The Objective View

May 2008

Newsletter of the Northern Colorado Astronomical Society

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Next Meeting: May 1, 7:30 pm

Johannes Kepler, His Life and Discoveries

by Nate Perkins, Ph.D., Avago Technologies

Club Business at 7:15 pm

Discovery Science Center
703 E Prospect Ave, Fort Collins

http://www.ncastro.org/Sites/DiscoveryCtr.htm

Club Brochure: http://www.ncastro.org/Contrib/2008_Brochure.pdf

NCAS Programs

June 5 Telescope Help Session
July 10 TBA

Discovery Sci Ctr Starwatch, 703 E Prospect, Ft Collins

May 9 8:15 pm

Dark Sky Observing Opportunities, Roland's Astro Corral

May 2. 3. . Check club-news that site is accessible.

Rocky Mountain National Park Starwatch, Upper Beaver Meadows

Dates are June 13, 27; Jul 11, 25; August 8, 22

http://www.ncastro.org/Sites/RockyMtnNP.htm

Other Events

Little Thompson Observatory Star Night:
May 16 7:30 pm Speaker TBA http://www.starkids.org

CSU Madison Macdonald Observatory Public Nights
On East Drive, north of Pitkin Street
Tuesdays 8 pm if clear, when class is in session

Cheyenne Astronomical Society May 16 7 pm
Cheyenne Botanic Garden
http://home.bresnan.net/~curranm/

Chamberlin Observatory Open House, dusk to 10 pm
May 10, Jun 7, Jul 12, Aug 9, Sep 6 303 871 5172
http://www.du.edu/~rstencel/Chamberlin/

Longmont Astronomical Society May 15 7 pm Dr. Fran Bagenal, JUNO mission to Jupiter's Magnetosphere
FRCC, 2121 Miller Rd. See new web page design at:
http://www.longmontastro.org/

April 3 Program

Searching for the Invisible Universe, Erica Ellingson, Univ of Colorado, Boulder

The Solar System in 3D, Nick Schneider

The Sun is one of 100 billion stars in the Milky Way galaxy. In the 1920s, the faint spiral nebulae were recognized as other galaxies far beyond our own. The observable universe likely holds about 100 billion galaxies. Cosmologists ask: 1) what are the contents of the universe? What are the overall properties of matter, energy and space? What is the history of the Universe and what is its future? In 1929 Edwin Hubble found that most galaxies are flying away from each other, and space is expanding. This suggests that all space and time were in a single point 14 billion years ago, time of the Big Bang. Initially the universe was hot and thick, then at age 100,000 years it became transparent. Tiny ripples in the distribution of matter collapse together and form stars, galaxies, and large galaxy clusters. An expanding universe with matter will tend to decelerate from gravity. The amount of matter decides whether the expansion is indefinite or ultimately ends in the Big Crunch. The determining point is the critical density, which is about 1 atom per cubic meter. When we survey all the stars in the galaxies, the density is less than 1 percent of the critical density. Is there anything else? The rotation of spiral galaxies should be slower at the outskirts, as we see planets in our solar system behave. Vera Rubin in 1973 found that spiral galaxies spin like rigid disks. This suggests there is "dark matter" which dominates the rotation. A spherical dark matter halo surrounds the galaxy and has at least 10 times its mass. Can galaxy clusters be used to measure dark matter between galaxies? Gravitational lensing produces arc-shaped images of the galaxies behind a cluster. Erica showed a simulation of lump of dark matter crossing in front of a skyline. The warped images can be analyzed to derive the

