MARCH 2007

The Denver OBSERVER

Newsletter of the Denver Astronomical Society

One Mile Nearer the Stars

The Greatest of the Great

Magnificent M42 (NGC 1976) lies about 1,500 light-years from our sun. The Great Nebula in Orion is easily one of the most observed objects in the skies. Be sure to read Stuart Hutchins' article on Page 3 for more information. Contact Philip Good for image details.

MARATHON TIME!

Inside The *Observer*

MARCH SKIES

The month of March opens with a lunar eclipse but, unfortunately, it will be visible only to those in the eastern U.S. However, Venus continues its rise in the western sky, setting more than three hours after sunset. Telescopes will show the disk of Venus more than 80% illuminated and an apparent magnitude M_v -4.0. Recall early last month that Mercury was visible to the lower right of Venus at sunset, however, on the 22nd Mercury reaches its greatest western elongation and will be visible to early morning risers less than an hour before sunrise. Mercury and Venus both go through phases similar to that of the Moon.

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MARCH PREDOMINANT CELESTIAL OBJECTS

Description	RA	DEC	Description	RA	DEC
γ Andromedae, double star	02h 03.9m	42° 20'	Pleiades	03h 47.5m	24° 06'
Mira, Variable star	02h 19.7m	-2° 57'	M42, Orion nebula	05h 35.4m	-5° 22'
Perseus double cluster	02h 21.5m	57° 08'	σ Orionis, multiple star	05h 38.7m	-2° 35'
ι Cassiopeiae, triple star	02h 29.0m	67° 24'	M35 cluster	06h 08.9m	24° 21'
M77, Spiral galaxy	02h 43.0m	0° 01'	Castor, double star	07h 34.6m	31° 54'
			M81 galaxy	09h 55.6m	69° 04'

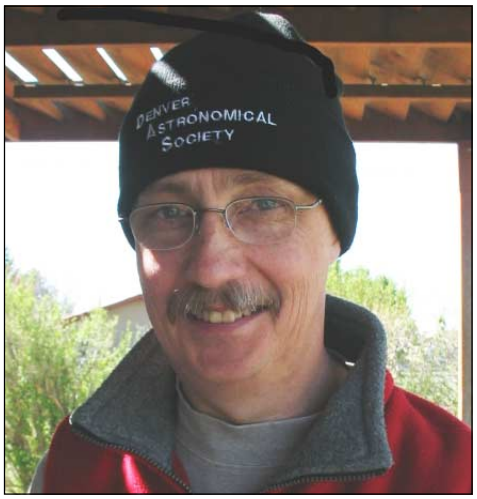
3 ..... Full moon (AKA "Old Moon")
11 ..... Last quarter moon
18 ..... New moon
20 . Spring or Vernal equinox (18:07 MDT)
25 ..... First quarter moon

President's Corner

The elections have passed, and we're looking forward to DAS's next Astro nomical Year. This year we will focus on the Edmund G. Kline Dark Site and on extending outreach to schools. With increasing light encroachment on our weekday observing sites, everyone is having to travel farther afield to get to dark skies. It helps to be ready with your observing program to maximize your time at the site. To this end, we are looking to start observing programs locally. These will be at Chamberlin on our public outreach days, backyards around the metro area, and at the Dark Site.

This is not to say that your backyard should be ignored. Some members are getting excellent results from backyards, even those immediately adjacent to car dealerships. I live on the north end of town and have good access to northern skies. Those who live along the southern end still have pretty good southern skies. Lights from new construction along I-25 near Fort Collins is spilling to the east. The expansion of new houses in Douglas County is being felt to the south. DAS recently renewed our membership with IDA, and we are looking into ways to support dark sky initiatives along the Front Range.

There are new bookshelves in the Director's Office at Chamberlin. This is the first step to making improvements to the observatory's decor, greatly helping us conduct our open house and public night events. Eventually, Dr. Howe's office will become a conference room. There is no news about the State Historic Fund Grant at this time. DU has a new person handling the grant, and we hope this will help get the work started.



