

The Denver OBSERVER

Newsletter of the Denver Astronomical Society
One Mile Nearer the Stars

Image copyright 2007 David Wolf

Chilly Sisters

About 400 light years away and easily seen with the unaided eye, the Pleiades (M45) glitter like blue gems in the dark and signal the coming of winter. Maybe they're just ice cubes that chill the night. David imaged them from his Chainlube Observatory in Englewood on October 8, 2007. He used a modified Canon Rebel XT and an Orion 80ED at f/6.

HAPPY NEW YEAR!!

JANUARY SKIES

Inside The Observer

I can't keep up with Comet Holmes' capriciousness. Just when I thought it had died, it came back to life. What will it do in January? Only the "Shadow" knows. Look for it somewhere around

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Michael Carroll,

January Speaker 3

Astro-Imaging Part 3 4-6

Membership Info *back page*

Perseus. While you're looking for Holmes check out the cluster M34 to the west of Algol, then dip straight south to fine edge-on spiral galaxy NGC 1023, west of ρ (*rho*) Persei.

The better-behaved Comet Tuttle will peak in brightness the first week of the month. For a good chart of where it will be look on page 74 of January's *S & T*. What is interesting about its path across the sky are the objects it will come near. On De-

4	.....	Quadrantid meteor shower peaks
8	.....	New moon
15	.....	First quarter moon
22	.....	Full moon
29	.....	Last quarter moon

cember 28 it passes left of M31 (the Andromeda Galaxy), as it drops into the south, and a day later passes the bright star β (*beta*) Andromedae. Then, on New Years Eve it plows through M33, the face-on spiral in Triangulum, a galaxy that's so low in surface brightness it's the hardest Messier object to find despite being the largest in sky area. A thought: We ought to have a New Years party planned around this conjunction, with drinking and dancing and so on as an optional activity. BYOB. It's always fun to sing *Auld Lang Syne* whilst hoisting a wee dram around the old telescope.

Continued on page 7

President's Corner

Looking back can be fun, but looking forward always fosters hope and excitement. This month we can look forward to Comet 8P/Tuttle and Mars being well placed for evening observation. On February 20th we have a lunar eclipse and a special DAS Open House.

February will see elections for the new DAS officers. If you are interested in running for office, contact Dennis Cochran, Wayne Kaaz or Ivan Geisler and toss your hat into the ring. The end of March will see the annual DAS Banquet.

We are looking for a new chairman for the Edmund G. Kline Dark Site. Candidates should make their intentions known to a DAS board member.

We are starting a new project within DAS, to design and build a complete telescope around the excellent 17.5-inch mirror and diagonal we own. This effort is to make a great telescope, not to decide where we deploy



Wayne Green, DAS President

the scope for use. Interested members should contact Ron Pearson or any other board member.

I'm keeping this month's column short to be able to include a list of DAS 2008 events for your refrigerators. See Page 7 for details.—Wayne Green



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<i>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.</i>	

DAS Schedule	JANUARY	FEBRUARY
	<p>1 New Year's Day (No Public Night)</p> <p>5-6 EGK Dark Site Weekend</p> <p>12 Open House at Chamberlin Observatory (<i>Begins at 5:00 P.M.</i>)</p> <p>18 General Membership Meeting at D.U.'s Olin Hall (<i>Begins at 7:30 P.M.</i>)</p> <p>25 E-Board meeting at Chamberlin Observatory (<i>Begins at 7:30 P.M.</i>)</p>	<p>9-10 EGK Dark Site Weekend</p> <p>16 Open House at Chamberlin Observatory (<i>Begins at 5:00 P.M.</i>)</p> <p>20 Lunar Eclipse Open House at Chamberlin Observatory (<i>Begins at 5:00 P.M.</i>)</p> <p>22 General Membership Meeting at D.U.'s Olin Hall (<i>Begins at 7:30 P.M.</i>)</p> <p>29 E-Board meeting at Chamberlin Observatory (<i>Begins at 7:30 P.M.</i>)</p>

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.



