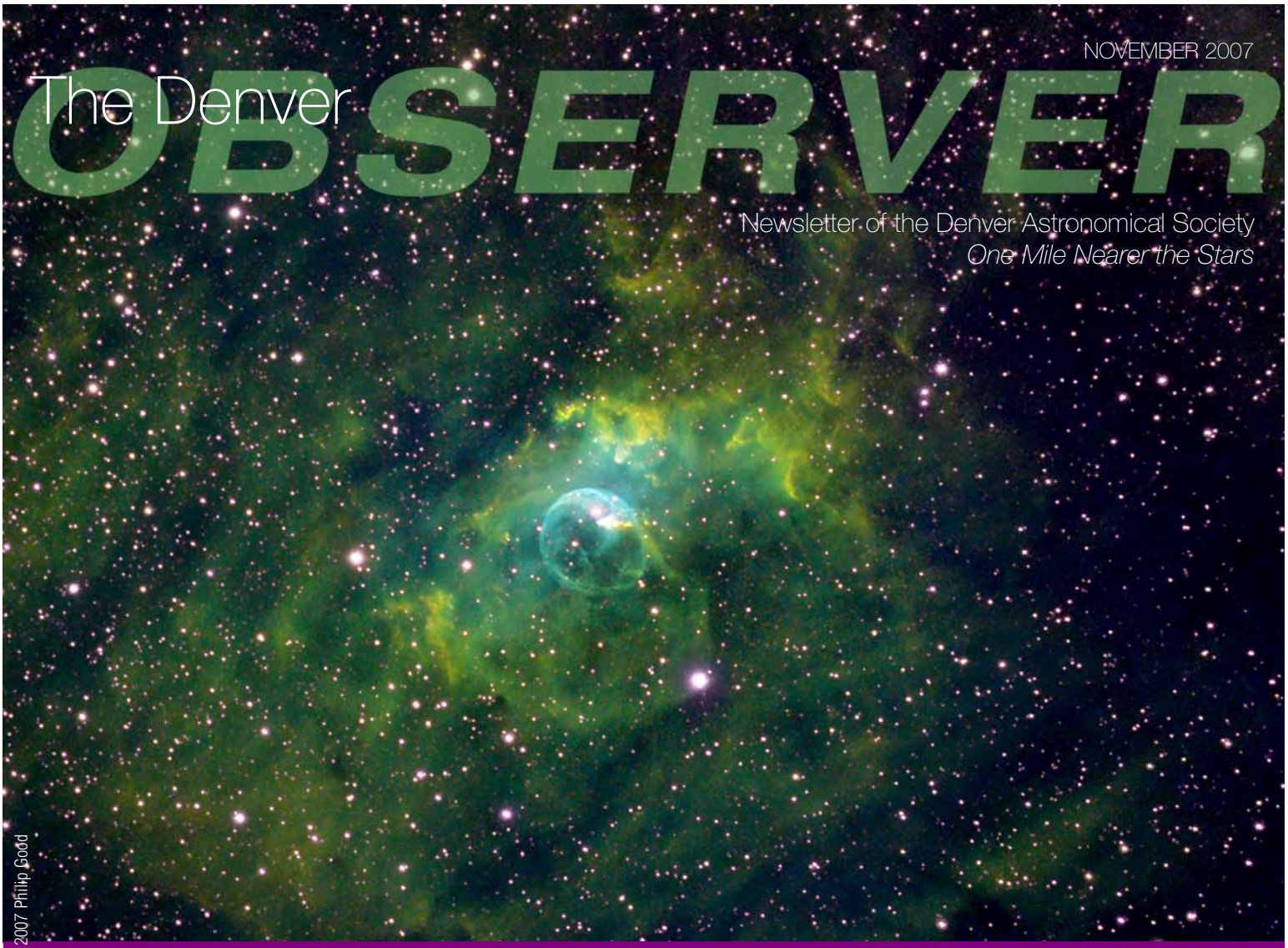
NOVEMBER 2007

# The Denver OBSERVER

Newsletter of the Denver Astronomical Society

*One Mile Nearer the Stars*





## A Bounty of Beauty

**The Bubble Nebula (NGC 7635), in the constellation Cassiopeia, is created by a massive star approximately 40 times more massive than the sun blowing out material into space. The dense gas surrounding the star is forming the cast off material into a bubble. The nebula is six light-years wide, expanding at four million mph and is 7,100 light-years from Earth.**

# HAPPY THANKSGIVING

## NOVEMBER SKIES

This is the month to look for Cetus the Sea Monster, whom I mentioned last month as the villain of the Andromeda story. In particular, look for Mira, the long-period variable star in Cetus which is just below the bottom of the deep V in Pisces. You can track Mira's brightness for a year to see its cycle of variability and experience the discovery of stars that pulse like celestial hearts.