Wayne Green, President of the Denver Astronomical Society.

The Banquet is coming up fast! It is on March 3 at the White Fence Farm. With 90 reservations,we get the large banquet room. This will let us have a great feast and give Dr. John Steven's some pacing room for his talk about Lockheed Martin's role with Orion,

Continued on page 7

DAS Schedule

MARCH

2 E-Board meeting at Chamberlin Observatory *(Begins at 7:30 P.M.)*
3 DAS Spring Banquet at the White Fence Far, *(Begins at 6:00 P.M.)*
11 Daylight Savings Time starts *(2:00 A.M.)*
17-18 EGK Dark Site Weekend (Messier Marathon)
24 Open House at Chamberlin Observatory *(Begins at 5:00 P.M.)*

APRIL

6 General Membership Meeting at D.U.'s Olin Hall *(Begins at 7:30 P.M.)*
14-15 EGK Dark Site Weekend
21 National Astronomy Day #1 Open House at Chamberlin Observatory *(Begins at 7:30 P.M.)*
27 E-Board meeting at Chamberlin Observatory *(Begins at 7:30 P.M.)*

Public nights are held every Tuesday and Thursday evenings beginning at the following times: October 1 - March 31 at 7:00 P.M.
April 1 - September 30 at 8:30 P.M. at Chamberlin Observatory
Costs to non-members are: $3.00 adults, $2.00 children.
Please call (303) 871-5172 for reservations.

Society Directory

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The Executive Board conducts the business of the DAS at 8 P.M. at Chamberlin Observatory. Please see the Schedule of Events for meeting dates. All members are welcome.

thedas.org

Orion's Great Astrophysics Laboratory

by Stuart Hutchins

Orion on Film
Credit & Copyright: Mathew Spinelli

Orion, the Hunter, strides larger than life across the northern winter sky, studded with bright stars. After the Big Dipper, he is probably the most recognized constellation in the northern skies. Every young boy loves a star named "Beetle Juice", and even binocular observers soon find M42, the dramatic Great Orion Nebula. But an internet sojourn through the archives of APOD (Astronomy Picture of the Day: *http://antwrp.gsfc.nasa.gov/apod/archivepix.html*) reveals the nebula is much larger and more fascinating than what the human eye can see. In fact, the deep film image

OrionDeepWide
Credit & Copyright: Robert Gendler

of Orion by Mathew Spinelli hints at the giant dusty molecular cloud that spawned Rigel and the belt stars Alnitak, Alnilam and Mintaka. I did a search of the APOD archives for "orion nebula" and turned up the images and science information outlined below. Many more are on the site for you to explore.

The size of this 100 light year wide cloud is shown more clearly in this picture by renowned imager Robert Gendler, using a CCD camera. The Great Nebula (lower right in the image) is merely a 13 ly wide bright blister burned out of the near side of the cloud by the four young massive stars of the Trapezium, which are easily seen in amateur telescopes. The huge cloud is dark and opaque, and we see only the surface glowing in H-alpha where it is ionized by ultraviolet radiation. Blue reflection nebulae surround the bright stars. All this situated in - you guessed it - the Orion arm of the Milky Way, which also contains Earth's solar system. At a distance of 1500 ly, this is the nearest stellar nursery to Earth, and the most studied by astronomers. Hubble images at other wavelengths and infrared light reveal a fantastic cosmic laboratory for astrophysics.

The giant cloud (bottom left) is mostly cold hydrogen and some helium, full of dust and contracting under its own gravity. The stellar nurseries contain glowing gas, hot young stars, proplyds, and stellar jets spewing material at high speeds. Many of the filamentary structures visible in this image are actually shock waves - fronts where fast moving material encounters slow moving gas.

Imaging through these filters allows scientist to trace the abundances of specific elements. Many organic molecules like water, methane, alcohol, and formaldehyde are being synthesized deep within the cloud, shielded from UV radiation, and utilizing the surfaces of carbon and silicate dust grains. These are detected using radio telescopes. Recent observations have confirmed that water molecules now exist in the famous Orion Nebula, and are still forming. The nebula is so vast that even the measured minuscule production rate creates enough water to fill Earth's oceans 60 times every day, speculate discoverers led by M. Harwit (Cornell).