Renowned Artist, Michael Carroll, Speaks to the DAS in January

by Keith Pool

Our guest speaker for the January 18th General Meeting will be Mr. Michael Carroll. Carroll has been an astronomical, science fiction and paleo artist for more than two decades. He has done work for NASA and the Jet Propulsion Laboratory. His art has appeared in several hundred magazines throughout the world, including *Time*, *National Geographic*, *Scientific American*, *Asimov's*, *Smithsonian*, *Astronomy*, *Sky & Telescope*, *Ciel et Space*, and *Astronomy Now* (UK). His paintings have aired on *Nova*, *National Geographic's Explorer*, and other television specials and have been exhibited throughout the world. Carroll is a Fellow and founding member of the International Association for the Astronomical Arts. He is the 2006 recipient of the Lucien Rudaux Lifetime Award for contribution to the astronomical arts. One of his paintings is currently on its way to Mars (in digital form)—aboard the Phoenix Lander.

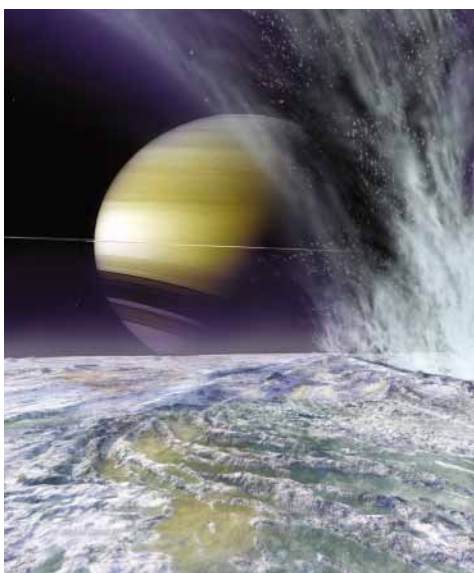
In addition to painting, Carroll is a popular science author, writing for such magazines as *Astronomy Now*, *Popular Science*, *Astronomy*, *Sky and Telescope*, *Odyssey* and *The Artists* magazines. He has authored or

coauthored over a dozen books on topics ranging from space to geology and biology. His book *Alien Volcanoes* (John Hopkins University Press) is due out in June 2008. Carroll will be signing his newest book, *Space Art: Drawing and Painting Planets, Moons and Landscapes of Alien Worlds* at the General Meeting.

Come join us as Michael Carroll explores the wonders of volcanoes on other planets and moons. From the more familiar forms of erupting mountains on terrestrial worlds to the truly alien cryovolcanoes of ice and liquid gas, Carroll shows us—through photos and paintings—the latest discoveries at Mars, Saturn and Venus.

As always, the general meeting begins at 7:30 P.M. and is held in Olin Hall's room 105 on the University of Denver's campus. There is a fee for parking in the lot adjacent to the building, but there is usually available street parking nearby if you don't mind a short walk. Afterwards, all are

invited to nearby Chamberlin Observatory for refreshments, conversation, and weather permitting, views through the 20-inch refractor.



Michael Carroll (above right). His extraordinary work has graced the covers of numerous magazines and aired on television specials—his exhibitions are known worldwide. Two of his paintings (left and right) are published here with his permission.



Image(ine) That

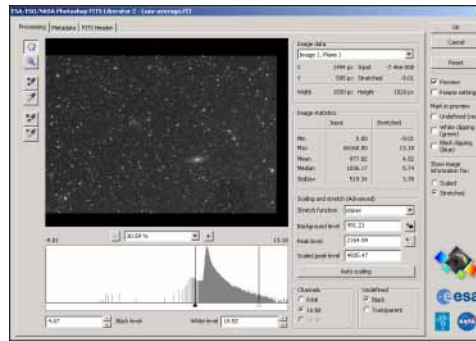
Part Three

Article and Images by Steve Solon

At this point in our imaging journey, it's likely that the seat of your pants may be a bit frayed and you're out of tea; you've spent quite some time at the computer. One trade off is that you're moderately clear-headed, a condition that working with pungent film chemicals will not leave you in.

Let's review the process thus far in steps. You've:

- 1.) Created as stable an imaging platform as possible,
- 2.) Taken exposures of 30 seconds or longer for a better S/N ratio,
- 3.) Assembled good sets of reduction images: darks, flats, flat-darks,
- 4.) Aligned the reduced images,
- 5.) Examined each aligned image for quality, deleting the poor ones,
- 6.) Saved the combined images (L or H-alpha, R, G and B) as FITS files in a



The "Fits Liberator" plug-in allows Photoshop® to work with FITS files.

separate folder and aligned that folder.

