

# Smoky Mountain Astronomical Society

S. C. R. A. P. S.

Society's Chronological Astronomical Papers

About hobbies....

Many men go fishing their entire lives  
without knowing it is not fish they are after.

~David Henry Thoreau

## From the President - Lee Erickson

Volume 30, Number 5  
May 2007



Last month's presentation on galaxies has my mouth watering for some clear skies and a chance to observe the swarms of galaxies that this time of year offers. I was better able to keep up with, and enjoy, Michael's presentation than I was two years ago. This is because, in the intervening time, Sasquatch (with Michael's help) has shown many of these galaxies to me. I think I have moved from inexperienced beginner to experienced beginner.

Our next meeting on Friday, May 11th is followed by a Star Party at Unicoi crest on Saturday the 12th. Let's hope for clear weather, and keep an eye on the SMAS Yahoo groups for any spontaneous star party opportunities. It was just about a year ago that several of us saw Omega Centauri (the biggest globular cluster in earth's sky) for the first time. We were up on Unicoi Crest. It was quite late and we were fortunate that the humidity was low. The sky on the southern horizon was clear, and seven degrees above the horizon, there it was. Wow! Omega Centauri alone is worth the drive to Unicoi Crest!



Here is a picture from last May which was taken at Unicoi Crest. You can see we still had to dress warmly.

**There will be no June meeting at PSTCC.** Like last year, it is our month to picnic. Last year we had great weather, so we will play it safe and repeat what seems to be a good recipe. Speaking of recipes, start thinking now about your Astronomy theme food item. We will begin menu planning at the May meeting. The club will fund a meat course so we need vegetables, salads, beverages, desserts and some eating and drinking utensils.

**Bob Arr, Michael McCulloch, Owen Hoffman and Tim Hunt with the club's 20 inch telescope Sasquatch. May 2006, UC**

## Agenda for May 11, 2007 Meeting

7:00 Meet and greet

Return checked out library books

7:30 Formal meeting begins.

Announcements: Picnic Preparation.

Night Sky: Lee Erickson "Cigar Galaxy"

Program: Bob Arr's re-formatted DVD "SMAS Beginner's Course"

Gastronomy to follow meeting.

### Minutes of April Meeting

Lee Erickson began the meeting by introducing guest Crystal Danker, a friend of Dennis Hutcheson and Cassie Morgan.

Jim Sanders was presented with his Messier Binocular Award from the Astronomical League. Special note was made of his excellent sketches in his award. Well done, Jim!

During a discussion of our ongoing effort to find a mount for the club's 125mm F8 Burgess Refractor, Dennis Hutcheson announced that he was going to donate his Meade LXD55 mount to the club. The LXD55 mount is a perfect match for this telescope, and will give SMAS its only goto/tracker telescope.



**Lee Erickson presents Messier Binocular Award to Jim Sanders (right)**

Lee Erickson reprised the PSTCC star party with pictures and narration, and credited all those SMASers who worked behind the scenes, and the Pellissippi personnel who supported the effort. It was a very worthwhile exercise, and helped strengthen our ties with the school.

Michael McCulloch gave the Night Sky presentation, devoted to the springtime blossoming of the galaxies. His images were extraordinary, and his sky maps easy to follow. He had a list of 36 April targets that he and Ed Gorney had personally observed in one night two years ago. He distributed copies of the list and sky maps to the attendees.

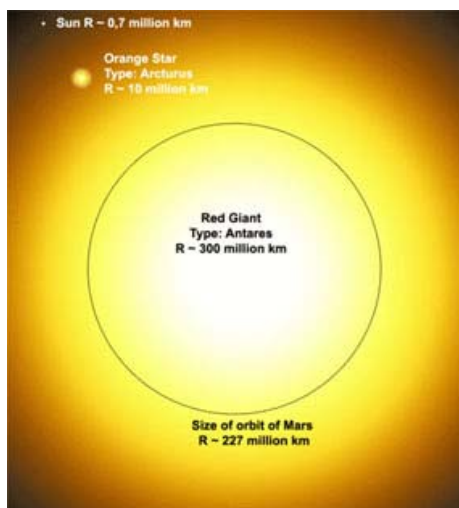
Michael's presentation elicited many comments from the audience about the structure, origin and mysteries of galaxies, as well as techniques to observe some of their difficult-to-see features.

### Readers respond to the size of Antares.

Several readers wrote to discuss Antares after April's Question of the Month.

**Janice Erickson wrote:** Antares is about 700 times the diameter of the sun, which would put its outer surface between the orbits of Mars and Jupiter

**Lee Erickson wrote:** Since the radius of Jupiter is about 5 AU we can say that Antares would occupy  $(4/3\pi \times R^3)$ , about 523 cubic astronomical units. The solar system occupies a volume at least out to the Oort cloud where comet material is still gravitationally bound to our sun. The Oort cloud is estimated to be 50,000 to 100,000 AU in radius. Our solar system occupies a volume then of  $5 \times 10^{14}$  to  $4 \times 10^{15}$  cubic astronomical units. Let's just call it  $1 \times 10^{15}$  for simplicity.



