# SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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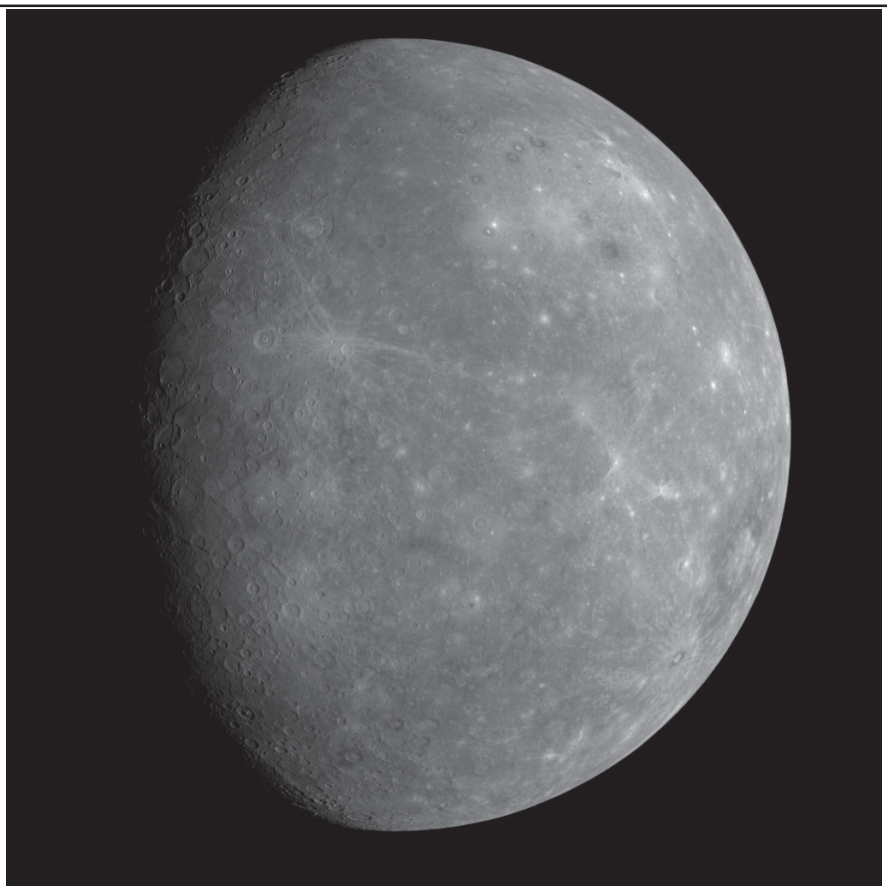

On January 14, 2008, MESSENGER became the first spacecraft to visit Mercury since Mariner 10 more than 30 years ago. This image shows the hemisphere of Mercury that was not previously imaged by Mariner 10; the Caloris impact basin is visible at upper right. MESSENGER will complete two more flybys of Mercury, in October 2008 and September 2009, before entering orbit around the planet in 2011. Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

## OCA CLUB MEETING

The free and open club meeting will be held Friday, February 8th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. The featured speaker this month is Scott Kardel of Palomar Observatory, discussing the 60th anniversary of the 200-inch Hale telescope.

## STAR PARTIES

The Black Star Canyon site will be open on February 9th. The Anza site will be open on February 2nd. Members are encouraged to check the website calendar, for the latest updates on star parties and other events.

Please check the website calendar for the outreach events this month! Volunteers are always welcome!

*You are also reminded to check the web site frequently for updates to the calendar of events and other club news.*

## COMING UP

The next session of the Beginners Class will be held on Friday, February 1st (our annual 'Basics of Astrophotography class') at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.
GOTO SIG: TBA (contact coordinator for details)
Astro-Imagers SIG: Feb. 19th, Mar. 18th
EOA SIG: Feb. 27th, Mar. 26th
Astrophysics SIG: Feb. 15th, Mar. 21st
Dark Sky Group: TBA (contact coordinator for details)

# President's Message

By Barbara Toy

**The 2008 OCA Board**

This is the time of year we welcome the new OCA Board and say a sad farewell to those past members who, unfortunately, will not be returning for another year on the Board. Every year, it seems there are at least one or two people who cannot continue on, and we are always sorry to see them go, even though one of our strengths as a club is in having regular additions of new members to the Board.

In 2008, the officers will remain the same as they were in 2007: I will continue as president, Craig Bobchin as vice president, Bob Buchheim as secretary and Charlie Oostdyk as treasurer. The general trustees will be the same except for the addition of Sheryl Benedict and the loss of Bill Hepner. In addition to Sheryl, the 2008 trustees will be: Tom Kucharski, Alan Smallbone, Steve Condrey, Gary Schones, Steve Short and Shelia Cassidy.

I've known Bill Hepner for about seven years now, and have had the pleasure of working with him at many outreaches, particularly in my first few years as a member of the club. When I started going out to Anza and set up in the Football Field, he was one of the regulars who set up there, as well. As a Board member for the last three years, he has brought a valuable perspective as a club member and active astronomer who has a certain amount of physical disability to deal with, which gives him a good understanding of the needs of other members and visitors with disabilities. One of his particular interests has been improving the access from the Football Field to Anza house, which was has been put on "hold" until we are certain of the changes we will be making to the Football Field as part of the overall Anza site development. A ramp or stairs from the Football Field to Anza House is definitely needed and I hope we will be able to address that before too much longer.