It's time to assemble all this work into an image that will give you great satisfaction. Remember that what you produce is up to you. I know several folks who've gone gray trying to get their images absolutely perfect under close scrutiny with a microscope;

this is supposed to be enjoyable. Along those lines, though, while there will be some "zooming-in" to check details during the course of final processing, as a rule, you'll view your final work from at least a foot away when all is said and done—don't go crazy over dust-sized specks.

Many of the tools we'll use in Adobe Photoshop® require experimentation—we'll cover the basics, but play around with the different settings. Don't forget to ask questions of imaging friends; these are works-in-progress, after all.

The folks at the European Southern Observatory and the Space Telescope Science Institute released to the public a plug-in for Photoshop® some time ago that is used to process Hubble images. It's called "Fits Liberator" and can be downloaded for free at: spacetelescope.org/projects/fits_liberator. This program allows Photoshop® to work

with FITS files, something previously not possible.

We'll begin with the luminance image in our example "7331-Stephan's" folder, since this is where most of the detail lies. Opening the luminance FITS file activates the Lib-

War with a World

During a period in the solar system's history known as the "Late Heavy Bombardment," some 3.9 billion years ago, our celestial companion sustained 95 percent of the impacts we see today. Were it not for Earth's active geology, biology and weather, this tortured surface might easily resemble our own. Steve captured Luna with 30 frames at .01 seconds per frame through a Custom Scientific 4.5 nanometer h-alpha filter.



erator plug-in (above left.) This wonderful tool supports an advanced histogram that allows you to manipulate brightening and darkening over a greater range than other programs. On the right side of the window, check the boxes labeled **White clipping** and **Black clipping**. As you “stretch” your image, these will keep you out of the maximum danger zones. Under **Stretch Function**, I like working with the setting **AsinH**—it offers the greatest flexibility for me, but experiment with the different settings. You’ll also want to try the **Background** level and **Peak** level functions by clicking on the icon to the right of the figure window. Now, adjust your sliders in the window under the image—get used to the touch of “just right”, but remember, you can always start from scratch if you don’t like the results. Moving the white slider to the right can significantly reduce burned galaxy cores and overly bright nebulosity. Click OK when finished and the image will be imported into Photoshop®. “Fits Liberator” tends to flip your image vertically; correct this by clicking *Image>Rotate Canvas>Flip Canvas Vertical*.

To create a color-combinable luminance image, you must first change the lum’s mode. Click *Image>Mode, highlight RGB color* and change from 16 to 8 bits per channel.

Resizing is the next step. CCD images are typically large in size, but small in the dots-per-inch category. Click *Image>Image Size*, be sure that **Constrain Proportions** is checked and change your Width to 8 inches—Height will automatically adjust—and change your Resolution to 300 pixels per inch. Now you have the beginnings of an image that will be suitable for moderate-size printing.

Sharpening is a tool that can be badly overused, so begin carefully. Apply a mild **Unsharp Mask** to the entire image by clicking *Filter>Sharpen>Unsharp Mask*. Start with an Amount of 50%, a Radius of 1.5 pixels and Threshold of 10 levels—watch the preview window to see the results—click OK when finished; if you change your

mind immediately after the fact, click *Edit>Undo Unsharp Mask*. Use the **Zoom** tool (magnifying glass icon) and zoom in a few times to check stars for over-defined edges, shadowing, and a flattened appearance, signs of too much sharpening. By the way, right-clicking with the **Zoom** tool engaged allows quick zooming and image size functions.

Keep in mind that sharpening, like most of the processing functions, can be applied to only part of an image, if desired. Use the **Lasso** or **Marquis** tools to draw around an area you’d like processed a bit more—in the case of our example image, perhaps some of the detail in 7331’s spiral arms. Start with the above **Unsharp Mask** settings and experiment. Do the same for the galaxies of Stephan’s Quintet. After sharpening an area, use the **Blur** tool to smooth the edges. If you should get several processes down the road and decide you don’t like a particular function you’ve used, you can get rid of it. Click *Window>History*, highlight the mistake function and click the trash can icon.

Use the other various histogram functions carefully to change brightness levels. **Image>Adjustments>Levels** allows the changing of different pixel brightness groups. **Image>Adjustments>Brightness/Contrast** applies general brightening and contrast levels to the entire image. Experiment with **Curves**, as well, to brighten dim areas.

At this point, get up and walk away from your work—this break restores your vision, sanity and sense-of-self away from the image. Upon your return, make a few more adjustments, save the image as a TIFF and minimize it.