Pisces, one of the dim constellations and the key to finding Mira, is a giant V just below the bottom of the "Great Square" of Pegasus that is now cocked over to look like a diamond. The huge V of Pisces is twice as big and twice as hard to see as the bottom of Pegasus. The almost-full moon will be nestled deep into Pisces' V on November 21. Cetus and Mira are below that, scraping the horizon. The sea monster is often depicted as a whale in old star atlases.

Mars rises in the evening at 8:30 on November 1 and at 6:30 at the end of the month. There was a time early in my life and probably before yours that Mars was associated with flying saucers. The best time to see the UFOs is—wait, I wasn't supposed to tell you that. Forget it. No UFOs. Anyway, Mars gets closer and appears larger as the month wears on. I won't

*Continued on page 6*

| | |
|---|---|
| 1 | Last quarter moon |
| 9 | New moon |
| 17 | First quarter moon |
| 18 | Leonid meteor shower |
| 24 | Full moon |

Inside The *Observer*

# President's Corner

On the 4th of October and 3rd of November 1957, the Soviet Union successfully launched the first two orbital spacecraft: Sputnik I and II. Sputnik means "traveling companion." The second craft carried a dog. This effort was part of the International Geophysical Year and helped to start the famous space race. A new race is essentially building now, and it is time to evaluate what amateurs might contribute to this new effort. The deadline for this new race seems to be the year 2020, just 13 years from now.

The theme of the November 2nd General Meeting is show-and-tell and it would be appropriate to hold a panel to discuss, as amateurs, what the past and current space race means to us. The DAS has been with Chamberlin for the entirety of the current space effort. Let's scratch our heads and reminisce about the past 50 years or so, and speculate about our next 50 years. If you are interested, drop by the meeting and toss your two cents into the discussion.

Wayne Green, DAS President

The DAS annual potluck will be held on the 1st of December at the Columbine Unitarian Universalist Church starting at 6:00 P.M. This is the same place as last year—a great venue. Directions and details appear in an article elsewhere in this edition.

The season is opening for the annual club blood sport—yearly elections. We will appoint an election committee and begin to accept nominations for the 2008 Executive Board at November's General Meeting. The General Election will be at

*Continued on page 3*

## DAS Schdule

### NOVEMBER

2 General Membership Meeting at D.U.'s Olin Hall—Members Show-N-Tell night *(Begins at 7:30 P.M.)*
9-10 EGK Dark Site Weekend
17 Open House at Chamberlin Observatory *(Begins at 5:00 P.M.)*
22 Thanksgiving Day (No Public Night)
30 E-Board meeting at Chamberlin Observatory *(Begins at 7:30 P.M.)*

### DECEMBER

1 DAS Holiday Potluck *(Begins at 6:00 P.M.)*
5 First day of Chanukah
8-9 EGK Dark Site Weekend
15 Open House at Chamberlin Observatory *(Begins at 5:00 P.M.)*
21 E-Board meeting at Chamberlin Observatory *(Begins at 7:30 P.M.)*
25 Christmas Day (No Public Night)

*Public nights are held every Tuesday and Thursday evenings beginning at the following times:*
*March 9 - April 14 at 8:00 P.M.*
*April 15 - September 1 at 8:30 P.M.*
*September 2 - March 8 at 7:00 P.M. at Chamberlin Observatory*
*Costs to non-members are: $3.00 adults, $2.00 children.*
*Please make reservations via our website (www.thedas.org) or call (303) 871-5172.*

## Society Directory

***President:***
Wayne Green (303) 530-1023
*Email: president@thedas.org*
***Vice President:***
Keith Pool (303) 718-7273
*Email: vicepresident@thedas.org*
***Secretary:***
Darrell Dodge (303) 932-1309
*Email: secretary@thedas.org*
***Treasurer:***
Brad Gilman (720) 488-1028
*Email: treasurer@thedas.org*