amount and distribution of dark matter. The HST galaxy cluster image "The Beast" shows dark matter in big haloes surrounding and blending individual galaxies. Could a change in the law of gravity with extreme scales work? The Bullet Cluster shows two galaxy clusters which have just passed through each other. It illustrates the difference in the minimally interactive dark matter plotted with gravitational lensing and the intergalactic normal matter in the clusters. The normal matter interacts and lags behind in the collision. The total matter density of the Universe including dark matter in clusters is about 25% of the critical density, so the Universe will expand forever. Will the rate of expansion be steady or decrease? The answer was a surprise. White dwarf supernovae (Type SNIa) are a standard candle for estimating distances to extremely distant galaxies. When the distance data came in, the expansion was accelerating! This requires a cosmological constant to oppose the effects of gravity. The Big Bang theory was clinched for many with the discovery of the Cosmic Microwave Background in 1965. Light was emitted when the Universe was dense and hot. Now with cooing and expansion, the signal acts like an opaque object with T=3 Kelvin: microwave wavelength. One of the first missions to map the CMB in detail was the BOOMerang balloon flown in 1998. The scale of CMB ripple was an indicator of the overall curve of space. It was not magnified or diminished, so the overall curve of space is flat. For space to be flat, something has to counteract the curving effects of matter in the Universe. The Dark Matter, supernova, and CMB results all converg on a universe model with dark matter and an cosmological constant. The WMAP mission gave the best CMB map to date. The Universe is 74% dark energy, 22% dark matter, and only 4 % normal matter. The best estimate of the age of the Universe is 13.7 +/- 0.15 billion years. The Universe will still expand forever. What is dark matter? What unknown force is counteracting gravity? What will happen in the far future? Continued expansion to the Big Rip?

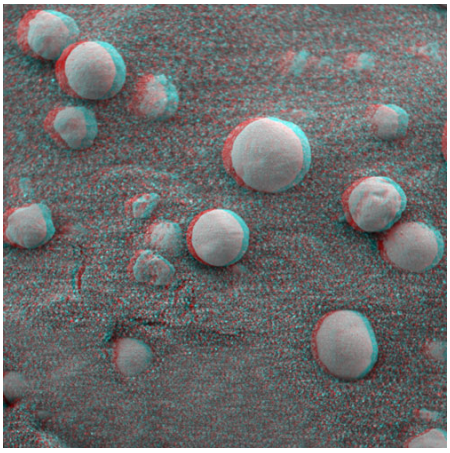
Erica Ellingson is associate professor, Department of Astrophysical and Planetary Sciences (APS) at the University of Colorado, Boulder, and a researcher in the Center for Astrophysics & Space Astronomy (CASA). See more on her interests at: http://casa.colorado.edu/~elling/

Nick proceeded with a show of anaglyph stereo images. He began at the scale of jumping spiders and progressed through the planets. 3-D viewing places us at the scene in a most immersive way. Members are indebted to Nick and Erica for two stimulating lectures and their gift of a signed copy of their latest Astronomy text for the club.

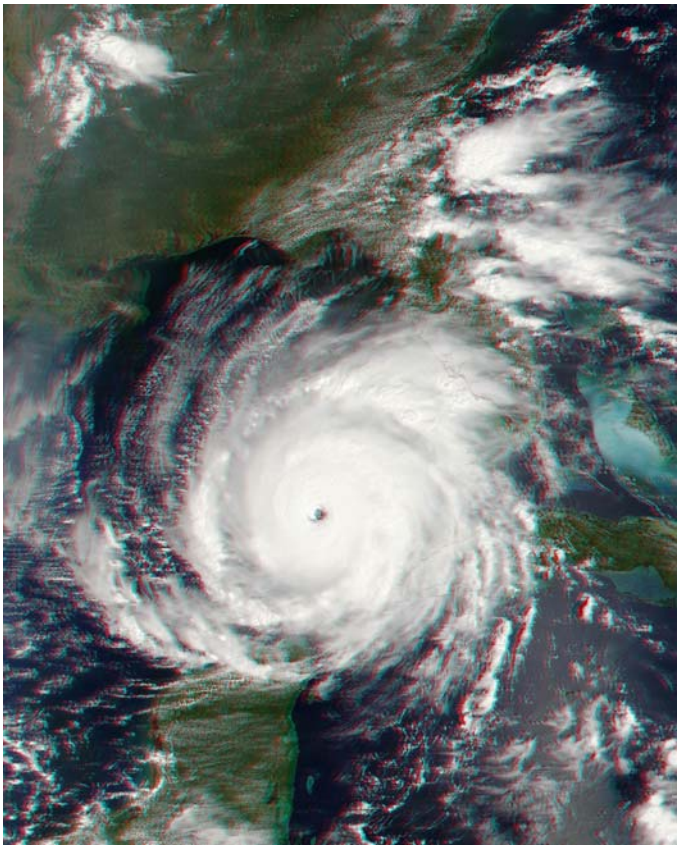
Nick Schneider is associate professor, Department of Astrophysical and Planetary Sciences (APS) at the University of Colorado, Boulder, and a researcher in Laboratory for Atmospheric & Space Physics (LASP)