Perform the above work on your reds, greens and blues—with some differences. Photoshop® will automatically change the **Mode** and **Bits** per channel of the color images when they’re combined, so there’s no need to perform these corrections. Resizing is necessary, however, to match aspect ratios with the luminance you’ve just finished. This is especially necessary if



The Channels Box

you’ve shot your color images at a lower bin rate. You can either resize each color image individually or after they’re combined. Also, color images contain much less light data than luminance images—sharpening them would create havoc. Instead, apply a mild **Gaussian Blur** by clicking *Filter>Blur>Gaussian Blur* and selecting a Radius of 1.5 pixels. Essentially, all we want out of these images is their color. Save the finished images as TIFFs

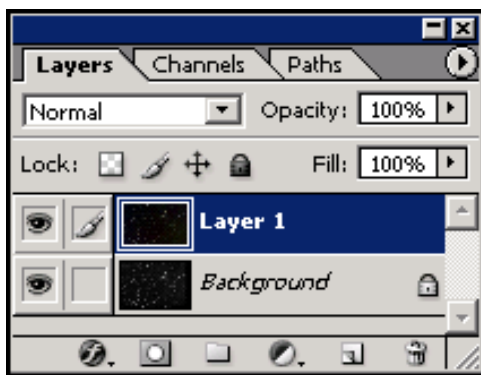
Combine your color images as a group first. Open your red, green and blue TIFF images (all previously aligned, hopefully.) Click *Window>Channels*—the box above appears. Click the arrow at the top right corner, select **Merge Channels** and change the Mode to **RGB Color**, making sure there are three channels—if not, check the Bits per channel of each of the color images under **Image>Mode**—one may have been changed to 8 (computer gremlins)—change it back to 16. Click OK and check that the file names match, then click OK—there is your color combination, which can be manipulated in a thousand ways. As a rule, the image will be fairly dim; carefully add some **Levels** or **Curves** brightening to bump things up. Save the image as a TIFF file—“7331 color combine” or something similar.

To mate it with your minimized luminance, click *Select>All*—an animated marquis forms around the edge—then click *Edit>Cut*; your image will disappear. No

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worries—it's gone to the Clipboard; close the blank window. Bring up your luminance image and click *Edit>Paste*. Your color image appears with no sign of the luminance. The reason is that you've created two layers—the color, on top at full opacity, and the luminance buried underneath (labeled "**Background.**") We'll fix that by showing both layers and adjusting them. Click on the **Layers** tab. You can change the "Layer 1" to "7331 color" by right-clicking on the image to the left of "Layer 1" and clicking "Layer Properties"—change the name and click OK. Click the **Opacity** arrow and move the slider to 50%—both layers are now visible and it's a good idea to check your alignment, just to be sure all is well. Zoom in until you



The Layers Box

have only a few stars in the image and click *Edit>Free Transform*. Your cursor becomes a small arrow and clicking and dragging it moves the color layer over the luminance—make sure that things line up the way they should. Several pressings of your keyboard's arrow keys will move the color layer in small increments for fine aligning. When finished, double click in the image to apply the transformation. You can apply a **Free Transform** as often as you like, as long as you have not **Flattened** the image. Once you are accurately aligned, cropping and resizing the entire image can be performed, although I recommend saving this until you're a bit further down the processing line.

A trick to getting better, truer color is to change the blending method. In the **Layers** box, move your opacity back to

100%, click the **Normal** box down-arrow and select **Color** at the bottom. This blending mode renders stars a more lifelike color and gives greater flexibility in adjustment. Experiment with the other blending modes just to see their properties. At this point, save the image as "7331 composite"—it will be saved as a "PSD" (Photoshop® Document) because it contains layers. As you continue with manipulating the image, periodically save it.

Now, comes the experimentation. Too many possibilities are available to list here—trial and error is the best way to learn. For starters, though, **Levels, Curves and Brightness/Contrast** will be the primary functions for bringing out faint details. Other basic tools you'll use, also under *Image>Adjustments*, are: **Color Balance, Hue/Saturation, Selective Color, Channel Mixer** and **Shadow/Highlight**.

Experiment with too much red and too little blue, desaturate the magentas and pump up the yellows. Apply changes carefully. This is where your creativity, knowledge of the target and artistic whim combine to produce the final outcome. . . your image. When you've finished (and who is ever really finished), click *Layer>Flatten Image*. Your work can now be saved as a TIFF for printing or JPEG for sharing via email and you'll still have your original PSD to work on again as you learn.