## Executive Board Members

Jack Eastman — Ron Pearson
Joe Gafford — David Shouldice
Frank Mancini — Bryan Wilburn
Ron Mickle — Dan Wray
Steve Solon, Past President
President Emeritus, Larry Brooks

## Committees

***Van Nattan-Hansen Scholarship Fund***
Ron Pearson (Chair)
P.O. Box 150743
Lakewood, Colorado 80215-0743
***EGK Dark Site Committee:***
Wayne Kaaz (Chair) (303) 840-1549
*Email: kaazmos@msn.com*
***IDA Representative:***
Dr. Robert Stencel
***Public Outreach Committee:***
Ron Mickle (Chair)
Bryan Wilburn (External Outreach Coordinator)
*Email: bwilburn@4dv.net* (303) 542-5137
***Student Astronomy Committee:***
Naomi Pequette ( Chair)

## Volunteers or Appointed Representatives

***ALCor:***
Jerry Sherlin
*Email: alcor@thedas.org* (303) 680-6894
***IDA Representative: (International Dark Sky Association):***
Dr. Robert Stencel
***Newsletter:***
*Observer* editor, Patti Kurtz
*Email: p_kurtz@comcast.net* (720) 217-5707
*Observer* proofreaders: Darrell Dodge and Steve Solon
**The Observer *is available in color PDF format from the DAS website.***
***Website:***
Darrell Dodge
***DAS Information Line:***
(303) 871-5172
***DAS Correspondence:***
Denver Astronomical Society
Chamberlin Observatory C/O Wayne Green
2930 East Warren Avenue
Denver, Colorado 80210

*The Executive Board conducts the business of the DAS at 7:30 P.M. at Chamberlin Observatory. Please see the Schedule of Events for meeting dates. All members are welcome.*

# Come One, Come All to the DAS Holiday Potluck!

*by Darrell Dodge*

It's time again for the annual DAS Holiday Potluck, to be held this year on Saturday, December 1st from 6-9 P.M. We will again be meeting at the Columbine Unitarian Universalist Church (CUUC), 6724 South Webster Street, Littleton, Colorado.

Bring your best culinary potluck creations (salads, casseroles, light meat dishes, desserts and breads) to this traditional end-of-year gathering. The DAS will provide liquid refreshment, eating utensils, and ham and turkey meat servings. You'll experience the very best of company and enjoy a photo review of the year's highlights as well as some traditional holiday music.

The DAS participation prize drawing will be held at the potluck, covering the last three months of DAS outreach and volunteer activities during 2007.

The church is located several blocks east of Wadsworth Boulevard, on the south side of Coal Mine Road.

### Driving Directions:

The easiest way to get there is to take C-470 to the Wadsworth exit and proceed north on Wadsworth to Coal Mine Road. Turn right (east) on Coal Mine, proceed down the hill to Webster St. (traffic light), turn right, then first left into CUUC.

### Directions from other locations:

**From Santa Fe South:** Turn west (left) on Mineral (becomes West Ken Caryl), north (right) on Pierce Street; west (left) on Coal Mine. Proceed down the hill to the first traffic light. Turn left onto Webster St. then first left into CUUC.

**From Santa Fe North:** Turn west (right) on Bowles, south (left) on Platte Canyon, west (right) on Coal Mine. Proceed to first traffic light past Pierce Street. Turn left onto Webster St., then first left into CUUC.

**From C470 North or West:** Exit at Bowles Ave. Head east, then turn south (right) on Wadsworth Blvd. (then see above).

### Volunteers Needed

Volunteers are needed to help set up before (starting at 3P.M.) and clean up after the potluck. E-mail Darrell Dodge at *dmdodge@aol.com.*

A popular shooting target for astrophotographers, the Double Cluster in Perseus is made up of two naked-eye visible clusters—NGCs 884 and 869. Joe made this mosiac at the Okie-Tex star party near Kenton, OK, with an SBIG ST-2000XM CCD camera on a 10-inch f/4.5 newtonian: Two frames of 3,3,3,3 minute exposures of LRGB respectively.



## President's Corner (continued)

next February's general meeting, and officers will assume responsibilities at the Banquet in March.

We are also seeking people to run for the Astronomical League's Mountain Area Research Section (MARS) region. All MARS positions: Chair, Vice Chair, Regional Representative, and Treasurer are open. The MARS election will be by email ballot in January. Now is your chance to get involved with the AL at the regional level. The AL is discussing ways to revitalize amateur astronomy and ways to develop membership and leadership for clubs. Your ideas would be appreciated — drop me an email.