We will miss Bill's perspective in the Board's discussions in these and other areas, and I hope he will continue to work on the issues he is concerned about and that, in particular, he will continue to keep the Board aware of what could be done to make our facilities more accessible. He has continued to be active in our outreach program, and I look forward to seeing him at outreach and other events in the future.

The other two candidates who will not be on the 2008 Board are Leonard Vorhis and Sam Saeed, who were both running for a Board position for the first time. They both would have been excellent additions, and I hope that they will consider running again next year. There have been a number of good Board members in the past who were not elected the first time they ran, but persevered until they were elected, and that could happen with any of these candidates. Both Len and Sam have expressed interest in participating in Board meetings this year as visitors, and I'm looking forward to their contributions.

Sheryl Benedict has been a frequent visitor to the Board over the last year, and was interested in running a year ago, but couldn't because she hadn't yet been a member of the club for a year. I'm looking forward to having her as a Board member this year and to working with her and the other Board members in 2008.

**Hollywood Comes to Anza**

We had an unusual event out at Anza on December 29, as an interesting close to 2007. A film crew from the History Channel came out to film people setting up and interview them about their favorite nebulas and about photographing nebulas, which was the subject of the program they were working on (the powers that be at the studio insisted this had to be on "nebulas" rather than "nebulae," much to the distress of the producer), with particular reference to the Orion Nebula. This was for the 14th episode of the series, "The Universe," which is currently running on the History Channel. It is supposed to air about ten weeks after the filming session, which would be in late February or early March, so, if you get the History Channel, keep an eye out for this particular episode.

Even though Darryl Rehr, the producer and writer for the episode, had extensive telephone conversations and e-mails exchanges to set things up for the shoot with Dave Kodama, Alan Smallbone and me, and possibly others, it turned out to be quite a bit different than what we expected. Besides filming people setting up their telescopes and cameras on the pads, we understood that they were going to be doing some shooting in Dave's and Alan's observatories, and maybe some of the other member observatories, depending in part on who could be out there. Darryl also expressed interest in filming the Kuhn in action, so I was looking forward to having Pat Knoll demonstrate the imaging set-up he has been working on for the Kuhn. They did do some shooting of people setting up on the pads, but it seemed that everything else we'd discussed got changed.

The first bit of surprise for us was that the film crew arrived a lot later than they planned. We were starting to worry, thinking that they had gotten lost, but it turned out that they had stopped along the way to shoot some of the scenery. By the time we found this out, a number of members had shown up to help out, so there was a certain amount milling around while people

decided whether to set up, where to set up, and wondered exactly what the crew was going to do, when they were going to get there and just how cold it was going to get (it was a cold day, and got a lot colder as the afternoon wore on).

While we were setting things up for this event, Darryl had talked to Alan about how and why astroimagers use filters, which came up in one of the interviews he did for another part of the program, and he wanted Alan to repeat the information on film, showing sample filters and how they were used in a camera. This was to be done at Alan's observatory, but, when Darryl arrived, he decided (without any discussion) that it would be better to do the filter demonstration in the club observatory instead, and then he decided that he would also take some sequences of Alan moving the telescope and doing some other activities that might be associated with taking images – if you ignore the minor facts that the equipment wasn't fully set up the way it would be in a real imaging session on the Kuhn, the telescope wasn't moved through its control computers, the telescope's mirrors were covered, and the roof was closed during the entire proceeding.

*Alan Smallbone (center) demonstrates imaging program for History Channel camera crew in the OCA observatory, 12/29/07, for "The Universe" episode on nebulas. The producer/writer for the episode, Darryl Rehr, is on the right, and the camera man is on the left, next to the Kuhn telescope. Picture taken by Kevin Nelson.*

The upshot of all this is that, if that footage makes it into the final program, please keep in mind that this was a dramatization, not a demonstration of an actual imaging session, and the different sub-sequences were shot over and over and over and over and over and over again with the camera in different positions and Darryl asking the same questions in slightly different ways until he got enough variations on one sequence and moved on to the next. Watching the camera crew and Darryl in action during that session gave me a very different perspective on how documentaries are put together – I suspect now that most are filmed in ways similar to what we observed, with the director and camera crew playing a very active role in setting up what you see and dramatizing the subject matter instead of being an unobtrusive recorder of what is taking place. This may make the final product more visually interesting, but accuracy seems to suffer in the process.

Although I didn't see that part of the filming myself, I was told that they interviewed Bruce Waddington, Sam Saeed., Craig Bobchin and Sheryl Benedict on camera, and maybe others, showing how they set up and answering questions about nebulas and what they liked about viewing and photographing them, and so on. They also took a nice time-lapse sequence of the sunset as seen over the dome of Star Cruiser, which is next to the club observatory, taken from the slope across the road from the two observatories. It'll be interesting to see how much of all of this makes it into the final program, and how they fit all these bits and pieces into the finished episode – and how much information they actually provide about nebulas in the program!

**January at Anza**

For the second month in a row, the Anza Star Party fell victim to the weather in January. It rained a lot on the day of the star party, so I don't think anyone actually went out to the site that day. The next Saturday, however, the weather was much better – and quite a few people showed up to enjoy it. It was cloudy in the afternoon, but cleared up by dark, and, even though there was some moonlight, the sky was nice and steady during the first few hours of the night. The wind kicked up around 10:00, so it got a lot colder and the seeing deteriorated, but it was still a nice evening under the stars.

