October 2012 Newsletter

the Photographers' Formulary

Volume 9 Number 10

Emily Lakdawalla: Mining NASA's Image Archives

"Saturn"
NASA/JPL/SSI, Color Composite by Emily

In this Issue

- Emily Lakdawalla: Mining NASA's Image Archives
- October 2012 Newsletter Specials

THE PHOTOGRAPHERS' FORMULARY, INC.
P.O. Box 950, 7079 Hwy 83 N
Condon, Montana, USA 59826-0950
E-mail: Anthony Mournian, editor
Website: Photoformulary.com
Tel: (800) 922-5255 or (406) 754-2891
Fax: (406) 754-2896

Photographers' Formulary Interactive Newsletter

Thumbnail images in this newsletter are ALL linked to larger versions for better viewing. ***Every thumbnail image*** acts as an ***active button*** to a larger version which is often stored on the photographer's personal website, or on the Formulary storage site.

DO THIS: **whenever you see a thumbnail image, *click on it*. When you *click on it* you will quickly see the larger version at a resolution you can enjoy.**

Anthony Mournian, editor
Photographers' Formulary Newsletter

Emily Lakdawalla: Mining NASA's Image Archives

Unmanned interplanetary probes were born with the Mariner I and Mariner II missions in 1962. Mariner I had to be destroyed shortly after launch, but Mariner II made a successful journey to Venus and now lives in an orbit around the sun. Neither Mariner carried a camera.

Many missions later, in 1979, Voyager I and Voyager II, equipped with cameras were sent on extended missions, with the eventual goal of leaving our solar system after photographing both Jupiter and Saturn. Voyager I is now headed into the vastness of space beyond Neptune, Pluto and Uranus.

"Crescent of Jupiter"
NASA/JPL. Color Composite by Emily Lakdawalla

Those early flights carried simple scientific experiments aimed at producing information about the origins of the solar system, and photographing worlds far beyond our own planet Earth.

Cameras used on Voyager, and now, were simple, black and white, and durable. In those times the Charge Coupled Device (CCD) and the digital camera had not yet overwhelmed a world of film based photography. Television cameras had decades to go before they would produce images with color and clarity almost equal to the human eye. Wrist radios remained a part of Dick Tracy's arsenal; cell phones were yet to flood the markets and the airwaves.

America's National Aeronautics and Space Administration (NASA) documented each mission with tools of the day, relying on television cameras to capture a stream of raw data, from which an occasional

image was extracted as part of NASA's public outreach effort.

"Rhea, Dione and Saturn's Rings"
NASA / JPL / SSI / Color Composite by Emily Lakdawalla

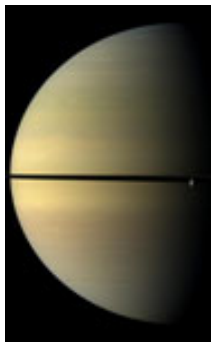
In the 70's and 80's unmanned missions blasted off with increasing regularity to the moon and beyond. As each new probe made its way into space, older missions and their images were put to bed in the consciousness of NASA's viewing audience.

Cameras aboard interplanetary missions were sent with gathering of scientific data in mind, not the twenty-four hour news cycle. Then, as now, scientists had little interest in "pretty pictures" of the sun, our neighboring planets or the darkness of space. Their interest instead was narrowly focused on bits of information from which they would try to decipher what gases or elements were in a given piece of rock; or from what evidence they might deduce a rock, or a supposed stream bed had ever been exposed to water.

"Titan and Dione"
NASA/JPL/SSI, Color Composite by Emily Lakdawalla

A constant stream of data was received from those probes, however, and dutifully stored at various Planetary Data Sites (PDS) around the United States. Because the data remained in its "raw" state, it was impossible to see any images collected without having access to data files stored at the PDS facilities, or to the software and computers necessary to make "heads or tails" out of the raw data.

Years passed. New interplanetary missions rocketed into the ether, making their way into the cosmos. Cameras and equipment aboard spacecraft improved, becoming



"Saturn"
NASA/JPL/SSI, Color Composite by Emily Lakdawalla

more powerful even as they became smaller and less bulky. Alongside computers aboard the spacecraft, earthbound computers shrank in size even as they flexed their muscles with increased speed, power and storage. Image editing software and search engines became easier to use, and a new generation of adults, computer users from childhood, came on the scene.