For more information, a terrific resource is Ron Wodaski's book, *The New CCD Astronomy* © 2002 New Astronomy Press. Even though the publication is now six years old, it continues as a wonderfully applicable manual for this ever-changing medium. Be aware, though, that it is printed in black and white, yet there are references to the color in some images. Also, you'll find many of the image Figure numbers are out of sequence.

Enjoy your images and the process of learning—never-ending, it is.

Questions always at: galaxyshots@att.net

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* FITS Liberator window reprinted with permission—©2005, ESO, ESA, STScI



The Horsehead Nebula (NGC 2024) in Orion (left).

Steve made this RGB image with the StellarVue SV-80mm—80:30:40 minutes, respectively.





Photo © 2007 by Joe Gafford

The Andromeda Galaxy (M31) with elliptical galaxies NGC 205 (above it) and M32.

This image is a mosaic of 15 images taken at the Okie-Tex star party and the EGK Dark site from October through November, 2007. An SBIG ST-2000XM ccd camera was used on a 10-inch f/4.5 Newtonian. Each image is a stack of 20/20/15/20 minutes of LRGB for a total of more than 20 hours of exposure time due to a redo of a few color frames. An older, less saturated image of M31's core was stacked on for detail. This was Joe's first field test of his 10-inch with a new tube assembly that has internal armature bands to stiffen it for heavy ccd cameras. As a result, this is Joe's deepest image to date of anything he's taken due to better tracking.

January Skies

(continued)

Continued from page 1

The next two nights, January 2 and 3, Tuttle passes to the right of that mysterious seldom-seen constellation Aries. Find the Seven Sisters; Aries is a curved line of stars between them and the comet, closer to the comet. A Tuttle day farther south the comet passes the spiral galaxy M74 as it cruises down the left half of the giant V of Pisces. By January 9 the rapidly-dimming Tuttle is just west of Mira in Cetus. After that it should drop into the murk near the horizon.

Mars will also be dimming as it pulls away from Earth, but a bright object all month, closer to Auriga than to Gemini as the month wears on. Its 15-arcsecond disk may yield details to the patient observer who waits for those moments when the sky settles down along her line of sight. If you're doing a planetary night Saturn comes into view after midnight, in Leo. Another plan-

etary happening is the conjunction of Jupiter and Venus at the end of the month. The pair are at their closest on the early morning of Monday February 1, a photo-op that happens in the last bit of darkness before dawn. Mythologists may wonder what's going to happen when these two powerful personalities get together in the sky!

Meteors: the Quadrantids peak January 4 just after midnight; start looking for them about 11 P.M. The January *Astronomy* (page 53) says it is a strong shower with an hourly rate of 120 meteors. That's two per minute. The radiant of this shower is in the north-east.

I believe that the theme of this month's Open House on the 12th is Mars Madness. Some of us are already over the line, however: I will be out on the field seeing how many possums will fit into the tube of my dob—even though the manufacturer says never, never do this! But don't worry, these are fun-loving possums.—*Dennis Cochran*

2008 DAS Events & Star Parties					
Mo.	GM	OH	DSW	EB	Notes:
Jan	18	12+	5	25	+Mars Madness
Feb	22	16/20+	9	29	+Lunar Eclipse (Wed)
Mar	29*	15	8	28	*Spring Banquet
Apr	18	12+	5	25	+Saturn!
May	16	10+	3	23	+Nat'l Astro Day 1
Jun	13	7	1	20	TSP (6/1-6/8)
Jul	18	12+	4	25	RMSS (7/2-7/5) +OH and DAS Picnic
Aug	15	9	2	22	WUTS (7/31-8/2)
Sep	12	6+	27	19	+Jupiter! Okie-Tex (9/27-10/4)
Oct	11*	4+	25	17	*Auction +CO Astro Day
Nov	14*	8	29	21	*Show and Tell
Dec	13*	6	27	19	*Holiday Potluck

Public Nights are Every Tuesday and Thursday
Except: Jan 1, Nov 27, Dec 25

Key to above calendar:

- GM = General Meeting
- OH = Open House
- DSW = Dark Site Weekend
- EB = Eboard Meeting



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

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 Phone numbers: Home () Work ()
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 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 (<i>Students under age 23</i>)	\$ _____
<i>Astronomy Magazine</i> /\$34 and/or <i>Sky & Telescope Magazine</i> /\$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

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