Besides about 20 members on site, we had about 30 students from Biola University, who were there for a field trip until around 11:00. They spent most of their time in the club observatory, viewing through the Kuhn and the four-inch refractor attached to it, as well binoculars for such things as Comet Holmes (still very visible in Perseus – at this point, it was an enormous fuzzy ball that was too large to see well in the telescope but was a great binocular object). Near the end of the evening, they were invited over to the observatory across the street, where John Kerns and Don Lynn showed them a number of objects in the 24-inch Newtonian and a refractor, and Dave Radosevich showed them the images he was capturing (I understand that their warming room, which has a very efficient heater, was also very popular on that chilly evening!). What struck all of us about these students was how enthusiastic they all were about what we were showing them, as well as how nice and exceptionally polite they all were, to each other and to us. I always enjoy the classes that visit Anza at different times, and they all have students who are enthusiastic about being there, but it is unusual to have every student in the class genuinely thrilled about seeing things

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# AstroSpace Update

February 2008
Gathered by Don Lynn from NASA and other sources

**Galaxy evolution** – A study of more than 5000 galaxies imaged by the Hubble Space Telescope (HST) found that galaxies were much more likely to be involved in mergers during the first half of the life of the Universe than they were during the second half, as expected by the currently held theories of galaxy formation. The study found that the rate of star formation rises by a factor of 2 or 3 after galaxies merge, not nearly as much as was commonly believed. The few galaxies observed to have extreme bursts of star formation after mergers are not the norm. The study also used Spitzer infrared images to determine star formation rates, even those obscured by dust in visible light. Only 20% of star formation that occurred in the second half came from merged or disturbed galaxies. This agrees well with computer simulations of recent galaxy evolution. The study found that the star formation rate of normal galaxies continues to decline with time. 20% of present-day spiral galaxies were found to be bulge-less (their disk has no bulge in the center), much more than current theories of galaxy evolution predict.

**Early galaxies** – A team of astronomers has found galaxies in HST images that fit what galaxy formation theory predicts for the predecessors of today's large spiral galaxies, such as our Milky Way. The galaxies found are so distant that their light took 12 billion years to reach us. They are 1/10 to 1/20 the mass of the Milky Way, have 1/40 the stars, and have active star-forming regions. They have a variety of shapes: round, oblong, and somewhat linear. The galaxies are known as Lyman alpha emitters because of the type of spectral lines that they exhibit (Lyman alpha is a particular line emitted by hydrogen). Observations by the Blanco telescope in Chile were used to locate Lyman alpha emitting galaxies, observations by the Magellan Telescope in Chile determined their redshifts and therefore distances, and Spitzer infrared images allowed determination of their numbers of stars. HST observations were the only ones with sufficient resolution to determine size and shape.

**More early galaxies** – Another team studying early galaxies made HST observations regarding the theory that massive galaxies formed by smaller galaxies merging. They found galaxies more massive than our Milky Way, that existed when the Universe was 1/5 its age now, and analyzed their shapes. They expected such galaxies to be elliptical (shaped as an ellipsoid), as are essentially all of the very massive galaxies today, but many of them were flattened disk galaxies (4 of the 7 largest in this study). Theory and computer simulations show that a merger with any substantial galaxy destroys the shape of a disk galaxy, turning it elliptical. So the newly found early galaxies, at least the disk-shaped ones, probably formed from the collapse of very large gas clouds, not from the merging of smaller galaxies. The ages of the stars in the newly found galaxies were determined, which showed the galaxies had remained in the state observed for over a billion years. The team believes that all the galaxies found were predecessors to the type of huge elliptical galaxies seen today, but the disk-shaped ones were seen before their first major mergers.

**Early star formation** – A galaxy has been observed forming stars 1000 times faster than our Milky Way, yielding 4000 Suns per year. The galaxy is so distant that its light took 11 billion years to reach us, and the space between us and it has expanded so much that its infrared light has been stretched into submillimeter radio waves. The observations were made with the Submillimeter Array telescope in Hawaii. The fact that the galaxy is large does not fit well with current theory of galaxy formation, which holds that small galaxies should have been colliding and forming large numbers of stars, which later merged into the large galaxies. Additionally the galaxy had more dust than theoretically expected this early. If more galaxies like this are found, it will require reforming the theory.

**Wrong-way galaxy** – It has generally been agreed that spiral galaxies rotate in the direction that makes their arms trail the rotation. A galaxy has been discovered with arms spiraling both directions, proving that is not always true. The galaxy is NGC 4622, located about 200 million light-years away. Recent computer analysis of images shows that in addition to the obvious pair of clockwise arms, there is also a faint inner pair of counter-clockwise arms, an outer single clockwise arm and an inner single counter-clockwise arm. No matter which way the galaxy rotates, 3 of its 6 arms lead the rotation instead of trailing. The team that did this analysis believes that they have determined the direction of rotation, and it is the long-known bright clockwise arms that lie in the "wrong" direction. Further work will be done to find out how this occurred. One suggestion is that a companion galaxy disturbed this one into the unusual configuration.