For his web page see: http://lasp.colorado.edu/~nick/

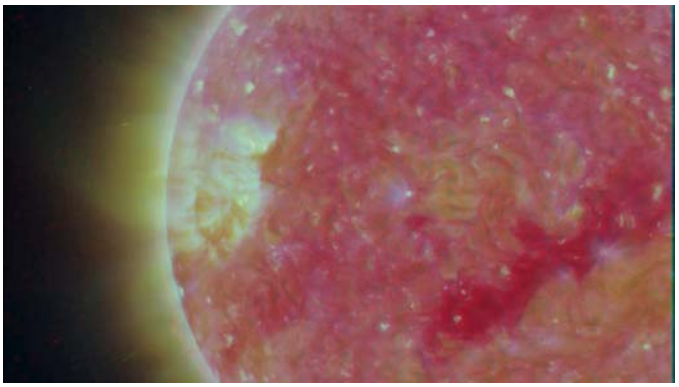
Making 3-D Pictures:
http://stereo.gsfc.nasa.gov/classroom/3d.shtml



Blueberry-shaped nodules image by Mars Rover Opportunity
Feb 12 2004 NASA/JPL/Cornell/USGS/Texas A&M



Hurricane Rita 2005
http://wettersat.heim.at/Rita.jpg



3 wavelength image from the STEREO pair of Spacecraft
http://www.nasa.gov/mission_pages/stereo/news/stereo3D_press.html

Lunar Transit Movie:
http://science.nasa.gov/headlines/y2007/12mar_stereoeclipse.htm

April 3 NCAS Business

Treasurer Bob Michael called the meeting to order. The calendar of observing events was announced. Our Spring speakers were announced. The Western Nebraska Star Party is May 29 to June 1. The Nebraska Star Party is Jul 27 to August 1. The Astronomical League convention for 2008 is in Des Moines IA this summer. Members were asked by email what projects they would like to support.

Max Moe Defends His Honors Thesis

Hi all,

I just successfully defended my undergrad honors thesis on planetary nebulae yesterday and just wanted to thank you for all of your generosity and support. If it wasn't for my parents driving me out to dark-sky sites in the wee hours of the night and your encouragement and awesome views through your scopes throughout junior high and high school, I wouldn't be here today attempting to conquer the mysteries of the cosmos. It was actually the view of the Ring Nebula through your 30" telescope, Gary, at Foxpark 8 or so summers ago that got me hooked on planetary nebulae.

We now have about 10 different sources of evidence suggesting that the binary fraction of planetary nebulae is ~70% where the remaining ~30% come from single stars with masses greater than ~2.4 times the mass of our own sun. Therefore, sadly, our sun will not make a planetary nebula.

Attached is a picture of the planetary nebula Abell 72 I took (along with Orsola De Marco, Howard Bond, and George Jacoby) at the 2.1m telescope at Kitt Peak this past November. It was my favorite object of our target list of 29 objects that we got during our 8 night (all clear) observing run. It was the most stressful observing run I've ever been on since on 6 of the 8 nights it was just Orsola and me - Orsola working the telescope and I working the CCD - but I wouldn't change it for anything else in the world! Abell 72 has nice filamentary structure and a galaxy right next to it. Unfortunately, that bright star bloomed into the nebula itself slightly (we didn't care since we were only concerned with the blue central star) so I had to fix it up a little bit. Hopefully the colors come out right since I'm using a Sun microsystems monitor and it might come out slightly different on a PC or Mac. Anyway, enjoy and thanks again.

Cheers, Max

Hello From Mike Hotka,

Congratulations on your defense. Its great to see you do something you really love.

If our sun will not make a planetary nebula, what WILL it do? The 2.4 sun size is also the minimum mass needed for a star to go supernova, correct?

