

Smoky Mountain Astronomical Society

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

Society's **Ch**Ronological **A**stronomical **P**aper**S**

I believe a leaf of grass is no less than the journey
work of the stars. Walt Whitman

From the President - Lee Erickson

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Burr... Some cold weather is upon us. Of course, it is to be expected since the northern hemisphere is now getting less sun light. Not only have the length of the days changed for the shorter, but also the angle with which the sun strikes the ground delivers less heat for any given area. In fact, if you live above 66.5 degrees north latitude you may be experiencing prolonged periods of no sun light and heat.

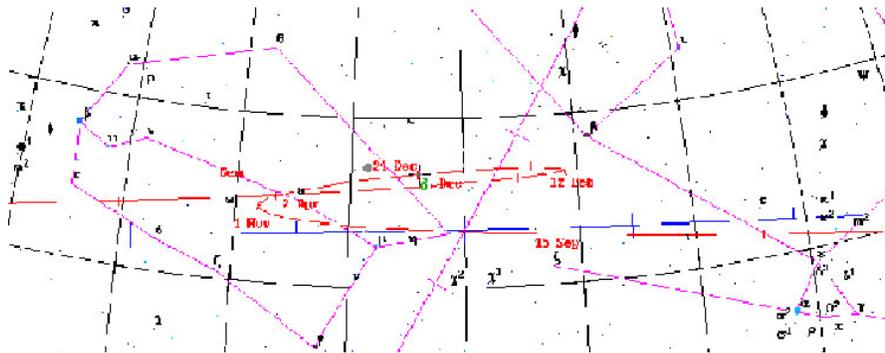
When I was quite young, I learned that the Earth's orbit is slightly elliptical. I immediately leapt to the incorrect conclusion that the greater distance in part of the orbit caused winter. The teacher, Mrs. May, anticipating my error, immediately told us that the earth was farther from the sun during our summer and not our winter. We were also told about how the seasons were opposite in the southern hemisphere. When I understood, I remember feeling sorry for people in Australia whom I assumed would have unpleasantly hot summers and even colder winters than we had in Minnesota.

It was only many years later I learned that the quantitative effect of the non circularity of the earth's orbit on temperature was small. Even later still, I learned that Australia is more equatorial than Minnesota and so not as cold as Minnesota. Now I envied them their climate.

Earth is at perihelion on January 3rd. This is just 13 days from the shortest day of the year December 21. In between is December 24 when Mars is in opposition and I would have though closest to us. However, from <http://seds.lpl.arizona.edu/~spider/spider/Mars/mars2007.html> I have learned that Mars will be closest a bit earlier, December 18th. This pass is a not very close 55 million miles. [In 2003, it came within 35 million miles — Ed.]

Earth has been overtaking Mars and the result is that the normal eastward apparent movement of Mars against the background stars has halted and now reversed to become a westward motion. This westward motion will continue until January 31.

I captured this animation of Mar's 2007 and 2008 motion from Guide. Mars will be moving from Gemini into Taurus during this retrograde phase beginning Nov 18 2007. Prograde will resume Jan 31 2008.



Our last announced Star Party of 2007 at Unicoi Crest was a success. On November 10th 2007, we enjoyed Comet Holmes and for me an unexpected observation.. My personal thanks to Kenney Pridgon for asking about Uranus and bringing a chart from Astronomy magazine with which to locate Uranus. After first finding Pegasus and then Capricornus we located Aquarius in between. Uranus is currently in Aquarius and after a bit of searching with Sasquatch at low magnification a bright blue object was located. Under higher power, it became a not-quite point-like blue object. Having only once before seen Uranus (about 10 years ago) I was not certain, but Tim Hunt confirmed that what we were seeing was the color he had remembered. Once again, I found that astronomy with friends is rewarding.

As the evening progressed, Tim Hunt united his high tech Cannon Rebel with my home made barn door tracker for some wide angle astro photography. We had great fun. I have only shot film off of my barn door tracker and because I usually took 10 and 20 minuet exposures, it takes quite some time finish a role of film. When I did finish a roll, it was often difficult to figure out what I might have done to improve the tracking.