**Spitzer** (infrared space telescope) – One key discovery made in recent years about the supermassive black holes found at the centers of most galaxies is that the size of the black hole is correlated with the size of central bulge of the galaxy, not with the size of the entire galaxy. The black hole is always about 0.2% the mass of the bulge. Galaxies with no bulge have no black holes. New Spitzer observations of 32 flat galaxies without any central bulge shows that rule doesn't always hold, since 7 of them had substantial black holes in their centers. Bulgeless galaxies tend to be dusty, so previous observations had not found the black holes because they were obscured by dust. Infrared penetrates through most dust.

Spitzer observations of the **supernova** remnant Cassiopeia A have found a significant amount of **dust**, 10,000 times the mass of the Earth. It had been hypothesized that supernovas early in the history of the Universe created the dust that was necessary for planet formation in later generations of stars, and necessary to cool gas clouds enough to maintain star formation rates. But this is the first observational evidence that supernovas produce the required dust. In these observations, the dust was found the same places as the gas, which was known to be produced by the supernova. This ruled out the possibility that any source other than the supernova put the dust there. There was a little less dust than predicted, but if a little of the dust becomes too cold to detect in infrared, then it fully explains where the dust came from in the early Universe.

**Jet collision** – A galaxy has been observed colliding with the jet from the supermassive black hole at the center of a nearby galaxy. This is the first time this situation has been seen. The 2 galaxies are in orbit around each other quite closely, only 20,000 light-years apart. The radiation that such jets produce would damage the atmosphere of any planets in its path. The collision may induce considerable star formation along with accompanying planet formation. Determining what is going on with these galaxies required observations from HST, Chandra, Spitzer (all in space), the Very Large Array radiotelescope in New Mexico, and the MERLIN interferometer radiotelescopes in the United Kingdom.

**Double Einstein ring** – HST has imaged the first known double Einstein ring. A single Einstein ring is caused by a distant object being precisely behind a massive object (both objects are often galaxies) so that the gravity of the foreground object bends light (by Einstein's General Relativity) from the background object equally on all sides, resulting in a ring of light. The double ring is formed similarly, but there are 2 background objects, one farther than the other. The 3 galaxies are at such distances that light from them took 3, 6, and 11 billion years to reach us. HST was aimed at the object because a hint of rings showed up in the Sloan Digital Sky Survey. The distribution of dark matter necessary to make the observed double ring has been calculated, and it matches the distribution found about spiral galaxies, so it is likely a spiral. The mass of the middle galaxy has been calculated from the geometry of the rings, and it is 1 billion solar masses, putting it in the dwarf galaxy category. This is the first measurement of the mass of a dwarf galaxy at great distances. Scientists are hoping to find more double rings, since combining measurements of many of them would allow calculation of the curvature of space, the matter density of the Universe (including dark matter), and some properties of dark energy.

**Gas cloud collision** – A long-known cloud of gas known as Smith's Cloud has been observed by the Byrd Green Bank radiotelescope and it was found that it is on a collision course with the Milky Way. It will strike our galaxy's disk about 90° ahead of where the solar system is, and slightly farther from the center, in 20 to 40 million years. The leading edge of the cloud is already interacting with gas in the disk. No stars have been found in the cloud, though it contains enough hydrogen to make a million stars with the Sun's mass. It is expected to trigger much star formation when it hits. It has been theorized that a ring of bright stars known as Gould's Belt was created by a similar collision. The cloud is 11,000 light-years long, and covers 15 degrees of our sky. It would appear spectacular if we could see radio light.

**Milky Way halos** – A team of astronomers while studying 20,000 stars in the halo around our Milky Way galaxy has found that there are actually 2 halos, an inner one and an outer one. The inner halo stars contain 3 times more heavy elements, and orbit the galaxy more slowly and the opposite direction. The inner halo rotates the same direction as the disk of the galaxy, at about 50,000 mph, while the outer one goes 100,000 mph oppositely. The halos probably formed in different ways at different times.

**Neutron stars too massive** – Astronomers working with the Arecibo radiotelescope have measured the masses of neutron stars. Their result is that they can have masses of 1.9 to 2.7 times that of the Sun, in substantial disagreement with theory, which says they should be 1.6 to 2.5 times the Sun's mass. Any less massive should fail to compress electrons into neighboring protons to form neutrons, and any more massive should collapse into a black hole. This is observation is so extraordinary that it will have to be confirmed by others. One explanation proposed is that the compressibility of a sea of neutrons is poorly understood, and that less compressibility would raise the neutron star mass limits to those observed.

**Flare located** – Astronomers used a technique called Doppler imaging on the star BO Microscopii, a fast rotating star, to map where spots are on the star. The technique calculates where objects that are too small to resolve must be in order to produce the Doppler changes in the spectrum observed over time. Several flares occurred during the observations, and astronomers were able to map where one of them occurred, and surprisingly it was not where any of the star spots were. Flares on the Sun typically occur at sunspots. This is the first time a flare has been located on any star other than the Sun. The star is about 90% the mass of the Sun, is located 150 light-years away, is only 30 million years old, and rotates in just 9 hours.

**Distant gamma-ray burst** – Detection by the Swift satellite, followed by images with the Gemini 8-meter telescope, has found the most distant short gamma-ray burst yet. Short bursts have different properties and cause than long bursts. Short ones are likely caused by colliding neutron stars, though other theories exist. The burst was so distant that it took light 7.4 billion years to reach us, which is almost twice as far as the previous short burst record. The total energy was about 100 times that of a typical short burst, which allowed it to be seen so far. It is not clear whether this burst had a different cause than typical short bursts, or whether the energy of a short burst can vary widely.