Hi Mike, Dr. Bob and everyone,

First let me answer Mike's question. The 2.4 solar mass limit is NOT the supernova limit. Stars as massive as 8-10 solar masses can lose enough mass while they are a red supergiant so that their core mass remains below the Chandrasekhar limit of 1.44 solar masses - the critical CORE mass limit above which a star will undergo a supernova.

So what happens to our sun? Well, the mass loss rates just prior to the planetary nebula (PN) phase will be about a factor of 10 lower for progenitors around 1 solar mass versus progenitors around 2.4 solar masses. This means the the subsequent PN that is formed from a 1 solar mass progenitor will be a factor of 10 times less mass and therefore a factor of 10 times fainter in terms of surface brightness. Moreover, the transition time from the planetary nebula ejection to the point where the central star becomes hot enough to photoionize the surrounding material is much, much longer for lower mass progenitors. I re-did some stellar models with more realistic mass-loss rates and found this transition time for a ~1 solar mass progenitor to be about 100,000 years. Basically, the planetary nebula will be expanding and dispersing for 100,000 years before the central star will finally "light up" the nebula. The central star of a ~2-2.5 solar mass progenitor will heat up and "light up" the surrounding planetary nebula in timescales less than a few thousand years. So again, the planetary nebula that forms from a 1 solar mass star will be 100-1000 times fainter than a planetary nebula that forms from a ~2.4 solar

mass progenitor. This nebula will just simply be too faint, too old, too low mass, too large, too dispersed, and too low of a surface brightness to be observed. Most of the PN we see in the sky like the Ring, Dumbbell, etc are less than ~10,000 years old.

So how does a stellar companion help stars below 2.4 solar masses make a PN? First, tidal interactions between the red supergiant and the companion will "spin-up" the rotation rate of the envelope of the red supergiant. This increase in rotation rate will increase the mass loss rate by a factor of 10 or more in some cases. Therefore, the subsequent PN formed will have the necessary ~0.2 solar masses of material to shine as a bright, normal PN. Secondly, if the companion is close enough, it will be engulfed by the red supergiant star in an event known as a common envelope (CE). The companion will deposit its orbital energy and angular momentum and eject the envelope as it spirals closer and closer to the core of the giant star. Since the effective radius is significantly reduced and since the luminosity will remain a constant based on the core mass, then the temperature must go up according to the Stephman-Boltzmann law: L ~ R^2*T^4. Therefore, the core will heat up to the necessary temperature to photoionize the surrounding material in the timescale of the CE interaction - which is only 10-50 years!

Now let me answer Dr. Bob's question about the paper(s). The first paper has already been published by the Astrophysical Journal (ApJ - Moe & De Marco 2006). The ~70% binary fraction result (which was my honors thesis) will be submitted to ApJ in the next month - most likely in a series of three papers: 1) Moe & De Marco will be my full on honors thesis which is about 40 pages long, 2) Politano, De Marco & Moe will compare a Monte Carlo simulation method to my population synthesis method, and 3) De Marco, Moe, Politano, & Herwig will be a short 4-page ApJ letter highlighting the main results of paper 1 (Moe & De Marco 2006) and the previous two papers mentioned since we feel it is important to consolidate the ~100 pages of research (regular format, not ApJ format) into a few pages that people can actually read. Once these papers get accepted, we will put it up on astro-ph so you can read them.

Hope you all have a good astronomy day tomorrow if you're in the Boulder area and hope you can make it to Sommers-Bausch Observatory and Fiske Planetarium.

Cheers, Max

From Greg Halac: ISS Construction

I thought this was an Interesting animation showing the phases of construction of the ISS ...

http://www.tietronix.com/anim/MoviePlayer.asp?myMovie=movies/assembly640x360.swf

Earth at Night Animation

A submission to the "Digital_Astro" Yahoo group. Thought this group would enjoy it ...