So to a fair approximation, Antares would occupy about  $5.23 \times 10^2 / 10^{15}$ . That works out to be  $5.23 \times 10^{-13}$  of the solar system. Which is to say, just about negligible. The solar system would still be, to best approximation, empty.

**As an aside, George Weems wrote (about Arcturus):** Reference Scientific American, April 2007 "The Ghosts of Galaxies Passed" on page 40 by Rodrigo Ibata and Brad Gibson;

And just think that Arcturus is an "interloper" that came from a dwarf galaxy that was "disassembled" by the Via Lactea (Milky Way)...

... a study was done on the Hyades and they discovered all the stars in the Hyades have very similar composition. This fingerprinting via spectroscopic analysis might be used to trace back the origins of where various star streams were born-however they say Arcturus was definitely kidnapped by the Milky Way. It is (appropriately enough) part of the "Arcturus Stream". It is a very good article.

\* \* \*

So for April, we have three winners, all of whom share the prize for correctly answering SCRAPs April Question of the Month. A donation will be made to the SMAS Library in their names. Congratulations!

*("Kidnapped by our Milky Way." Astounding! -Ed.)*

## Antares

Dear Editor of SMAS:

I must admit that your pictures on the relative sizes of objects in the solar system and universe, as well as the question on Antares, intrigued me, so I decided to look up the answer to your question and see what else I could learn

Your question was: If Antares was centered on our Sun, how much of the solar system would it occupy? Such a simple question, such a complex answer.

I first began my research with my favorite site, Astronomy Picture of the Day, at <http://antwrp.gsfc.nasa.gov/apod/ap980726.html>. The caption of the photograph gave me a bit of information, but not enough. As the internet is prone to do, you are often led down more and more divergent paths until (hours later) you finally remember what it was that you had originally intended to look for.

I'm not sure if the caption on the photograph is copyrighted or not, but I'll give credit to APOD and hope there is no problem with my sharing this information with your gentle readers. Everyone may know everything about this star, but some may not. I beg for your humble patience as I expound on the subject. Please feel free to add more complex details as editor's notes as you see fit.

**APOD's Explanation:** Antares is a huge star. In a class called red supergiant, Antares is about 700 times the diameter of our own Sun, 15 times more massive, and 10,000 times brighter. Antares is the brightest star in the constellation of Scorpius and one of the brighter stars in all the night sky. Antares is seen surrounded by a nebula of gas which it has itself expelled. Radiation from Antares' blue stellar companion helps cause the nebular gas to glow, as photographed above. Antares is located about 500 light years away.

**First of all, I wanted to know "How did this star get its name? "** Antares was named by the ancient Greeks and means "anti-Ares" or "not Mars". As you know, Mars is reddish in color and is named for the Roman god of war. The Greeks called this god Ares. Antares is red in color and the Greeks wanted to differentiate between the planet and the star since they are similar in color and brightness. As Mars moves through the ecliptic, it can pass close to Antares, thus creating more opportunities for confusion.

*(Continued on page 5)*

But I also learned that Antares has a link to ancient Arab cultures and was known as “Antar’s Star”. According to Wikipedia, Antara was the son of Shaddād, a well-respected member of the tribe of 'Abs, and of Zabaibah, an African female slave. The tribe neglected Antara at first as an illegitimate son or slave, due to his color and slave lineage. Nevertheless, Antara soon claimed attention and respect for himself by his remarkable personal qualities and courage in battle, excelling as an accomplished poet and a mighty warrior. Antara's poetry is well preserved, and often talks of chivalry values, courage and heroism in battle.

The Russian composer Nikolai Rimsky-Korsakov wrote his Symphony No. 2 based on the legend of Antar.

Antares was also important in other ancient cultures: Egypt, Persia and India. After all, it is the 15<sup>th</sup> brightest star in our sky. It is believed to be the “lance star” in the Biblical book of Job and is also important in astrology and in the ancient religion of Stregheria.

**Next, I wondered about the class of stars called “red supergiants”.** Ok, we know it’s red, but why is it red? What is a supergiant? And what is this “M class” that I have seen referenced?

Without getting into the complexities of what I learned about black body curves and how the surface temperature of stars was determined (I’m sure an astronomer could spend days discussing this subject), let me overly simplify things and say that the “color” of a star indicates the surface temperature and that the surface temperature of Antares is about 3,000 K (3,000 degrees Kelvin). If you don’t have the conversion of Kelvin to Fahrenheit in your head, let me just say that this temperature is on the cool side for a star. For comparison, our Sun has a surface temperature of about 6,000 Kelvin.