**Strange gamma-ray burst** – A long gamma-ray burst has been seen at a location where no galaxy can be found, nor even traces of gas, which should accompany galaxies. Such bursts are believed to be caused by the supernova explosions of very massive stars, and such stars should be located within galaxies. The few stars found outside of galaxies are never massive stars because massive stars do not live long enough to travel substantially outside a galaxy. The burst was one of the brightest bursts of the year, but there was less gas and dust around it than any previous burst. One possibility is that the burst occurred in a long tidal tail stretching from a fairly distant galaxy (there is a galaxy 88,000 light-years away from the burst). Such tails are created when galaxies interact, and the tail could be too dim to show up in the images taken. Further work will be done to test this hypothesis.

**Integral** (gamma-ray satellite) has for the first time measured the shape of the cloud of antimatter known to exist at the center of our Milky Way galaxy, and it is lopsided, with twice as much mass on one side of the galactic center as on the other. This probably rules out the theory that dark matter is decaying into antimatter there, since this should produce a symmetric shape. There is also a population of low-mass X-ray emitting binary stars off-center the same direction. It is possible that matter falling toward the X-ray

*(continued on page 8)*

# The Apple Stopped Here

By William K. Vogeler

Second of a three-part series

Newton's Apple stopped falling because it couldn't get past the Earth.

With inertia from the Big Bang, all matter is traveling the same outward course in the expanding universe. Everything from galaxies to stars to planets — it is all moving. Even Newton and his Apple were set in motion by the Big Bang.

It is like a person traveling in a spacecraft. The rocket moves the spacecraft, the passenger and everything else in the vehicle. But matter slows or stops when it meets resistance from other matter. In the cosmos, stars strain against space and curve it. On Earth, apples crash into the ground.

The more massive and dense matter becomes, the more resistance it encounters in this expansion. And the resistance to that motion is the apparent weight.

This relationship is like a parachute and its cargo suspended in air. The parachute apparently carries the weight, but actually air molecules trapped against the fabric hold it aloft.

In a similar way, the Big Bang is pushing matter against the fabric of space and creating the apparent effect of gravity. That force is really matter moving against other matter.

This idea is consistent with aspects of Newtonian gravity and Einstein's general theory of relativity. Newton perceived that bodies of matter attract each other, and Einstein concluded that matter does so because it curves space. The Big Bang further explains these phenomena.

As seen at the edges of the universe, for example, the Big Bang launched galaxies that are accelerating away. These galaxies are stretching the fabric of space so thin it provides less resistance. Applying Einstein's theory, this means that the curvature of space — or gravity — is diminishing there.

In the realm of atoms, the Big Bang ejected matter that evolved into elements with various resistances — or weights. Lead, for example, has more electons and protons than helium and so it meets more resistance on its course through space. In Newton's terms, the Earth is heavier still because of its massive combination of elements. But it is actually just meeting more resistance. So if the Earth were not in the way, apples would keep falling away from the Big Bang like everything else. In that sense, the Apple stopped here. ■

**EDITOR'S NOTE:** Following this article are two letters regarding the first article in this series. The scientific method is rarely as cut and dried as many basic textbooks make it appear. The process is by its very nature full of debate, sometimes polite (as we see here) and sometimes somewhat less than polite. It is at its heart a very human process, and thus subject to the same strengths and weaknesses of human behavior as we see in every other aspect of life. In days past scientific disputes were sometimes settled at swordpoint (the fate of Tycho Brahe's nose was but one of many such incidents in Renaissance and Early Modern Europe) and unchecked fautly scientific assumptions have led to the downfall of nations (by rejecting Mendelian genetics as a tool in agricultural planning for purely ideological reasons, Trofim Lysenko almost single-handedly starved the USSR in the 1930's). Fortunately the scientific community has since learned better, more productive ways to settle its disputes.

The *Sirius Astronomer* is an amateur publication. We at OCA strive to ensure the accuracy of all statements made herein, scientific or otherwise. The ensuing debate is part of that process, just as it would be in a professional scientific journal. However, as an amateur publication we are not subject to the same stringent peer review process that such a journal would utilize. Thorough research involves checking multiple sources and when possible the empirical data in order to verify one's assertions.

If you are a student using this publication as part of your research, you are strongly advised to research primary source material. This is true of any academic pursuit, not just the sciences, but moreso within the sciences because of the stringent and taxing process by which researchers are able to publish. It is a higher standard of quality designed to ensure that the scientific method can remain the bedrock of modern civilization without being compromised by human failings.

If you're simply an interested amateur, we hope that you will use these articles as a foundation for further reading on the topic at hand. Astronomy is one of the few scientific fields in which the amateur can and regularly does make a meaningful contribution to the knowledge of the professionals. Therefore, nothing in the title 'amateur' should ever be construed as 'second-rate'. By conducting proper research, both at the eyepiece and in the library, we can ensure that our hobby enjoys the respect of professional and lay-person alike.

# LETTER TO THE EDITOR

To the Editor:

In the interest of keeping the *Sirius Astronomer* scientifically accurate, I have to comment on some of the statements made in William Vogeler's article in the January 2008 issue (page 5).

Most cosmologists hold that the fabric of space is what is expanding (commonly called the expanding universe), carrying all contained matter along with it. This is in contradiction to Mr. Vogeler's statement that "evolving matter pushed out against the Fabric of Space."