Planetary geologist, Emily Lakdawalla was among the next generation of earthbound interplanetary explorers. A graduate of Amherst, Lakdawalla took her undergraduate degree in geology to the midwest where she taught

"Saturn's Moon, Prometheus"
NASA / JPL / SSI / Color composite by Emily Lakdawalla

science in a middle school for two years. Though she enjoyed working with bright young minds, she found teaching a less than satisfying use of her education and decided to return to school for an advanced degree in Planetary Geology.

Known as "Astrogeologic Study" in the early days of space exploration, planetary geology was unheard of until 1960 when Eugene Shoemaker, a scientist with the United States Geological Survey, (USGS,) fought to establish it as a discipline first in California, and later in Flagstaff, Arizona. The field studies the origins of the planets, their moons, asteroids and meteorites, trying to fathom their make-up and how they came to be.

At Brown University in Rhode

"Serene Moons of Saturn"
NASA/JPL/SSI, Color Composite by Emily Lakdawalla

Island, Lakdawalla worked with Professor James Head, a seasoned scientist who had trained the original astronauts in planetary science so they would know what to look for and how to identify what they found on America's Apollo missions to the moon.

"Janus against Saturn"
NASA / JPL / SSI / Color Composite by Emily Lakdawalla

Though Lakdawalla's original goal may have been a career in academia, she was sidetracked by her discovery of the Regional Planetary Imaging Facility (RPIF) located on the Brown campus. She found a treasure trove of data and images in the RPIF, one of NASA's storage facilities of data for distribution of images to the public.

Until then, Lakdawalla had no idea of the massive amounts of data available from previous space missions. In fact, until she stumbled on the RPIF she was barely aware of many of the missions themselves. But it wasn't long before she found herself spending every spare minute at the RPIF, poring through cabinets of data and reels of images. Though it took time from her regular studies, she had been bitten by the bug and knew her time looking at the mountains of data would be well spent.

Tethys, from Cassini Flyover, April 14, 2012
NASA/JPL/SSI, Color Composite by Emily Lakdawalla

Remember: This is an interactive newsletter. *To fully enjoy the photographs*, click on any thumbnail image and a larger version will download immediately. Click on any BLUE text and your browser will open a new link outside the newsletter

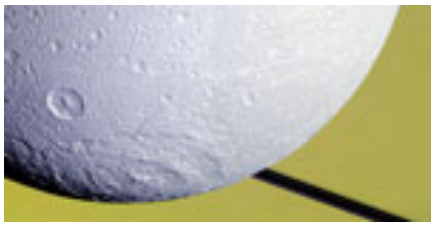
With a Masters of Science under her belt, Lakdawalla came West, eventually finding a home at The Planetary Society in Pasadena, California where she wears many hats. Much of her work is in managing and editing The Planetary

"Endeavor's Last Flight"
©2012 Emily Lakdawalla

Society website. As part of that task, Lakdawalla records a weekly radio segment, does a standup video blog, and processes and posts photographs from past and present interplanetary missions.0

Her role as an 'evangelist' for The Planetary Society is to share the adventure of space exploration with the world in as many ways as she can. Look for her on Facebook, Twitter, and any medium which allows her to spread the news of space exploration from missions to outer space, to the caterpillar speed, down to earth final journey of the retired space shuttle Endeavor as it traveled from Los Angeles International Airport to its final display space at the California Science Center in Los Angeles Exposition Park, a mere twelve miles away.