I look forward to seeing you all at the show-and-tell meeting and the pot luck!—*Wayne Green*

# Image(ine) That

## Part One

*by Steve Solon*

Well, suffice to say that the art of astrophotography (now *astroimaging*) has come light years (had to do it), from the days of plates and film and now, to digital. There are those who still bemoan the passing medium of film, and rightly so, for there was much more involvement in taking pictures: the use of chemicals, getting mixtures and times just right, the anticipation of taking the negatives from the dryer, wondering how well you'd done with your hours at the guiding eyepiece—therein lies the romance. Now, this romance is not gone, by a long chalk, but has been accelerated, if you will, by the speed of silicon.

The results are astounding. Amateur images now surpass pictures taken by the largest and finest instruments of only a few decades ago. The instrumentality has evolved, with specialized monochrome cameras designed specifically for astroimaging and digital color single-lens reflex (*DSLR*) models that can shoot anything.

I image from our southwest Littleton home, a location better than some, but certainly not as good as others. Having learned awhile back that I have trouble staying awake during long nighttime drives, and with a very early morning work schedule, I opted to raid the savings account and set up permanent shop in our yard. One distinct advantage is a never-changing polar alignment, among other things. On the downside, light pollution muddles the clarity. Living close to the foothills presents stability issues, as well. Winds come skating off the mountains right over our home at record speeds; even the clearest night can sometimes hide violent upper-level turbulence that turns round stars into eggs.

With these things in mind, my methods for shooting vary from those valiant folk who venture to remote black skies; with choices come consequences.

I use an older model SBIG ST-8e CCD camera that produces monochrome images, so I must shoot through filters to produce color images (although, I love black and white work as well). For all of my adult life, I've been mesmerized by the beauty of deep space; hence, this is what I try to capture.

Steve images from this well-equipped observatory in his backyard in Littleton.

Whether you image for beauty or for science, though, even advances in imaging technology don't preclude some necessary basics that still hold sway, fundamentals vital to getting the most from your work.

To begin, a definite *must* for any imaging is a stable platform. No matter what type of instrument setup you're using, everything must be rock solid, from the tripod or pier to the interface between camera and the scope. If you're not going to guide (either auto or manually) during your session, your rig must be able to produce images of at least thirty seconds in length with round stars; any shorter than this tips the *signal*-to-*noise* ratio in favor of *noise*, so batten down the hatches.

Digital imaging requires the stacking of data—many exposures combining to produce a result. Some folks have asked whether it's better to shoot fewer exposures for longer lengths or many exposures for shorter lengths. The answer is to gauge your exposure time by what the sky will give you; the darker and more stable the skies, the more good data is obtained with fewer, longer exposures. If your skies are moderately light polluted, as mine are, you must shoot a greater number of shorter exposures to increase *signal* (the object's light) over *noise* (poor sky darkness and camera electronics.)

From my location, I gauge exposure length by taking test shots of varying lengths, this in addition to having a base knowledge of my sky conditions. Typically, I'll shoot h-alpha, red, green and blue exposures for three minutes—any longer and average stars begin to bloat. For luminance, the exposure length depends on the number of bright stars in the field; the Beta Cygni nebula region or the Horsehead Nebula, with unavoidable Alnitak in the picture, limit exposures to no more than thirty seconds—but I will take a huge number of these thirty-second shots.

The key to producing detail here is data, Data, DATA—shoot the life out of the sky (within reason.) If you work with clay, for example, and you use rainwater, you're not going to get very far collecting it in a paper cup—you need great quantities of it. The same holds true for imaging data. Again, the number and length of exposures depends on your location; Dark skies produce great luminance data with cumulative exposures of an hour or less; color data with a bit more. The bottom line is: *You can't work with it if you don't collect it.* The images in the reader galleries in *Astronomy* and *Sky & Telescope* magazines attest to this. The captions under each image usually give total exposure times for the various filters used, and the numbers aren't small. Tony and Daphne Hallas, for example, recently produced a stunning image of galaxy M81, also known as Bode's Nebula. The total LRGB exposure time was 11.5 hours. Now, while this may seem extreme, the results speak for themselves—deep detail with a host of small galaxies and hydrogen regions tucked among the arms of the larger galaxy. By the way, digital images are no small item—the newer cameras can produce single images of five to twenty megabytes. A healthy-sized hard drive and at least a half a gig of RAM go a long way in collection and processing.