It has not been established whether the universe has an edge, so one cannot state with any certainty that "The universe was curved on the outside edges" as Mr. Vogeler states. Cosmologists have presented two possible ways that the universe could avoid having any edge: curvature in higher dimensions (analogous to the Earth having no edge), or that the universe is infinite. Neither has been established or disproved.

The theory that the fabric of space presents resistance was thoroughly disproved by the Michelson-Morley experiment in 1887, at least insofar as resistance to light. If one wishes to claim such a resistance affects matter but not light, then one has to disprove General Relativity, which claims gravity affects both light and matter.

Also a resistance theory cannot possibly explain the recently discovered acceleration of the expansion of the universe. The more distant supernovas seen (and other observations) show that the outer parts of the visible universe are expanding more slowly than nearby ones (or more precisely, were expanding more slowly at the time the light left them), not the opposite that the resistance theory would produce.

The acceleration of the expansion that scientists have observed in recent years could not possibly be explained by any effect ccurring at the edge of the visible universe, because we have evidence that the universe extends much farther than the visible universe. That is, matter exists many times farther away than the most distant galaxies and quasars that we now can see, or ever can see (because the light has not had time to reach us). For example, we know that the matter that emitted the cosmic microwave background radiation now lies many times farther away than any observable galaxy, and like matter nearer to us, it should have formed stars and galaxies very much like the ones we see nearer.

Observations of distant galaxies and quasars have shown that gravity is not diminished near the edges of the visible universe, as claimed by Mr. Vogeler. If it diminished, it would change spectra in ways that are not observed.

Donald S. Lynn
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# THE AUTHOR RESPONDS

Dear Editor:
Thank you for publishing my first article in the series I submitted to *Sirius Astronomer*. I hope that you will publish the other two articles because they more fully explain my theory on gravity.

I also am grateful for the letter of Donald Lynn, who gave me some help with my theory before publication and has called it "resistance theory." In our pre-publication correspondence, he generally agreed with my view of the expansion of the universe but disagreed with my conclusion that gravity was an effect caused by the Big Bang.

I am convinced, however, that my conclusion is sound. I would like to address Mr. Lynn's principal objections first, then offer a "logic experiment" for my theory.

1. The Michelson Morley experiment did not, as Mr. Lynn states in his letter, disprove "the theory that the fabric of space presents resistance." That experiment disproved the existence of a "luminiferous aether," a theoretical medium through which light traveled.

2. The "fabric of space," as used in my article, is equated with Albert Einstein's reference to "space-time" in his theory on general relativity. Einstein's work did not discard the notion of resistance, however. He said in 1920:

*"...More careful reflection teaches us, however, that the special theory of relativity does not compel us to deny ether. We may*

*(continued on page 9)*

*(continued from page 5)*
emitting stars is creating pairs of electrons and anti-electrons, a known reaction under extreme conditions. More work will have to be done to prove this theory.

**Black holes** – New computer simulations of merging black holes shows that intermediate sized black holes will receive a strong kick from merging, sending them flying off at speeds as high as 2500 miles per second. This is enough to throw them out of their birthplaces, particularly if they are globular clusters with less mass than galaxies. If intermediate sized black holes are common (and this is not known), then there should be lots of them wandering somewhat randomly near large galaxies, due to past mergers. Unfortunately, little is known about intermediate black holes, those larger than ones formed by collapsing stars, but smaller than the huge ones formed at the centers of galaxies. Only 2 tentative discoveries have been made of intermediate black holes.

**Quadruple star** – A star that was thought to be single was found by its changing spectrum to be composed of 2 tightly orbiting pairs. One pair orbits at 83 miles per second, 1/16 AU apart (an AU is the Earth's distance from the Sun), completing a turn every 5 days. The other pair is 1/4 AU apart, orbiting merely 32 mps, once every 55 days. The pairs are separated nearly 6 AU and take about 9 years to circle each other. Quadruple stars orbiting this close are fairly rare. Stellar formation theory tells us that 4 stars will not form this close to each other. The best explanation is that they formed somewhat farther apart, but were dragged into closer orbits by friction with a cloud of gas that enveloped all 4 stars. This would imply all 4 stars formed out of a single gas cloud. The star is known as BD -22°5866 (because that is how it was numbered in the Bonner catalog), and lies 166 light-years away in Aquarius.

**Triple galaxy** – Astronomers using the Very Large Telescope in Chile have discovered 3 galaxies merging. The collision has been nicknamed the bird, since the galaxies appear like the body, wings and head of a bird in flight. It was thought that 2 galaxies were merging but the head of the bird was found by new observations to have its own motion, and therefore is a third galaxy. The head galaxy is moving at 250 miles per second, quite high for merging galaxies, and is apparently shooting through the other 2, which apparently had already begun interacting a couple of hundred million years ago. The smallest of the 3 galaxies is the brightest in infrared. The bird is classified as luminous infrared galaxies, since it produces about a trillion times as much infrared as the Sun does.

**Packed planets** – A team of astronomers developed a theory that planets will form around suitable stars as closely packed as possible without gravity destabilizing their orbits. The theory has been successful in predicting 2 planets so far in systems that had too large a gap between known planets. The predicted planets were found in the systems orbiting the stars HD 74156 and 55 Cancri. This is the first successful prediction of the location of a planet since it was done for Neptune just prior to its discovery about 160 years ago. Further planet discoveries will eventually tell whether the packed planet theory generally holds true.