However, with Tim's camera, we could immediately review the results and we could see that our polar alignment was probably OK. With a bit of experimenting we could see that the tracking speed was probably a bit slow. As midnight approached, Mars cleared the trees. Steve Braddy, observing Mars with the telescope his father has used for years, was able to see the color difference between the bulk of Mars and the polar ice caps. I think this was a first for him. As Mars nears its closest approach on the 18th, I hope we can call a spontaneous Planet Party and see Mars.

Our first meeting of 2008 will be January 11, 2008. Our program speaker will be Dr. Stephan Spanier. I have asked him to “speak to Amateur Astronomers on basic particle principles and the New Physics with the Large Hadron Collider”

The Large Hadron Collider (LHC) is being built in a circular tunnel 27 km in circumference. The tunnel is buried around 50 to 175 m. underground. It straddles the Swiss and French borders on the outskirts of Geneva, at the European particle physics center called CERN.



It is planned to circulate the first beams in May 2008. First collisions at high energy are expected in mid-2008 with the first results from the experiments soon after.

The LHC just might shed some light on the Dark Matter which out-masses “normal” matter, of which we are made, by a factor of about 5.5.

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Reminder for your December social calendar, SMAS Holiday Banquet, Saturday December 8th. We meet at 7:00 PM in the Gondolier restaurant. The address is 138 West End Avenue in Farragut, 966-5221. (Note: West End is the continuation of Concord Road.)



Minutes of November Meeting

by Dennis Hutcheson

The November 9, 2007 SMAS meeting was called to order by President Lee Erickson. Other members present were Dennis Hutcheson, Cassie Morgan, Tim Hunt, Mike Littleton, Jim Sanders, Janice Erickson, Stephen Braddy, Michael Nanny, and Kenny Pridgen. In addition to the ten members present we had one visitor, Drew Holley.

Announcements was made concerning the last SMAS Unicoi Crest Star Party for 2007 on November 10. In addition the announcement was made that the SMAS Holiday Banquet would be on December 8th.

The program for the evening was presented by Jim Sanders on Photographing Stars in Southern Australia. Jim first told the envious group that this was a combination business trip and the possibility to do some astrophotography. Going through the equipment he used on the trip he explained he had pre-planned his outing based on weight and luggage limitations and was going to focus on wide field photos. Jim had made contact with other amateur astronomers in Australia to aid in his planning, and had also agreed to join Jim under the stars. Even though the weather did not fully cooperate with his plans, he was able to squeeze in a few hours and capture several very nice photos. Some of the objects visible in Jim's pictures included Omega Centauri, dark nebula The Coal Sack, and Crux and Eta Carinae.





Mysterious Cosmic Rays Linked to Galactic Powerhouse

The sprawling Auger Cosmic Ray Observatory in South America has produced its first major discovery while still under construction. The international Auger collaboration has traced the rain of high-energy cosmic rays that continually pelts the Earth to the cores of nearby galaxies, which emit prodigious quantities of energy.

“This is a fundamental discovery,” said Nobel Laureate James Cronin, the University Professor Emeritus in Physics at the University of Chicago. “The age of cosmic ray astronomy has arrived. In the next few years, our data will permit us to identify the exact sources of these cosmic rays and how they accelerate these particles.”

The Auger collaboration, which includes 370 scientists and engineers from 17 countries, formally announced its discovery in the Friday, Nov. 9 issue of the journal *Science*. Ten researchers belong to the University of Chicago contingent of the Auger Collaboration, including Cronin and Angela Olinto, Professor in Astronomy & Astrophysics. Cronin initiated the project with Alan Watson of the University of Leeds in the early 1990s.

Until now, the history of astronomical discovery has been dominated by the detection of light. “We are doing astronomy with proton-charged particles”, said Joao de Mello Neto, a Visiting Scholar from the University of Rio de Janeiro in Brazil. “We are opening a new window in astronomy.”