Ratios—how much luminance versus R, G and B (and h-alpha)—different books list varying amounts, enough to spin your head. Much of the way I shoot is by the seat of my pants, along with some knowledge of the intended target. Hydrogen-rich regions, such as the North America or Eagle nebulae, show best with great amounts of data taken through infrared-blocking red and h-alpha filters. With this in mind, I'll shoot four to six hours of h-alpha and at least two hours of red, followed by an hour each of green and blue. Again, darker locales will produce wonderful data in much shorter time. It's important to note that in an RGB or HaRGB image, not utilizing luminance data, it's best to take *all* exposures at the lowest *bin* rate available (1x1)—you need the best resolution possible from


At 27 million light years away, M101 is the matriarch of a family of nine surrounding galaxies, exerting her influence most visibly on distorted NGC 5474, a dwarf galaxy 44 arc-minutes to her southwest. Steve's LRGB composite totals 5.5 hours through an 80mm Stellarvue refractor and SBIG ST-8e CCD camera.

*all* images. This tip runs counter to what many imaging books suggest, but has worked very well for me. If your image *uses* luminance data, the luminance should be binned 1x1; the color data can be binned at 2x2. In an image of this type, all your detail comes from the luminance data and you process your final luminance image specifically for this before combining. In the final image, the color images contribute exactly that—*color.* I've found that there's very little extra detail to be gained by shooting the R, G and B at full binning in an LRGB image. Also, in regard to amount of data collected, remember that there will be many images deleted as unacceptable—always shoot more than you think you'll need.

A very necessary type of data to collect is the *dark* frame. This is an image of the electronic noise the camera produces; it must be subtracted from the *light* image. There are several ways to do this. Many folks take a dark frame right after a light frame. This works well for imaging done under dark skies, but is very time-consuming. For my location, the best results come from taking six dark frames after a set of lights (20 two-minute luminance frames, for example) and saving them in a separate folder to be used later in processing.

*Flat fields* must be taken as well. These are images of the focus position and dust, etc. that invariably sits on optical surfaces, no matter how hard you try to clean. The

***Continued on page 6***

Front Cover Image Specs—
NGC 7635
(The Bubble Nebula):

The image is a false color narrowband composite using the Hubble Space Telescope color palette where Red = SII, Green = Ha and Blue = OIII. Philip used an SBIG ST2000XM with Astrodon SII, Ha and OIII filters, on a Stellarvue SV115 f/7 telescope on a MI-250 mount. Captured with CCDSoft and automated with CCD Commander, he processed with CCDStack and Photoshop: 9.5 hours Ha and OIII, 8.5 hours SII in 30 minute.

## November Skies *(continued)*

***Continued from page 1***

tell you about the time I saw the canals, either, on a night of superb seeing with a superb Thomas Cave telescope. After all, he had seen them and sketched them himself. (Which of these sentences is true: 1. There are canals on Mars; 2. The Rockies will win the Series.)

If you're up at dawn you can see an airliner coming in to land on your street! Actually it's just Venus, Queen of the Morning. Little Mercury, closest planet to the Sun, is down in the crepuscule (not a medical term) below Venus. On November 7 he will be lined up to the left of Spica which is left of the crescent moon which is left of the lopsided square of Corvus the Crow. Might make a nice photo. If you stay up all night you can catch Jupiter and Comet 2007 F1 (LONEOS) at dusk, then finish with Venus and Mercury at dawn. In between around midnight watch Saturn rise.

The Moon will occult Regulus, the big star in Leo the Lion, in the 11 to 11:30 P.M. slot of Saturday November 3. In Denver it is almost a grazing event and shouldn't take too long to transpire. Refer to page 70 of the November *Sky & Telescope*.

**Galaxies of the Month:** NGC 7331 plus the fainter Stephan's Quintet in Pegasus. Look for them close together in the area above the top point of the diamond of the Pegasus "Great Square," up about 1/2 the length of a side of the Square. NGC 7331 is seen from an angle similar to the angle we see the Andromeda Galaxy.

**Meteors of the Month:** The Leonids, associated with Comet 55P/Tempel-Tuttle, peak on November 17/18 about 1 A.M. Refer to the November *Astronomy,* page 49.