**Stardust** – Analysis of some of the samples of Comet Wild 2 brought to Earth by the Stardust mission shows that about 10% of the material formed in a hot region close to the Sun, not in the cold distant Kuiper Belt where such comets form. This was determined from helium and neon isotopes that matched those in chondrite meteorites, which are known to have formed close to the Sun. The comet could not have picked up this much material on trips through the inner part of the solar system, since it spent all its life farther away until 1974 when Jupiter deflected it. The conclusion is that some material that formed near the Sun got deflected out to the Kuiper Belt early in the history of the solar system, and contributed to the comets forming there.

**Cassini** (Saturn mission) has observed Saturn's north pole and found that it has a hot spot remarkably like the one at its south pole. This was surprising, since the southern hot spot had been attributed to its being in sunlight for 12 Earth years. Of course the north pole has been in darkness all that time, so that explanation is out. The new theory is that permanent circulation patterns push atmosphere into both poles, causing it to compress and warm up, after which it sinks. Temperatures, circulation patterns, clouds, and chemistry of the poles were found to be similar. The only major difference found is that the northern pole has a hexagon of bright clouds about it, while the southern does not. This observation found that the hexagon extends upward to the top of the troposphere, farther than thought.

**Asteroid threat** – An asteroid discovered in November, designated 2007 WD5, was calculated to have a 1 in 75 chance of colliding with Mars on January 30, 2008. With better measurements made in early January, the chances were raised considerably, then finally lowered to 1 in 10,000 as I write this. The asteroid is only about 160 feet across, but its impact on Mars would make a crater perhaps a half mile wide. It would have been interesting to observe, as long as it's not our planet that gets hit.

**More asteroid threat** – A more accurate simulation of the Tunguska, Siberia, explosion of 1908 has come up with some surprises. The damage caused by the explosion, as opposed to topographic and ecologic factors, was less than previously believed. The total energy of the explosion was less by a factor of 3 or 4, and the asteroid that caused the explosion was much smaller than believed. However, there are more asteroids of this smaller size, so the total danger from asteroid impacts may be about the same as previously thought. But the finding says that we should be searching for smaller asteroids to protect ourselves from impact danger.

**Early Mars** – It is believed that carbon dioxide in the early Earth's atmosphere acted as a greenhouse gas and warmed it enough to keep it out of a permanent ice age. Although the Earth continuously loses carbon dioxide to form limestone in underwater sediments, it regains carbon dioxide from tectonic and volcanic activity recycling the limestone. Thus carbon dioxide remained a key player in Earth's atmosphere until plants consumed it, producing oxygen. This appears never to have happened on Mars, since it has almost no limestone. Yet there is evidence that the planet remained warm enough for liquid water for some time early in its history.

*(continued on page 11)*

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through the eyepiece, especially on a cold night.

Our Anza site is available to members 24 hours a day, seven days a week – and I'm happy to report that more people seem to be taking advantage of this all the time, so there are few times now when we don't have someone at the site at least once a week. We have a number of members who are able to use it during the week, and even a weekend close to the full moon can bring out a surprising number of members – on January 19, which was almost a full-moon Saturday, JV Howell and Gene Kent were there to work on the club's remote telescope, Bob Peck, Bruce Waddington and Alan Smallbone were there, each working on his own observatory, Dave and Jean Kodama were there to do some imaging, and I was in the club observatory working on this President's Message. I'm glad this great club asset is so well used, and the fact that members are showing up there at unexpected times also helps with site security. If you can't make it out there for a star party but can at other times – please do! Chances are that you'll find at least one or two other members out there, too, if the weather's good, especially on a weekend.

**Wish Lists**

A lot of our club facilities operate with equipment donated by generous club members – Joe Busch, for example, donated the computer we currently use to control the Kuhn telescope as well as the forkarm mount for the 12-inch LX200 in the club observatory, and a 5-inch refractor that we are hoping to use as the guide scope for the Kuhn, John Hoot donated the 12-inch LX200 that is currently in use as our remote-controlled telescope and the CCD camera that is also in use with the finderscope on that telescope, as well as other equipment over the years, Vance Tyree and Jerry Mulchin donated a lot of the components that keep our Anza site network running, and various people have donated furniture, vacuum cleaners, TVs and other things to make Anza House more comfortable and to help maintain it. We are very grateful for all those times people saw that the club had a need for certain items and provided them – we wouldn't be able to do as much as a club without that kind of help!

Sometimes our need for certain items isn't obvious, and I've been thinking we should periodically circulate a club wish list to give all of you a better idea of what we need in different areas. I won't put up a comprehensive list here, but here are a few things we could put to good use:

> Our Telescope Loaner Program needs accessories such as 1 ¼ inch eyepieces, Barlows, 1 ¼ inch diagonals, and finders for smaller telescopes – please contact Mike Myers, the Loaner Program Coordinator, at loanerscopes@twow.com, 714/240-8458;
>
> Karen Schnabel, our Librarian (karen@schnabel.net, 949/887-9517), can use any astronomy-related books you might want to get rid of, either for the collection or to sell for funds to help support the library;
>
> The OCA remote controlled telescope project could use a large flat-screen TV that can connect to a computer so we can show images as they are captured to groups in Anza House, and it could also use an electrically-controlled flip mirror so we can switch from a deep sky camera to a planetary camera remotely. We also need cameras, particularly a main camera, as we are currently using JV Howell's personal Canon Rebel, which is only available when he's running the telescope. Please contact Del Christiansen, the EOA Liaison, DelmarChris@earthlink.net, 714/895-2215, or me.