Orion Nebula in Oxygen, Hydrogen, and Sulfur
Credit & Copyright: WFI, MPG/ESO 2.2-m Telescope, La Silla, ESO

Continued on page 6

Messier Madness: 2007 Edition

by Darrell Dodge

The nights of March 16-17 and March 17-18 should be busy ones at the DAS EG Kline Dark Site near Deer Trail. The old Moon is in its final throes before new on those nights, which means those are the official DAS Messier Marathon nights for 2007. March - April is the only time during the year when observers at perfect sites at our latitude can hope to accomplish the feat of observing all of the 110 objects in the modern version of Charles Messier's famous catalog of non-comets. For a lot of reasons, however, it's probably better to have a goal of trying to observe as many as you can, not the entire list (see box).

Because of the importance of starting to observe as soon as possible after sun-down, it's absolutely imperative that participants arrive at the dark site early (5:00 pm or so). Late arrivers will not only imperil their chances of seeing the early objects, but may also make it difficult for other observers. Arriving before dark is also a good idea because the dark site has changed a lot since last year. There are eight new powered concrete observing pads and if you arrive in the dark, you may need some help finding your way around.

We will have Marathon forms at the site, which provide a check list of objects in one of the preferred orders for observing. And there will be a signup sheet for those wanting to make a competition out of it. There will be separate signup lists for star-hoppers and go-to-ers.

Because of evening and early morning challenges, absolutely perfect observing conditions are required to complete a Marathon at latitude 40 degrees north. (Lower latitudes are better.) The toughest object in the evening is M74, the low surface-brightness face-on Sc galaxy in Pisces, which is dropping into the Denver nebula in the West as darkness tries to fall. It may be easier to see with very big binoculars.

The early morning challenge is the globular cluster M30 in Capricorn, which—on the morning of the 17th—rises about 50 minutes before the Sun. But the hills to the southeast of our dark site are just high enough to block it until the Sun is starting to turn the sky to a neon blue, which makes the cluster virtually impossible to see.

Even if you miss M30, however, the early morning sky features a wonderful planet alignment this year, as Mars, Neptune, Mercury, the thin crescent Moon, and Uranus precede the Sun in a parade along the ecliptic.

For those who've tried a Marathon, the feat seems impossible to complete without a lot of luck. And as luck would have it, St. Patrick's Day falls right in the middle of this year's Marathon. But you'll need more than the luck of the Irish and green beer. You'll need perfect weather, perseverance, and stamina too. A more realistic goal and a little planning will help make your Marathon an enjoyable experience. (See the "Hints for Happy Messier Marathoning" box on the next page).

Let's all hope for clear skies and clear roads this year!

The Virgo Cluster is one of the trickier parts of the marathon to negotiate, as well as the most rewarding. Do YOU know which galaxy is M84 and which is M86?

observers deck

Hints for Happy Messier Marathoning

1. Practice difficult or unfamiliar areas of the sky a week or so before, using the telescope and observing aids you intend to use for the Marathon.
2. Arrive at the site well before sundown.
3. Use a checklist that lists the objects in the approximate order you will be viewing them.
4. Don't try to use the Marathon as a way to do or complete the AL Messier Observing Program. The program requires descriptive comments and there's not much time for that.
5. Do take the time to scribble some notable things about some of the objects. You'll appreciate having these later, especially when you're trying to remember if you really discriminated between easy-to-confuse objects like M86 and M84.
6. Aim for as many objects as possible, not ALL of the objects.
7. View easier objects first! Don't spend 30 minutes trying to see M74 while the other objects in the West are sinking out of sight (see #6). Observe M77, 31, 110, 32, and maybe M33 first.
8. If you miss M110, you will probably be able to see it in the morning.
9. Try not to panic when you start going through the Virgo/Coma Galaxy Clusters. These are all bright galaxies (except maybe for M90) and you should have plenty of time because there's a break in objects to observe when you're done.
10. When you're out of objects to view, try to get off your feet and get something to eat and drink. You'll probably be busy from 7:10 P.M. to around midnight, but a few short breaks in the middle of that period and a longer break (even a nap) sometime between 11 P.M. and 1:30 A.M. is a good idea.
11. Keep reviewing your checklist to make sure you've not forgotten an object. Common ones to overlook are M83 and M68.
12. Remember that all 110 objects were not seen in one night until 1985. Seeing more than 90 is a great achievement.