Lakdawalla has taught herself to process raw images from the

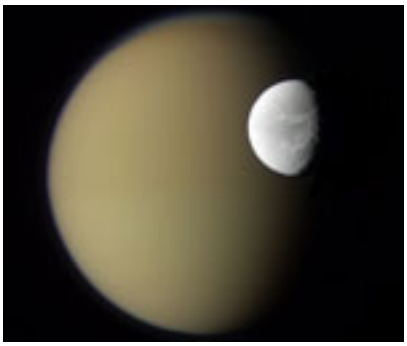


"Dione Against Saturn"
NASA / JPL / SSI / Color Composite by Emily Lakdawalla

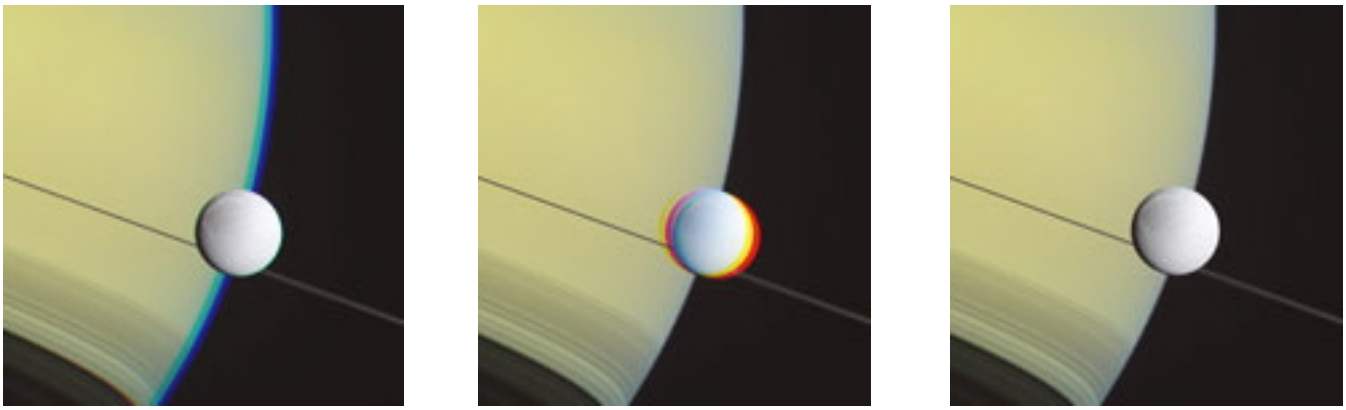
NASA archives. She searches through thousands of thumbnails for images which she might use to illustrate articles about space missions almost fifty years old, and for current imagery being received daily from America's stunningly successful Curiosity rover on Mars.

When Lakdawalla posts an image she has processed, she carefully credits the NASA mission or division responsible for originally capturing it. It's important that credit be given where credit is due.

While you or I may give little or no thought to the pre-visualization, calculations, and planning necessary to figure out where and when to point the camera on a spacecraft in order to photograph an object often moving thousands of miles an hour in an opposite or different direction from the spacecraft cameras, it takes more skills than most of us



"Titan and Dione"
NASA/JPL/SSI, Color Composite by Emily Lakdawalla



"Processing Image of Dione Against Saturn"
NASA / JPL / SSI / color composites by Emily Lakdawalla

will dream of having to get that "money shot." And it's the "money shot" Lakdawalla delights in finding.

Lakdawalla is not alone in her mining of NASA's archives. She's a frequent visitor and contributor to UnmannedSpaceflight.com, a website project of The Planetary Society. Its forums are, "*intended for the discussion of robotic space missions, past and present. In particular, it is a place where people meet to discuss and share the images returned by these missions and the ongoing drama of their exploration of space*."

Because "Science" is more interested in "raw data" than in "pretty pictures," the vast majority of NASA's image files have remained unseen. Lakdawalla, and others of the nearly 4,000 members of UnmannedSpaceflight.com delight in discovering unusual and beautiful images from past space probes. The images all require processing and assembly to create the oft times stunning "pretty pictures" we have come to almost take for granted as they flash across the evening news.

Until the Mars Curiosity mission, image capture devices aboard spacecraft were limited to low resolution black and white cameras. Curiosity may be the first interplanetary probe with a color imaging camera. Harkening back to the earliest days of color photography, multiple black and white images, each made using a different color filter, were "stacked" to achieve the final color image.

Aboard Mars rover Curiosity three images can be taken of an object with Curiosity standing stock still and rock steady. Aboard

"Curiosity's First Self Portrait Through Dust Cover"
NASA / JPL / MSSS /Processing by Emily Lakdawalla

a spacecraft hurtling toward the rings of Saturn of the moons of Jupiter, however, the camera platform is anything but stable. Perspective, distance, and lighting can change from image to image. Then, because the cameras often capture an image less than a megapixel square, a large image is a mosaic of many small images "stitched" together.