Finally, the November Open House is Saturday the 17th, starting at 5 P.M. Be there or Be square!—*Dennis Cochran*

A very familiar face to DAS members, birthday boy Brad Gilman celebrated his 50th at the September 28 E-board meeting. Happy Birthday, Brad!

Photo credit: Ron Mickle

## Image(ine) That *(continued)*

***Continued from page 5***

important bit here is that these images should be taken of the exact conditions existing at the time you took your lights—focus, equipment configuration, etc. If you have a permanent facility, this is relatively easy, since most of these factors don't change. A set of flats will typically do well for me for three or four months; by then, I'll clean the optical surfaces and change the equation; I must take a new set. Remember also, that a flat *is an image* and, thus, requires its own dark frame. Again, I'll take six *flat-darks* and save them in their own folder for later use in processing.

In the next segment, we'll look at some processing basics and a few tricks for squeezing every detailed photon from your work. If you have any questions, don't hesitate to e-mail me at *galaxyshots@att.net.*

Until then—*shoot, shoot, shoot.*

An Enfolded Crescent

At left, the hot, fast-living Wolf-Rayet star at the heart of the Crescent Nebula (NGC 6888) will end its life as a supernova in a hundred thousand years or so. To capture the faint tendrils of nebulosity surrounding the Crescent, Steve collected 4.2 hours of h-alpha data, 2 hours of red, 1 hour of green and 1.5 hours of blue. No luminance data was necessary due to the rich hydrogen content of the target.

Image copyright Steve Solon

observers deck

# A Missile in Your Eye

*by Patrick Barry*

Satellite technology designed to catch ballistic missile launches may soon help doctors monitor the health of people's eyes.

For the last 15 years, Greg Bearman and his colleagues at JPL have been working on a novel design for a spectrometer, a special kind of camera often used on satellites and spacecraft. Rather than snapping a simple picture, spectrometers measure the spectrum of wavelengths in the light coming from a scene. From that information, scientists can learn things about the physical properties of objects in the photo, be they stars or distant planets or vegetation on Earth's surface.

In this case, however, the challenge was to capture snapshots of short-lived events—like missile launches! The team of JPL scientists designed the new spectrometer, called a computed tomographic imaging spectrometer (CTIS), in collaboration with the Ballistic Missile Defense Organization as a way to detect missiles by the spectral signatures of their exhaust.

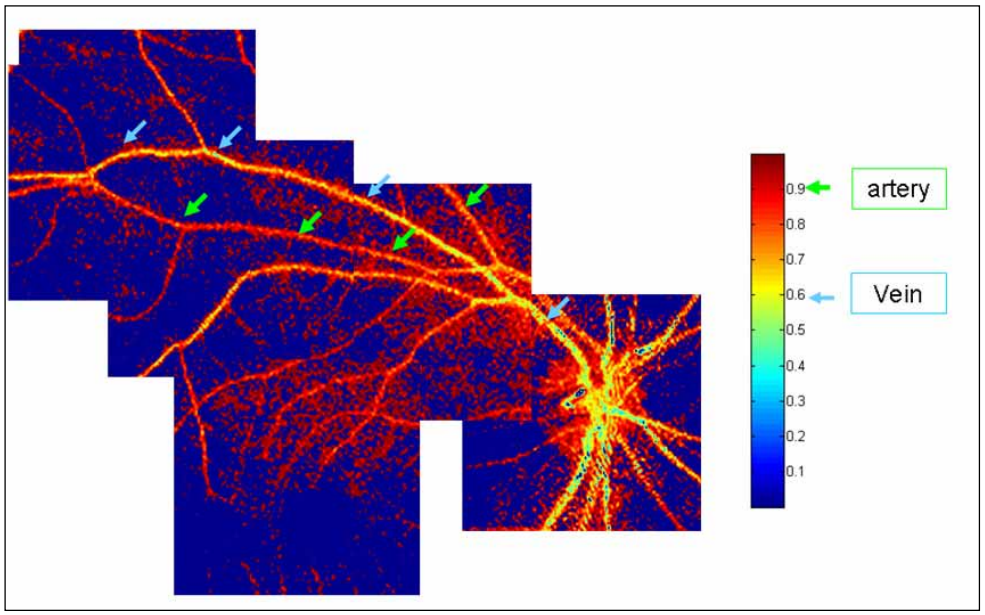
But now the scientists are pointing CTIS at another fast-moving scene: the retina of an eye.