The beautiful Pinwheel, M-33 in Triangulum, shines at magnitude 5.7 and performs its spiral whirls not far from the Milky Way's serene sister galaxy, M-31. Also known as NGC 598, the Pinwheel contains untold numbers of star-forming regions and sends us its glow from 2.3 million light years away.

March Skies

Continued from page 1

Saturn shines at M_v 0.0 in the east-southeast after sunset, steadily rising high in the sky as the night progresses. Saturn will not achieve this brightness again for several decades. Telescopic viewing will show the rings, which are more open than they were last month, and several of the brightest satellites of the Saturnian system. Don't miss Saturn's close encounter with the Moon on March 1 when the two pass less than 1° from each other as viewed.

Jupiter opens the month at M_v-2.0 and brightens to -2.3. While the best viewing times are the hours before sunrise, when Jupiter will be very visible in the south, it will be worth the effort for the early morning view to observe the eclipses of the Galilean satellites. Jupiter reaches western quadrature, which means its shadow will be cast farthest west, as viewed by us Earthlings. The result is the greater "apparent" distance of the satellites from the Jovian giant when they are eclipsed.

To get a great view of the planets, stars, and other celestial objects, visit the Denver Astronomical Society's next Open House at 5 P.M. on Saturday, March 24 at the University of Denver's Historic Chamberlin Observatory. For the public, there is a $1 upkeep fee to look through the Clark 20-inch telescope. Members of the Denver Astronomical Society have free access to the Clark 20-inch at Chamberlin Observatory during Open House.—*Ron Mickle (Astronomical Calendar 2007, Starry Night Pro, Sky & Telescope* and *Astronomy* magazines)

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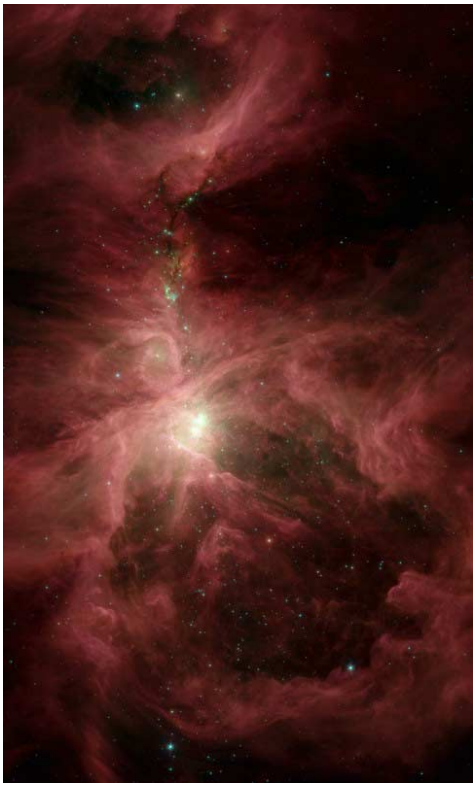


Spitzer's Orion
Credit: Thomas Megeath (Univ. Toledo) et al., JPL, Caltech, NASA

This stunning infrared view from the Spitzer Space Telescope penetrates the dust, allowing us to see further into the cloud (above) . At full resolution, the remarkable image data yields a census of new stars and potential solar systems. About 2,300 young stars surrounded by planet-forming disks were detected based on the infrared glow of their warm dust, along with about 200 stellar embryos, stars too young to have developed disks. This 0.8 by 1.4 degree false-color image is about 20 light-years wide.

