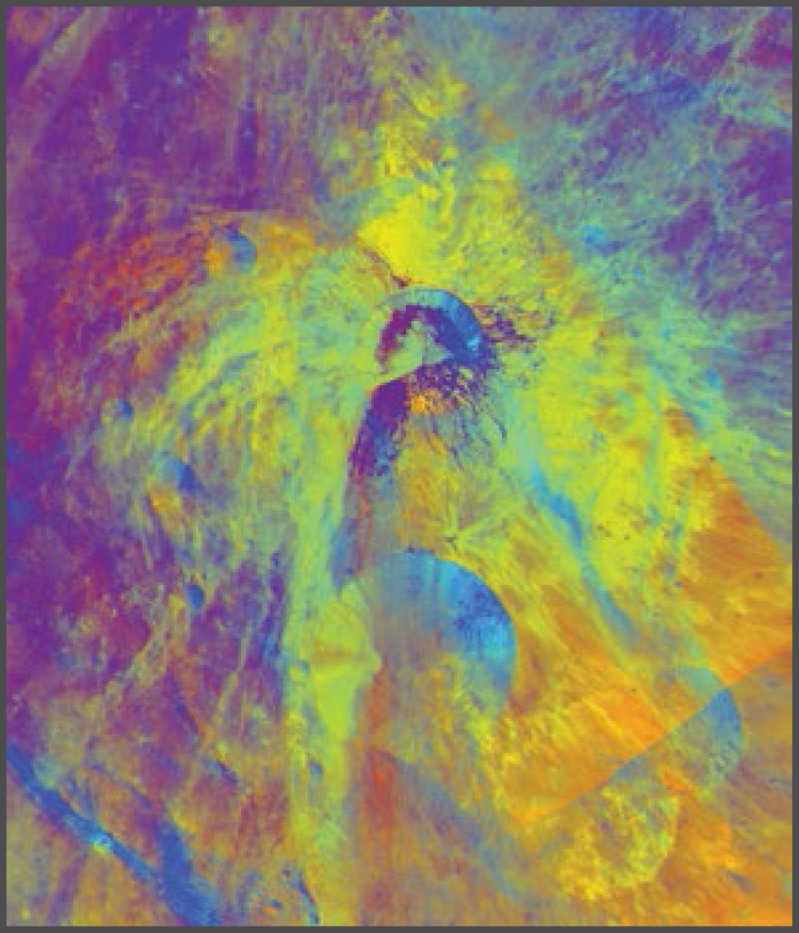
ART & THE COSMIC CONNECTION

Art & the Cosmic Connection takes learners of all ages on a journey through space and introduces planetary objects in an innovative way. Students become visual explorers as they learn how to use the elements of art to investigate and interpret the mysterious surfaces of our rocky celestial neighbors.

The program includes:

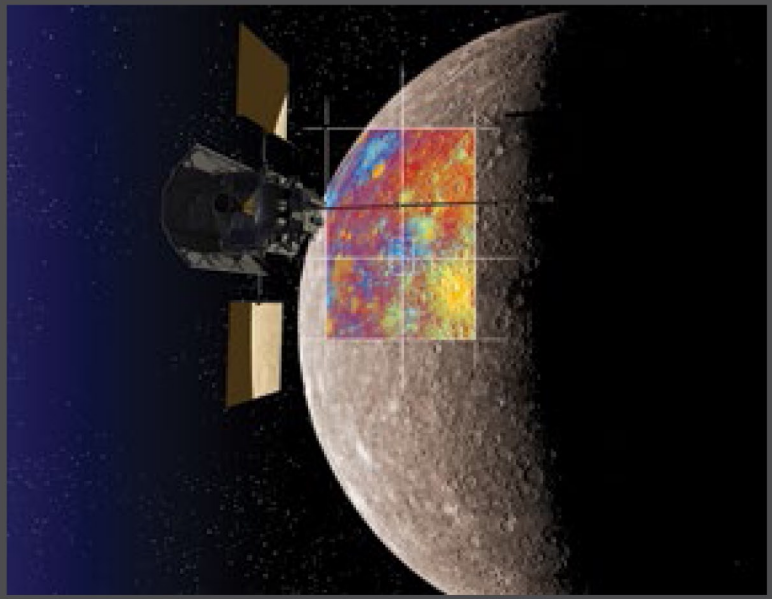
1. An educator guide that clearly explains the learning objectives, materials needed, and how to lead students through the art activity.
2. A PowerPoint presentation introducing the solar system, featuring beautiful NASA images from space, along with easy-to-follow presentation notes that describe the images and how to begin analyzing them.
3. Compelling NASA Earth and space images designed to be printed and used to inspire student art.