Blood flowing through the retina has a different spectral signature when it is rich in oxygen than when it is oxygen deprived. So eye doctors can use a spectrometer to look for low oxygen in the retina—an indicator of disease. However, because the eye is constantly moving, images produced by conventional spectrometers would have motion blurring that is difficult to correct.

The spectrometer that Bearman helped to develop is different: It can capture the whole retina and its spectral information in a single snapshot as quick as 3 milliseconds. "We needed something fast," says Bearman, and this spectrometer is "missile-quick."

CTIS is even relatively cheap to build, consisting of standard camera lenses and a custom, etched, transparent sheet called a grating. "With the exception of the grating, we bought everything on Amazon," he says.

The grating was custom-designed at JPL. It has a pattern of microscopic steps on its surface that split incoming light into 25 separate images arranged in a 5 by 5 grid. The center image in the grid shows the scene undistorted, but colors in the surrounding images are slightly "smeared" apart, as if the light had passed through a prism. This separation of colors reveals the light's spectrum for each pixel in the image.




This three-color composite image from the computed tomographic imaging spectrometer shows the oxygenation of the blood in the arteries and veins of a human retina. (Arteries appear red, veins appear yellow.)

"We're conducting clinical trials now," says Bearman. If all goes well, anti-missile technology may soon be catching eye problems before they have a chance to get off the ground.

Information about other NASA-developed technologies with spin-off applications can be found at *http://www.sti.nasa.gov/tto* .

*This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.*


Film Lives!

Ron photographed the Lagoon Nebula (M8) on October 3, 2007 from his Cosmic Rock Observatory in Evergreen. He used Provia 400 film with a 12.5-inch f/6 Newtonian telescope.

## About the Denver Astronomical Society

Membership in The Denver Astronomical Society is open to anyone wishing to join. The DAS provides trained volunteers who host educational and public outreach events at the **University of Denver's Historic Chamberlin Observatory,** which the DAS helped place on the National Register of Historic Places. First light at Chamberlin in 1894 was a public night of viewing, a tradition the DAS has helped maintain since its founding in 1952.

The DAS is a long-time member in good standing of the **Astronomical League** and the **International Dark Sky Association.**

The DAS' mission is to provide its members a forum for increasing and sharing their knowledge of astronomy, to promote astronomical education to the public, and to preserve **Historic Chamberlin Observatory** and its telescope in cooperation with the University of Denver.

The DAS is a 501(c)(3) tax-exempt corporation and has established three tax-deductible funds: the Van Nattan-Hansen Scholarship Fund, the Public Outreach Fund, and the Edmund G. Kline Dark Site Fund. To contribute, please see the bottom of the membership form for details.

More information about the DAS, its activities, and the special tax-deductible funds is available on the DAS web site at ***www.thedas.org.***

**Application for membership to the Denver Astronomical Society**

**New** ☐ **Renewal** ☐

Name: _____

Address: _____

City, State, Zip: _____

Phone numbers: Home (  ) Work (  )

E-mail Address: _____

Occupation: _____

Other Interests: _____

(Students Only) School: _____ Grade: _____

Do you want to download the newsletter in PDF format from our website instead of by postal mail?

Yes ☐ No ☐

Do you want the above information excluded from the yearly roster?

Yes ☐ No ☐

***Please Circle All That Apply:***

| | |
|---|---|
| Regular Membership: $35 Students: $12 *(Students under age 23)* | $ _____ |
| *Astronomy* Magazine/$34 and/or *Sky & Telescope* Magazine/$32.95 | $ _____ |
| Van Nattan Scholarship Fund | $ _____ |
| Public Outreach Fund | $ _____ |
| DAS Dark Site Fund | $ _____ |
| Total Amount Paid | $ _____ |

***Please send all checks to Brad Gilman, DAS treasurer, 7003 S. Cherry St., Centennial, CO 80122-1179. Please make donations to the DAS Dark Site with a separate check, payable to the "DAS Dark Site Fund." For DAS Membership and other funds, including new-member magazine subscriptions, please make amounts payable to the "Denver Astronomical Society." DAS RENEWALS ONLY: you may now send your*** Sky & Telescope ***subscription funds directly to the magazine's subscription service, using the renewal form sent to you.***

## Denver Astronomical Society

c/o Chamberlin Observatory
2930 East Warren Avenue
Denver, Colorado 80210

**2008 *Astronomy* Magazine Calendars For Sale!**
Only $10.00!!! While they last!