Sizes of stars are measured with regards to the star we know best – the Sun. Dwarfs are stars with radii equal to or less than the Sun. Giants are stars between 10 and 100 solar radii and supergiants are those stars with greater than 100 and up to 1000 solar radii.

The “M class” designation initially confused me. One of the mnemonics to remember is OBAFGKM or “Oh, Be A Fine Girl (Guy), Kiss Me”. But why should I remember this and what is it all about???? Initially, the stars were classified by the intensity of the hydrogen spectral lines seen – starting with A, with the strongest hydrogen lines and ending with P, with the faintest hydrogen lines. When surface temperatures became a more meaningful classification of stars, astronomers kept the letters associated with the old observations and simply reshuffled them. An O-type star is the hottest star known and an M-type star is the coolest star observed, with BAFGK-type stars in between. All the other

*(Continued on page 6)*

letter classifications were simply discarded. Mystery solved.

I am sure most of your readers know about the Hertzsprung-Russell Diagram, but I didn't understand it until recently. The Danish astronomer Ejnar Hertzsprung and the American astronomer Henry Norris Russell independently plotted the relationship between two basic stellar properties (luminosity and surface temperature) and this chart or diagram is named for both of them. Describing the H-R Diagram is a subject beyond the space available for this article. But let us simply say that Antares is a highly luminous, cool star not on the "main sequence" of the H-R diagram.

**Oh, dear. I haven't yet covered diameter, mass, luminosity or distance!**

How do you determine the diameter of a hot ball of gas? Generally, it is determined by the edge of the photosphere which is where the atmosphere of a star becomes dense enough to be seen. Our Sun has a diameter of about 700,000 kilometers. Antares is about 700 times the diameter of our Sun, or about 490,000,000 kilometers. That means that if Antares was centered on our Sun, its orbit would extend to between the orbit of Mars and Jupiter. Wow. That's BIG!

Antares is about 15 times more massive than our Sun. Our Sun has a mass of about  $2.0 \times 10^{30}$  kg or 300,000 greater than the mass of the Earth, although about only  $\frac{1}{4}$  the average density of the earth. I leave it up to the reader to calculate the mass of Antares.

Luminosity is another subject that would take longer to explain than I feel your readers could tolerate at this point. Luminosity is defined as the total energy radiated per second. Our Sun has a luminosity of  $3.9 \times 10^{26}$  W and Antares is 10,000 times more luminous than the Sun. Another Wow.

Distance? 500 Light Years is a long way. It takes about 8 minutes for light from the Sun to reach Earth, about 93,000 million miles or  $1.5 \times 10^8$  km or 1 A.U. (Astronomical Unit). So, how far away is Antares?

And the emission nebula surrounding Antares is..... Oh, well, a subject for another day.

Thank you for your time and patience.

Sincerely,

**Thank *you*, Ketcha, for sharing your thoughtful inquiry with our members. Beautifully done, and a lot of work. —Ed.**



Mike has been a member of SMAS for seven years (maybe eight, 's bin a long time). He is a professional geologist, is current a consultant with ORNL, researching techniques for mining methane gas from deep underground (very fascinating stuff).

He has a broad range of scientific interests, and is an amateur photographer, particularly interested in landscape photography. He is a member of the Southern Appalachian Nature Photographers.

Mike has a Meade ETX90. He lives in Knoxville. (Oh yeah, his last name rhymes with "rainy".)

***May Question of the Month***

More massive stars die quicker than less massive stars, right? That's cause they burn hotter, using up their fuel a lot faster.

OK, consider Sirius, that beacon of brilliance southeast of Orion's belt. That blazing blue-white star is the brightest one in our northern sky. It is a double, you know: they're called Sirius A and Sirius B. The tiny companion, Sirius B, is vastly smaller than the main star. But B is just a dead brown dwarf, all its fuel gone.

Why didn't the hugely bigger A die first?

Submit answers to Editor,  
201 Willard St, Maryville, TN 37803  
or  
smokymtnastro Yahoo group



SCRAPS depends      Help!  
Upon its friends      Help!

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One of our members reports he got stopped for speeding last month.


He had almost talked the patrolman out of it, when the officer spied the dog in the back seat.

Our anonymous member says the dog is now worth \$150.

See next page



# May 2007

SUN	MON	TUE	WED	THU	FRI	SAT
		1	2	3	4 UTK	5 TAO
6	7	8	9	10	11 SMAS PSTCC 7 pm	12 SMAS Star Party Unicoi Crest
13	14	15	16 New moon	17	18 UTK	19 SMAS Star Party Look Rock #1  TAO
20	21	22	23	24	25	26
27	28	29	30	31	UTK—roof of Neilson Physics Building on The Hill at UT 1st & 3rd Fridays TAO—Tamke-Allan Observatory Public Stargaze Watts Bar Lake, Roane County 1st & 3rd Saturdays	