Greg Halac

A different kind of astrophotography
Posted by: "Robert Reeves" reeves10@satx.rr.com
reeves102000
Thu Mar 27, 2008 4:29 pm (PDT)
Hi folks,

Kinda off topic, kinda not...so I am posting across three astrophoto lists. Here is a link to a different kind of astrophotography, looking at the Earth at night from space. My astronaut acquaintance, Don Pettit, has put together a 10-minute movie of what cities look like at night as seen from space. He shot these images while he was Science Officer aboard ISS Expedition 6 about 5 years ago. He recently posted this on YouTube and let me know about it today. It is a stunning movie, you have to watch it.

http://www.youtube.com/watch?v=eEiy4zepuVE

A bit of trivia.... most of the music during the movie is from royalty-free clips from Adobe Auditions, but for the Australian sequences, Don played his own didgeridoo that he had with him in space aboard ISS. As you remember, Columbia was lost while Expedition 6 was in space, so Pettit and his crewmates had to return in the Soyuz spacecraft. He couldn't bring back personal effects due to cramped space in the Soyuz, so he left his didgeridoo on the space station. Three years later his didgeridoo came home on STS-114 and now he has it again, and played it in this movie.

Enjoy!

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Nova Sagittarii 2008 Fading
See:
http://www.aavso.org/cgi-bin/newql.pl?name=nova%20sgr%202008&output=html

Eta Aquariid Meteors May 5

May ideally produce up to 70 per hour, but radiant is low in SE predawn

Plotting Impact Craters

On Wed, Apr 16, 2008 at 2:46 PM, Same Old Frank <sameoldfrank@yahoo.com> wrote: Also, while I'm here, as many of us know, there are about 180 known impact craters on Earth, in varying degrees of visibility, with the most famous probably being that mile-wide one in Arizona. Do any of you happen to know or have Web links for the location (and, ideally, the latitude/longitude) of
> some or all the other craters?

Frank, I think the Earth Impact Database at http://www.unb.ca/passc/ImpactDatabase/index.html has what you're looking for. -Ian

Best Looks

Moon	By Mercury 5/6, by Mars 5/10
	By Saturn 5/12, by Jupiter 5/24;
Mercury	In W at dusk
Venus	Hidden by Sun
Mars	In W early evening
Jupiter	In S at dawn
Saturn	High in Leo evenings

International Space Station Passes for Loveland – Fort Collins May 2008

Date	Mag	Starts			Max. altitude			Ends		
		Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.
2 May	-0.3	04:57:46	10	S	05:00:01	21	SE	05:02:16	10	E
3 May	-2.3	05:19:49	10	SW	05:22:40	74	SE	05:25:32	10	ENE
4 May	-0.4	04:10:15	20	SE	04:10:33	20	SE	04:12:47	10	E
5 May	-2.3	04:32:07	35	SW	04:33:09	71	SE	04:36:00	10	ENE
6 May	0.5	03:22:30	14	E	03:22:30	14	E	03:23:09	10	E
6 May	-1.3	04:53:52	15	W	04:55:54	36	NNW	04:58:36	10	NE
7 May	-1.4	03:44:10	45	ENE	03:44:10	45	ENE	03:46:20	10	ENE
7 May	-0.1	05:16:46	10	WNW	05:18:50	18	NNW	05:20:53	10	NNE
8 May	-1.3	04:05:45	34	NW	04:06:10	37	NNW	04:08:52	10	NE
9 May	0.7	02:55:54	15	ENE	02:55:54	15	ENE	02:56:32	10	ENE
9 May	0.0	04:27:14	12	WNW	04:29:01	18	NNW	04:31:06	10	NNE
10 May	-0.2	03:17:19	27	NNE	03:17:19	27	NNE	03:19:00	10	NE
10 May	0.7	04:50:54	10	NW	04:51:59	12	NNW	04:53:04	10	N
11 May	0.1	03:38:40	18	NNW	03:39:03	18	NNW	03:41:09	10	NNE
12 May	1.1	02:28:37	13	NE	02:28:37	13	NE	02:29:00	10	NE
12 May	0.8	04:00:49	10	NW	04:01:57	12	NNW	04:03:05	10	N
13 May	0.6	02:49:50	16	N	02:49:50	16	N	02:51:05	10	NNE
14 May	0.9	03:11:00	11	NNW	03:11:46	12	NNW	03:12:57	10	NNE
14 May	1.1	04:47:23	10	N	04:47:52	10	N	04:48:19	10	NNE
15 May	1.4	02:00:47	11	NNE	02:00:47	11	NNE	02:00:53	10	NNE
15 May	0.9	05:09:01	10	NNW	05:10:43	14	NNE	05:12:23	10	NE
16 May	1.1	02:21:50	12	N	02:21:50	12	N	02:22:42	10	NNE
16 May	1.3	03:57:08	10	N	03:57:33	10	N	03:57:57	10	NNE

