE: Programming in Pencil Code

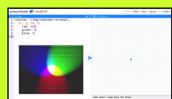
Working with data from NASA's Chandra X-ray Observatory and other telescopes on topics from exploded stars, to star-forming regions, to the area around black holes, students learn basic coding (for beginners - no experience required) and follow a video tutorial to create a real world application of science, technology and even art.

Take a look at the activities we provide with step-by-step video instructions for your students on <http://event.pencilcode.net>:

1. **RECOLOR** Try creating a color by stimulating your own red, green, and blue eye cells with an intensity between 0 and 255. This is how computers create color.
2. **SCENE** Explore filters and color-shifting using a coloring function that maps input RGB colors to an output RGB colors.

<http://event.pencilcode.net>

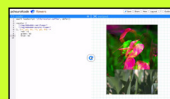
3. **FLOWERS** Mash up two images using a coloring function to mix red, green, and blue light from multiple images.
4. **SUPERNOVA** See how astronomers combine different images to create a single colored image of the leftovers from a star exploding.
5. **STARFORMING** Explore a deep six-wavelength stack of astronomy images, and create your own unique never-before-published RGB image of a star-forming region.
6. **KEPLER'S SUPERNOVA REMNANT** In 1604 a star suddenly exploded and became the brightest object in the sky. Examine the remnants of the supernova observed by Kepler in the 17th century.
7. **BLACKHOLE** See X-ray data revealing a supermassive black hole at the center of a galaxy.



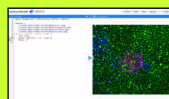
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4



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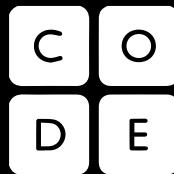


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For more information please visit:  
<http://chandra.si.edu/edu/pencilcode>

This activity was created by volunteers David Bau (developer of Pencil Code and a Google employee), August Muench (astronomer for the American Astronomical Society), Kim Arcand (visualization lead for NASA's Chandra X-ray Observatory), and Sydney Pickens and Matthew Dawson (both computer science educators with Google CS First.)