Lakdawalla finds an image she thinks will make a good candidate for publication, then gathers all the images made in the black and white series using the various color filters. Using image editing software that varies and changes from space mission to mission, she begins the sometimes tedious and difficult task of first adjusting, or "warping" the images to try to achieve a single image with a common perspective. Some images are smaller than others in a series. Others have a different perspective and need that adjustment, while others require "geometric shifting" and adjustment of brightness or contrast. When the image from each of the different color filters has been adjusted to Lakdawalla's satisfaction, they are "stacked" into the final color image.

There are other problems to be solved, however. On images from older space missions there are many artifacts. There may be "reseau marks" all over the images. "Reseau" comes from the French term for a net or mesh foundation

for lace. In astrophotography it refers to *"a reference grid of fine lines forming uniform squares on a photographic plate or print, used to aid in measurement."*

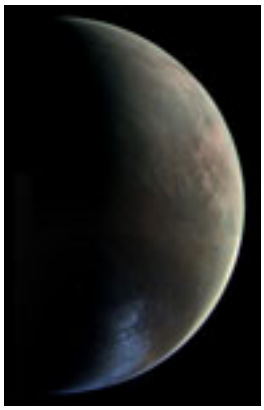
Mars on Approach as taken by Viking 2
Image by NASA/JPL

Unless the reseau marks are erased or covered over using Photoshop's Clone tool, the final image is covered with a grid of distracting black dots. *Not* a pretty picture.

Also to be dealt with on older images made using Vidicon television tubes are the varying degrees of barrel distortion. This is similar to "warping" and varies from image to image based on brightness. A bright image will have more distortion; a dim image will have less.

To combine these into a single image requires "de-warping" all images in a series as close as possible to a common level of distortion. Some basic adjustments can be made automatically, but most are made by hand on a frame by frame basis. The difference between what Lakdawalla starts with, and her final product, however, can be remarkable.

Consider this image of the crescent of Mars, taken as the Viking mission approached the Red Planet in the 1970's. The image as first published by NASA is garish and unfinished. Then take a look at the final image as processed by Lakdawalla. It takes as much time and as much care for her to produce a gem like this as it might take for you to go from a work print to a final exhibit quality print in black and white.



Mars on Approach as taken by Viking 2,
Image by NASA, Color Composite
by Emily Lakdawalla

Lakdawalla says it's worth all the effort. She says you get better as you go along. As you learn how to reduce "noise" in images and how to clean up reseau marks, each image holds more and more potential. You learn by experience, and by the generosity of others in sharing their tips and tricks, and apply those skills to each space mission, some of which are more difficult to work with than others.

The end result? "Pretty pictures" of worlds beyond our own, and a sense of time and place only to have been imagined less than a lifetime ago.

Montage of Mars on Approach as taken by Viking 2,
NASA / JPL / Color composites by Emily Lakdawalla

OCTOBER 2012

NEWSLETTER SPECIALS

PERFECTA-D PRINT DEVELOPER

Cat. No.: 75-0020
Promo Code: D7520
Regular $13.95
Special Price 50% off: $7.45

Quantity:Strictly limited to Stock on Hand. We have nine bottles.

Perfecta-D is a highly concentrated, neutral tone Phenidone-Hydroquinone formula. Unlike other liquid concentrate developers, Perfecta-D Print Developer will obtain the maximum black of the paper. Standard dilution is 1:7, with a shelf life of the concentrate of at least 2 years.

This developer is stable, long lasting, and a superior performer. Sequestering agents are added to developer to help them mix well - they isolate things in water, like magnesium, calcium, iron, etc., but usually impair the developer's ability to produce a strong black, as will the addition of extra sulfite.

Perfecta-D Print Developer contains sequestering agents as well as the additional sulfite, yet it will still obtain maximum black and yield a clean, full tonal scale. Perfecta-D can be diluted up to 1:14 and be used with longer development times, or in more concentrated dilutions. Fine Art photographers tend to try different dilutions and times with print developers, and Perfecta-D will respond well. Perfecta-D is good with old technology papers such as Elegance.

http://stores.photoformulary.com/-strse-776/Perfecta-dsh-D-Print-Developer/Detail.bok

DUPONT ESTAR MELINEX

Cat. No.: 09-0425
Promo Code: M425
Size: 36x52"
Regular $30.60
Special 20% off: $24.48

Cat. No.: 09-0426
Promo Code: M426
Size: 60x52""
Regular $45.80
Special 20% off: $36.64

Cat. No.: 09-0427
Promo Code: M427
Size: 120x52"
Regular $65.90
Special 20% off: $52.72

Take 20% off of your choice of any of the three sizes offered.