Composite image showing the diversity of Vesta's Antonia crater from Dawn

Find all this and more at: **http://discovery.nasa.gov/art**

ELEMENTS OF ART REVEAL PLANETARY SURFACES



Artist's rendition of NASA's Mercury orbiter, MESSENGER

Striking new images arrive from NASA missions to distant worlds: planets, asteroids, comets, moons. What do they tell us? The elements of art—shape, line, color, value, texture—help you make sense of what you see, honing observation skills and inspiring questions. Create a beautiful piece of art while learning to recognize the geology on planetary surfaces. Start with what we know on Earth and use that awareness to begin interpreting features on distant objects in the solar system. Science inspiring art—art empowering science!

ART & SCIENCE EDUCATION

Art & The Cosmic Connection is an interdisciplinary program developed by artists, scientists and educators that engages students in creative scientific inquiry.

NASA workshop at the Denver School of the Arts

The elements of art provide a unique perspective that rapidly empowers learners to analyze planetary surfaces from all over our solar system. How? Basic art forms become sign posts for specific geologic processes. Art depicts geology: straight lines indicate tectonics, circles are often craters. As learners lean in close to analyze images, the places where the rules are broken, like the circular pancake dome volcanoes of Venus, provide fodder for rich discourse. Learners begin to use other factors to infer results, just like scientists. As concepts build, students combine the elements of art to understand more complex surfaces and begin to tell their geologic stories—and thus the fascinating history of our solar system.

ACKNOWLEDGEMENTS

This poster features art created by 7th-12th grade students in visual arts classes at the Denver School of the Arts. Nearly 100 students participated in a NASA workshop that introduced them to *Art & the Cosmic Connection* and inspired their work.

The planetary pastels selected for the front of the poster were drawn by the following students:
Row 1, left to right: Ella Britton, Audrey Roberts, Miranda Viorst
Row 2, left to right: Anise Aiello, Jennifer Tsogtsaikhan, Nina Mascheroni
Row 3, left to right: Katie Grace-Shamburek, Owen Nuss, Kathleen Smith
Row 4, left to right: Olwyn Scarbeary, Quinn Makela, Ana Scharfenaker

The poster back features drawings by: Olwyn Scarbeary, Katie Grace-Shamburek, Miranda Viorst, Cain Cox, Nina Mascheroni, Kathleen Smith, Tess Meilinger, Karissa Fajardo, Quinn Makela, Vincent Thomas, Amelia Corrada and educator Rhonda Urbach.

Thanks to Deb Rosenbaum, director of the Visual Arts Department at the Denver School of the Arts.

SHAPE

MESSENGER captured these fascinating craters on Mercury, formed through past volcanic activity

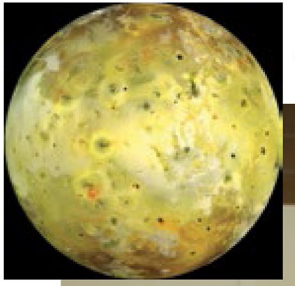
CIRCLES & CRATERS

When circles are viewed on a planetary image, it often indicates an impact feature, a crater. The size, shape, ejecta blanket (stuff thrown away or ejected from the crater), and number of craters give important clues as to the history of a planetary body. Heavily cratered bodies in the solar system include Mercury, our Moon, and Jupiter's moon, Callisto.