The cloud is turbulent, and gravitational collapse is unstable. As a blob of gas shrinks to half its size, the force of gravity becomes 4 times greater, and the gas is heated by compression. The cloud fragments into dense blobs which rapidly shrink and become proplyds - new stars embedded in dusty rotating disks. A disk can then fragment into planets around its star. Inserts to the mosaic image at right show several planetary systems in formation. The bottom left insert shows the relative size of our own Solar System.

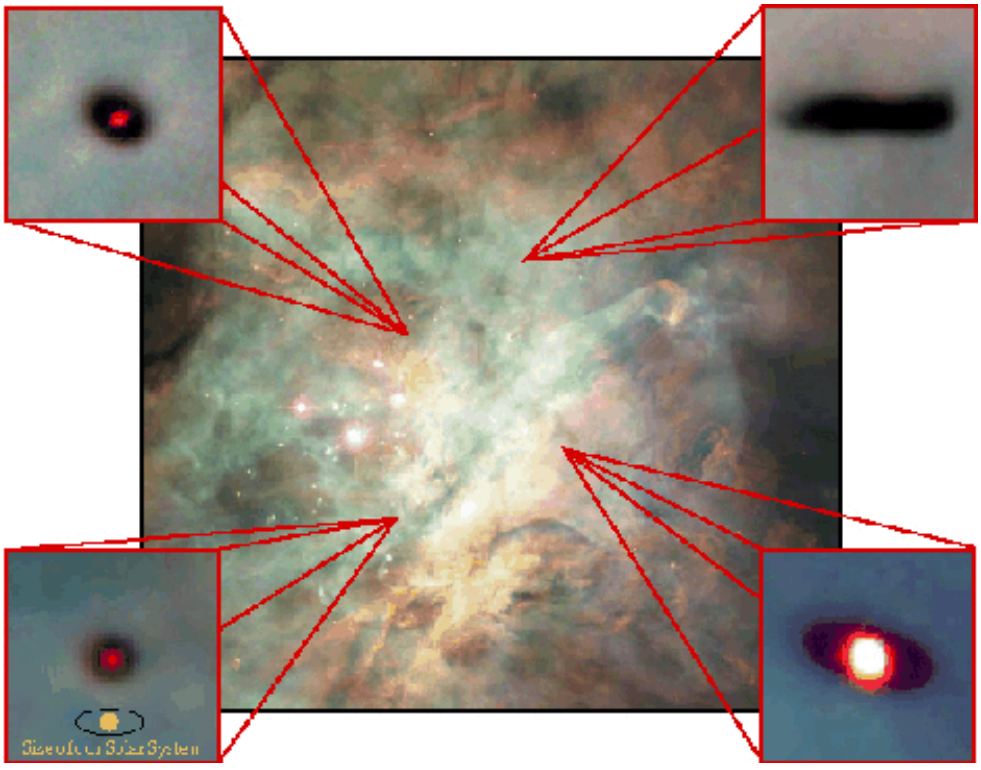
But for planetary systems, the active star-forming region can present a hazardous and inhospitable birthplace. While the formation of dusty protoplanetary disks seems common in Orion, these Hubble Space Telescope close-up images (right) dramatically reveal the torturous conditions they must face while trying to grow into full-fledged planetary systems. In each case, a central young star is surrounded by a disk substantially wider than our solar system. The disks likely contain material in the process of planet formation. However, withering ultraviolet radiation from one of Orion's nearby hot stars is rapidly destroying the disks — ultimately creating the comet-shaped clouds of glowing gas seen engulfing the protoplanetary systems. Planet formation must occur quickly here, if at all. Researchers estimate that about 90 percent of Orion's youngest protoplanetary disks will not survive the next 100,000 years.