Dupont's 583 Estar Melinex 7 mil film is pre-coated with a substrate that holds onto the emulsion.

Estar Melinex® is a polyester film used in many industrial, packaging, imaging, printing, technical and consumer products. Use it as the film base to make your own large format sizes of photographic film.

http://stores.photoformulary.com/-strse-964/Estar-Melenex/Detail.bok

THE PHOTOGRAPHERS' FORMULARY, INC.
P.O. Box 950, 7079 Hwy 83 N
Condon, Montana, USA 59826-0950
E-mail: Anthony Mournian, editor
Website: Photoformulary.com
Tel: (800) 922-5255 or (406) 754-2891

Click here for the Newsletter Archive

CONTACT US WITH QUESTIONS OR COMMENTS at 800-922-5255

A CHANCE TO MAKE YOUR OWN FILM IN CUSTOM SIZES UP TO 20X24”

A cottage industry of making your own large format is growing. Buy some **Dupont Estar Melinex 7 mil film**, then coat it with your own emulsion. Give yourself the freedom of producing your own large format film in any size, and produce film as you need it. There’s no escaping the uncomfortable fact that unusual sizes of film in large format have become scarce. They may not be gone, but they have become harder and harder to find,.

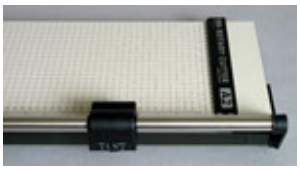
Buy one of our rotary cutters as a companion purchase with the Melinex. Melinex comes 54” wide, and as long as you like. Use one of our rotary cutters to cut it down as small as 6x6 cm, or as large as 20x24”. Ron Mowrey has two DVD’s to teach you how to make your own emulsions, and how to coat the film base. His DVD’s don’t give away any of Kodak’s trade secrets, but they do teach you what you need to know to have “film freedom!”

NOTE: These Specials are Limited to Stock on hand

DAHLE 14” ROTARY CUTTER

Cat. No.: 75-0962 **Promo Code:** D30
Regular Price: $225.95
Fall Special-30% off = $157.50

Dahle 14" Rotary Trimmer is designed for professional use and is indispensable in advertising agencies, graphic design and photographic studios, as it gives a burr-free cut on thick medium materials. Its features include ground upper and lower steel blades along with an automatic paper clamp. The rugged base helps maintain its stability while the clearly marked surface grid gives you precise registration points. Safety is ensured by totally enclosing the blade in a plastic housing. The cutting table preprinted with reference grid lines and the adjustable backstop fits either side. The scale bar calibrated in both inches and centimeters and the entire unit can be wall mounted.
http://stores.photoformulary.com/-strse-790/Dahle-14%26%2334-scln--Rotary-Trimmer/Detail.bok



MEYERS 13” ROTARY CUTTER

CAT. NO.: 75-0960 PROMO CODE: M130
Regular Price: $124.00
Fall Special-30% off = $86.80

MEYERS 15” ROTARY CUTTER

Cat. No.: 75-0961 **Promo Code:** M230
Regular Price: $155.95
Fall Special-30% off = $109.17

The Myers rotary action trimmer has the cutting capacity of a traditional knife guillotine cutter. It boasts a white-coated hard-wearing steel baseboard with clear guide rules for A series and B series paper sizes. The self-sharpening steel rotary blade is housed in an easy to hold cutter head for comfort and total safety.
http://stores.photoformulary.com/-strse-788/Myers-Rotary-Trimmers/Detail.bok

PREMIER 18” ROTARY TRIMMER

CAT. NO.: 14-0911 PROMO CODE: P30
Regular Price: $99.95
Fall Special-30% off = $69.97

The Premier 18" Rotary Trimmer is designed to cut single sheets of paper or film cleanly and precisely. It is completely safe and simple to use. Its compact portable design makes it perfect for use where space is limited.
http://stores.photoformulary.com/-strse-916/Premier-18%26%2334-scln--Rotorary-Trimmer/Detail.bok