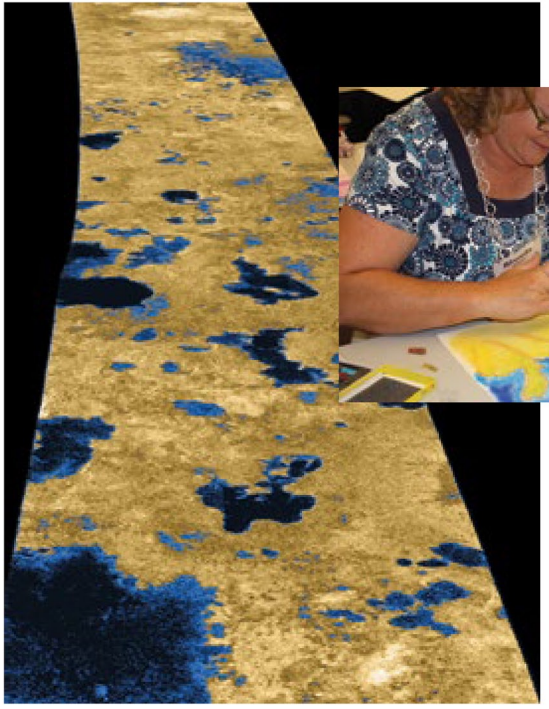
High resolution images of dramatic craters on Mercury from MESSENGER

BLOBS, VOLCANOES & LAKES

Organic shapes, or blobs, can be interpreted in two ways. Blobs often suggest the presence of volcanic processes and lava flows. Jupiter's moon Io, pictured at right, is the most volcanically active body in the solar system. The four rocky inner planets and some moons also have volcanoes. There may be ice volcanoes on frozen worlds in the outer solar system.



Jupiter's moon Io.



The radar instrument on NASA's Cassini spacecraft found bodies of liquid near Titan's north pole. Notice features similar to lakes on Earth, such as islands, bays and channels

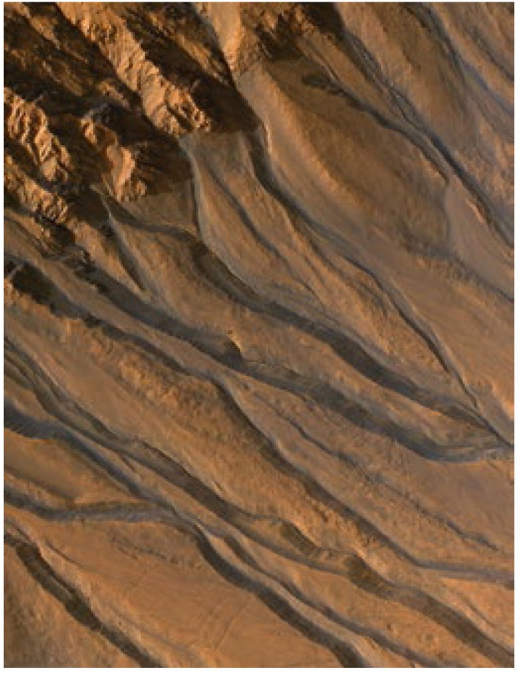
Blobby shapes can also indicate existing rivers, seas of surface liquid or ancient bodies of liquid that left remnants in the form of dried beds. Saturn's large moon, Titan, has lakes of liquid methane. Methane exists only as a gas on Earth.

LINE

STRAIGHT LINES & TECTONICS

The presence of straight lines on a planetary body often indicates tectonic activity, including faults, ridges, cracks and mountains. On Earth, tectonic activity is thought of as a land phenomenon; it can also be present in icy worlds, like Jupiter's icy moon, Europa.

Fascinating gully channels radiate from rocky cliffs in this image from NASA's Mars Reconnaissance Orbiter



SQUIGGLY LINES & EROSION

Squiggly lines on the planetary surface often show that forces of erosion, either liquid or wind, are at work. The surface of Mars suggests that the Red Planet had a much wetter past. By far the world with the most interesting water erosional features is our own home planet. Earth is the only place in our solar system known to have large bodies of liquid and flowing water on its surface.

The Lena River Delta in Russia photographed from space by the NASA Earth Observatory.

COLOR

In addition to visible light, scientists image planetary bodies in many different frequencies of the electromagnetic spectrum (infrared, radio waves, X-ray, ultraviolet, etc.) They also create colorized images, often exaggerating color differences to show subtle differences that the eye cannot detect, to highlight distinct aspects such as topography, mineral composition, even gravity! Light and color are critical tools in interpreting and understanding planetary surfaces. These enhanced color images of the giant asteroid Vesta are scientifically useful and stunning works of art.