The bright stars in the image on page 7 are the well known Trapezium, an open cluster of stars in the center of the Orion Nebula. The theory of star formation and computer simulations predict an abundance of small dim red stars and even smaller objects called brown dwarfs. Astronomers have searched for these

Protoplanetary Survivors in Orion
Credit: J. Bally (U. Colorado), H. Throop (SWRI), C.R. O'Dell (Vanderbilt U.), NASA

objects for many years, finding few. The many dim objects in this image are thought to be brown dwarfs and free-floating planets. Brown dwarfs are stars too puny to create energy in their core by fusing hydrogen into helium. Although many more brown dwarfs than hot stars have now been found in Orion, their very low masses make them inadequate to compose much of the dark matter expected in galaxies and the Universe. The above false-color mosaic combines infrared and visible light images of the Trapezium from the Hubble Space Tele-

Planetary Systems Now Forming in Orion
Credit: C. R. O'Dell and S. K. Wong (Rice U.), WFPC2, HST, NASA,



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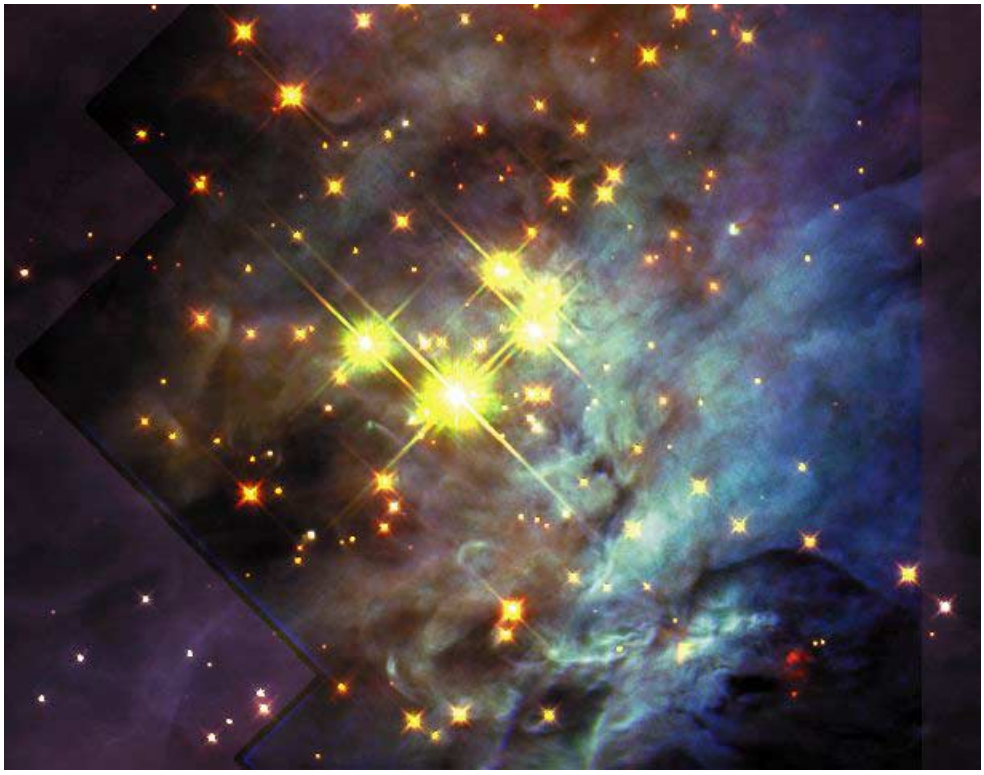
scope. Faint brown dwarfs with masses as small as about one percent the mass of the sun are seen in the infrared data.

The following was written by Jim Kaler, Professor Emeritus, University of Illinois (*http://www.astro.uiuc.edu/~kaler/sow/rigel.html):*