Cosmic rays – which are mostly protons – fly through the universe at nearly the speed of light. The most powerful cosmic rays contain more than one hundred million times more energy than the particles produced in the world’s most powerful particle accelerator. Fortunately, Earth’s atmosphere provides protection against their potentially harmful effects on humans.

Since 1938, when French physicist Pierre Auger discovered cosmic rays, their origin has been a mystery. Now the Auger collaboration has tracked them to Active Galactic Nuclei (AGN). Likely powered by supermassive black holes, AGN shine far brighter than regular galaxies as a byproduct of their gravitationally destructive force.

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“After decades of negative results from past experiments, Auger physicists finally find that cosmic rays do not come equally from every direction in space,” Olinto said.

Scientists have long considered AGN to be possible sources of high-energy cosmic rays. And while they have now found a strong correlation between the two, exactly what accelerates cosmic rays to such extreme energies remains unknown.

“They are really spectacular objects,” said Maximo Ave, a Research Associate at the Kavli Institute for Cosmological Physics at Chicago. “They most likely can be produced only in a place where some very extreme physical process is happening.” One such extreme process might be gamma-ray bursts, the possible result of colliding stars.

The Chicago group has focused much of its recent attention on the statistical analysis of Auger data. The numbers are relatively meager, considering that only one high-energy cosmic ray will strike a given square kilometer (less than half a square mile) of Earth approximately once each century.

The Auger collaboration has increased the odds of detection by building an array of detectors that cover 1,200 square miles of the Pampa Amarilla, a vast plain in western Argentina. When complete, the array will consist of **1,600 detectors** spaced at one-mile intervals. Ninety percent of the array is now operational.



Each detector consists of a plastic water tank measuring 5 feet tall and 12 feet in diameter. When a cosmic ray collides with an air molecule in Earth’s atmosphere, it triggers a shower that multiplies into billions of secondary particles before reaching the ground. When these particles cross from air into water, the speed changes, producing a shock. The shock creates a flash of light that is detected in the dark chamber of the water tank.

“With this we can estimate the energy, and we can estimate the direction it comes from, which are the two parameters that are important for this analysis,” de Mello Neto said.

Complementing the ground detectors are 24 telescopes that monitor the sky for signs of cosmic rays on clear, moonless nights. The telescopes detect the time emission of fluorescent light that results from the interaction of cosmic rays with nitrogen molecules in the atmosphere.

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“We see the event in two different ways, and this is a very powerful way of cross-checking the results,” said Vasiliki Pavlidou, Research Associate at the Kavli Institute for Cosmological Physics.

The *Science* article documents the 27 highest-energy cosmic rays detected by the Auger Observatory from January 2004 to August 2007. When correlated with a catalogue of objects in the sky, their direction of travel matched AGN locations in galaxies no more than 180 million light years distant from Earth and its galaxy, the Milky Way. “These distances correspond to the nearby extragalactic space, the suburbs of the Milky Way, in cosmological terms,” Olinto said.

Auger scientists first suspected that they had found an important result a year ago. But to ensure the accuracy of the results, the Auger team set up a strict procedure for analyzing new data as it came in without biasing the outcome.

“Many times, when you look for some statistical significance, you find it because you are looking for it,” said Lorenzo Cazon, Associate Fellow at Chicago’s Kavli Institute for Cosmological Physics. But now the Auger team has statistically validated their finding.

Said Cronin: “We have taken a big step forward in solving the mystery of the nature and origin of the highest-energy cosmic rays.”

Re-printed from the Mount Wilson Observatory Association newsletter *Overview*, November 2007, with thanks.

Didja get it?

They’re not viewing the cosmos with light.

They’re viewing it in protons.

That’s completely different.



December 2007

SUN	MON	TUE	WED	THU	FRI	SAT
						1
2	3	4	5	6	7	8 Holiday Party Farragut Gondolier 7 pm
9 New Moon	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25 	26	27	28	29
30	31 				SCRAPS depends Upon its friends	Help! Help!