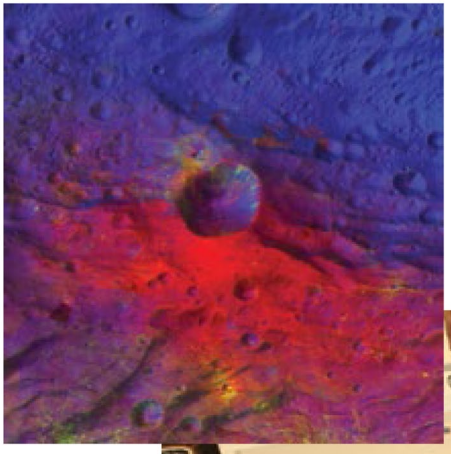
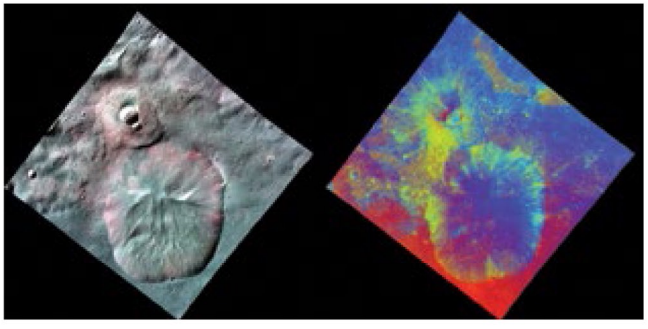


Image from NASA's Dawn spacecraft uses added color to reveal that different materials were ejected from the northern and southern areas of impact at Vesta's sloped Oppia crater

Two views of one image of asteroid Vesta from Dawn: through infrared filters on the left and with colors to represent different rock or mineral types on the right



VALUE

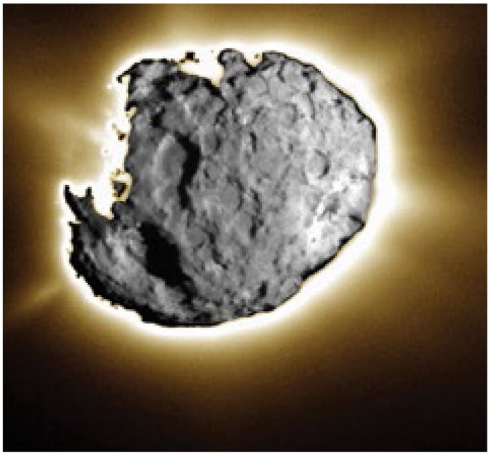
Value is the contrast of light and dark. Its scientific counterpart is called albedo - the measure of the reflectivity of a surface (think of snow vs. charcoal—which reflects more light?). Value/albedo is a critical tool for understanding a planetary body. Value differences in planetary images can be due to light and shadow from reflected sunlight or surface composition. Saturn's icy moon Iapetus has the most dramatic value contrast, half white and half dark. Scientists are still deciphering its mysterious geologic origins.

Circular crater on Mercury from NASA's MESSENGER spacecraft

Saturn's moon Iapetus from the Cassini spacecraft

TEXTURE

Implied texture is the tactile quality of a two-dimensional surface which we can see with our eyes, yet not touch. Images of planetary bodies are replete with various textures corresponding to eons of geologic history. Geologic events and processes build over time to create complex, layered textures which can be deciphered with the aid of the other art elements. Even the small bodies of the solar system, asteroids and comets, have complex geologic stories to tell.



Comet Wild 2 imaged by NASA's Stardust spacecraft during a close flyby to collect comet dust for return to Earth

CREDITS

Art & the Cosmic Connection was developed by artists and educators Monica & Tyler Aiello. Learn more about their work at http://www.studioaiello.net.

This poster is a product of NASA's Discovery and New Frontiers Programs, led by Shari Asplund at the Jet Propulsion Laboratory, Pasadena, CA, with support from Whitney Cobb and Judy Counley at McREL in Denver, CO.

Learn more: http://discovery.nasa.gov