RIGEL (Beta Orionis), marking Orion's left foot, is a supergiant and part of a large association of stars are related by birth. The group includes the stars of Orion's Belt, the Orion Nebula, and many of the other hot blue-white stars in the constellation. At a distance of 775 light years, Rigel actually shines with the light of 40,000 Suns. It is a "blue supergiant," a fairly hot star with a surface temperature (11,000 Kelvin) about double that of our Sun. Its warmer temperature gives it a bluish-white light that contrasts beautifully with Betelgeuse. If the hot star's invisible ultraviolet radiation is considered, the luminosity climbs to 66,000 solar, the radiation pouring from a star 70 times the solar size. Rigel is accompanied by a fairly bright, seventh magnitude companion nine seconds of arc away. Normally such a star is easily found in a small telescope, but Rigel's brilliance nearly overwhelms it. The companion, at least 50 times farther from Rigel than Pluto is from the Sun, is itself double. With an original mass around 17 times that of the Sun, Rigel is in the process of dying, and is most likely fusing internal helium into carbon and oxygen. The star seems fated to explode, though it might just make it under the wire as a rare heavy oxygen-neon white dwarf.

BETELGEUSE (Alpha Orionis) is one of the sky's two first magnitude supergiants (the other Antares of northern summer). Betelgeuse is one of the larger stars to be found anywhere. Typically shining at magnitude 0.7, this class M (M1.5) red supergiant (with a temperature of about 3600 Kelvin) is a semi-regular variable that changes between magnitude 0.2 and 1.5 over multiple periods between roughly half a year and 6 years. At its most likely distance of 425 light years, its measured angular diameter yields a radius 600 times that of the Sun, 2.8 Astronomical Units. If placed at the Sun, the star would go 55% of the way to the orbit of the planet Jupiter. From its size and temperature, allowing for its infrared radiation, Betelgeuse shines an amazing 60,000 times brighter than our Sun, which coupled with the temperature also gives a radius of 2.8 AU. However, the star is ejecting part of itself through a strong wind, and is surrounded by a huge shell of dust of its own making. That, an extended atmosphere, and the pulsations make it difficult to locate an actual surface and to tell just how large the star actually is. Even the distance is subject to uncertainty, the luminosity ranging from 40,000 solar to 100,000 solar. Whatever the actual numbers, Betelgeuse is clearly a highly evolved star, one whose central hydrogen fuel supply has run out. As a result, the core contracted into a hot dense state, and the outer portions swelled outward. We do not really know the star's condition at the moment, but the odds are that it is now in the process of fusing helium into carbon and oxygen in its core. From theory, its initial mass was probably between 12 and about 17 times that of the Sun which suggests that the core will fuse elements through neon, magnesium, sodium, and silicon all the way to iron. It will then collapse, and Betelgeuse will blow up as a supernova, most likely leaving a compact neutron star about the size of a small town behind. If it were to explode today, it would become as bright as a crescent Moon, would cast strong shadows on the ground, and would be seen easily in full daylight.



The Brown Dwarfs of Orion's Trapezium
Credit: G. Schneider (UofA), K. L. Luhman (CfA), et al., NICMOS IDT, NASA
WFPC2 data: C. O'Dell and S. Wong (Rice)

President's Corner

Continued from page 2

NASA's new Crew Excursion Vehicle. Join with us for awards and meet the new Officers and the new Board of Directors.

Get those banquet reservations in quickly!—*Wayne Green*

DAS 2007 Banquet
March 3, 2007, 5:30 P.M.

White Fence Farm
6263 W. Jewell Ave., Lakewood, CO. 80232
Phone: 303-935-5945.
Speaker: Dr. John Stevens, Director—Business Development (Lockheed Martin Space Sciences Division)
Cost: $27.00

Contact: Wayne Green
Email: *President@TheDAS.org*
Phone: 303-818-1290

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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 participates in **NASA's Project Astro** program.

The DAS' credo 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

Sky & Telescope Magazine/$32.95

..... $ _____

Van Nattan Scholarship Fund ..... $ _____

Public Outreach Fund ..... $ _____

Total Amount Paid ..... $ _____

Please make donations to the Dark Sky Site Fund payable to the DAS EGKDS Fund and mail to **Steve Solon, 9774 W. Elmhurst Place, Littleton, CO 80128-5199.** ***Please make other amounts payable to the Denver Astronomical Society and mail along with this completed form to*** **Brad Gilman, DAS Treasurer, 7003 S. Cherry St., Centennial, CO 80122-1179.**

Denver Astronomical Society

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