17 May	1.0	04:18:41	10	NNW	04:20:19	14	NNE	04:21:58	10	NE
18 May	1.4	03:06:51	10	N	03:07:05	10	N	03:07:19	10	NNE
18 May	0.2	04:40:29	10	NNW	04:42:56	25	NNE	04:45:22	10	E
19 May	1.1	03:28:12	10	NNW	03:29:48	14	NNE	03:31:23	10	NE
19 May	-1.9	05:02:28	10	NW	05:05:19	64	NE	05:08:08	10	ESE
20 May	0.2	03:49:55	10	NNW	03:52:20	24	NNE	03:54:44	10	E
20 May	-2.0	21:49:11	10	SW	21:51:35	43	SSE	21:51:35	43	SSE
21 May	1.1	02:37:34	10	NNW	02:39:07	13	NNE	02:40:40	10	NE
21 May	-1.8	04:11:49	10	NW	04:14:39	60	NE	04:17:28	10	ESE
21 May	-0.5	20:37:47	10	SSE	20:39:19	14	SE	20:40:51	10	E
21 May	-1.5	22:11:17	10	WSW	22:14:05	50	NNW	22:16:53	10	NE
21 May	1.2	23:48:16	10	NW	23:49:40	13	NNW	23:51:04	10	NNE
22 May	0.2	02:59:13	10	NNW	03:01:36	23	NNE	03:03:59	10	E
22 May	-1.9	04:34:03	10	WNW	04:36:44	37	SW	04:39:24	10	SSE
22 May	-2.1	20:58:27	10	SSW	21:01:11	43	SE	21:03:57	10	ENE
22 May	0.4	22:34:04	10	WNW	22:36:22	21	NNW	22:38:41	10	NNE
23 May	-1.8	03:23:34	52	N	03:23:52	56	NE	03:26:40	10	ESE
23 May	-0.4	04:57:25	10	WSW	04:58:34	12	SW	04:59:43	10	SSW
23 May	-1.5	21:20:26	10	WSW	21:23:13	53	NW	21:26:03	10	NE
23 May	1.2	22:57:22	10	NW	22:58:48	13	NNW	23:00:14	10	NNE
24 May	0.4	21:43:05	10	W	21:45:26	22	NNW	21:47:47	10	NNE
25 May	1.4	00:55:56	10	NNW	00:56:06	11	NNW	00:56:06	11	NNW
25 May	-1.6	20:29:25	10	WSW	20:32:14	57	NW	20:35:04	10	NE
25 May	1.2	22:06:17	10	NW	22:07:47	13	NNW	22:09:16	10	NNE
26 May	0.3	20:51:59	10	W	20:54:22	23	NNW	20:56:45	10	NNE
27 May	1.1	00:04:54	10	NNW	00:06:04	13	N	00:06:04	13	N
27 May	1.1	21:15:05	10	NW	21:16:38	14	NNW	21:18:11	10	NNE
28 May	1.2	00:26:18	10	NNW	00:26:42	12	NNW	00:26:42	12	NNW
28 May	0.9	23:13:46	10	NNW	23:15:03	12	NNE	23:16:01	11	NE
29 May	0.5	23:35:04	10	NNW	23:36:37	18	N	23:36:37	18	N
30 May	1.2	20:47:19	10	NNW	20:47:37	10	N	20:47:56	10	N
30 May	0.8	22:22:27	10	NNW	22:23:41	12	NNE	22:24:53	10	NE

http://www.heavens-above.com/main.aspx?lat=40.4997&lng=-105.05736&loc=Fort+Collins+CO+USA&alt=0&tz=MST