If you can donate any of these items, you can be assured that you will be helping us out a lot and that they will be very much appreciated!

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*assume the existence of an ether... Recapitulating, we may say that according to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an ether... According to the general theory of relativity space without ether is unthinkable . . ."*

As I explain in my subsequent articles, resistance theory does not contradict general relativity. It simply applies it in the context of an expanding universe.

The best evidence of this truth is an experiment. In honor of Sir Isaac Newton, I'll call it the apple experiment: Hold an apple above your head and drop it (and try not to hit your head.) The motion that you observe is the Big Bang in action. It is unthinkable, in my opinion, to conclude that the Big Bang is moving all matter in the universe and not the apple.

Sincerely,
William K. Vogeler

Sunset at Anza, December 29, 2007 (credit: Sandy Condrey)

**The Journey to Palomar is a documentary film on George Ellery Hale. It follows his epic struggle to build four of the greatest telescopes of the 20th century, located at the Yerkes, Mt. Wilson and Palomar observatories. The film will be shown on PBS late this year, but a special advance-screening will be held at the University Club of Pasadena on Saturday February 23, 2008. The screening of the film doubles as a fund-raiser for the filmmakers but some valuable extras are included such as dinner and a preview of the Giant Magellan Telescope ($150 level). The $250 level includes the same plus a tour of the Hale Solar Lab, a behind-the-scenes tour of the Mt. Wilson 100-inch and viewing through the Mt. Wilson 60-inch. A discount on those rates is being offered for astronomy club members. Those who sign up at the $250 level will get a $50 discount. At the $150 levels, astronomy club members will receive a $25 discount. Full information is detailed at: http://www.journeytopalomar.org/screening_02_23_08/screening_club_university.html If you have questions you can contact Todd & Robin Mason at masonproductions@ca.rr.com**

**FOR SALE:** Pentax K10 D w/18-55mm F3.5-5.6 AL zoom lens, charger, 4 GB memory, T-mount, remote cable CS-205, carrying case. All in original boxes w/warranty papers and software. Cost over $1400.00. Sell $900.00. Jim Leonard 760-377-3474

**FOR SALE:** Meade 10" LX200 Schmidt Cassegrain with SBIG ST-8 CCD Digital for computer imaging. TeleVue lens, 31mm Nagler, 35mm and 22mm Panoptic, 14mm and 8mm Radian, 2x Celestron Barlow, 12mm Meade Illuminated Reticle. Pelican 1500 hard case, one portable stand and one bolt-down stand. Over $12,000 in equipment. Asking $4500.00 Ray Vega 661-264-6627

**FOR SALE:** 10mm 2-inch eyepiece, $40. Also selling one brand-new (in box) green laser pointer, has a momentary switch (momentary is release and it goes off) for $50. This can be adjusted to about 4 times as bright as the pointers commonly seen for about $25 additional, but the beam is visible in the dark as is. Glenn Hand 909-861-6461 or email scopeguy20@gmail.com

*(continued from page 8)*

A new theory proposes that the greenhouse gas sulfur dioxide predominated on Mars during its early history, explaining how it was warm enough for liquid water. Sulfur dioxide prevents limestone from forming, explaining another Mars feature. Abundant sulfur minerals found by the Mars rovers are also explained by sulfur dioxide. This gas would have made the oceans of Mars, which many scientists believe existed early in the planet's history, quite acidic.

**Messenger** (Mercury mission) made its first flyby (of 3) of Mercury and took massive amounts of data, including over 1000 pictures. The flybys will change Messenger's orbit about the Sun to one with rather minimal change to achieve orbit around Mercury, which will happen in March 2011. The flybys afford certain observation opportunities that orbiting will not: flying down the planet's magnetotail, and approaching the planet more closely. Only one previous mission has ever visited the planet, Mariner 10 in the 1970s. Mariner 10 also did 3 flybys, but did not have the rocket power to go into orbit about the planet. Its orbit about the Sun took exactly 1 Mercury day, so the same half was in daylight every flyby, resulting in only about half of the planet being pictured. Messenger will fill in the rest of the view. In fact the first images returned already show much new territory. Messenger has much more sophisticated instruments than Mariner, so I predict a lot of new discoveries.

**Instant AstroSpace Updates**

**Suzaku** (joint Japanese and NASA X-ray satellite) has found that the white dwarf star AE Aquarii gives off pulses of high-energy X-rays each time it rotates (every 33 seconds). No other white dwarf is known to do this.

**Tholins**, highly complex organic molecules, have been found for the first time outside the solar system. HST visible-light and infrared observations found them in the disk of dust around a young star (8 million years old) that is 220 light-years away in Centaurus.

Astronomers have for the first time detected the light scattered by the atmosphere of an **exoplanet** (one orbiting a star other than the Sun) by using observations in polarized light. Measurements indicated the atmosphere is more than 30% larger than the planet itself. The orientation of the planet's orbit was also determined.

Researchers have dated as 4568 million years ago, plus or minus about 1 million years, the step in **formation of our solar system** when dust first coalesced into mountain-sized chunks of rock, by using chromium and manganese isotopes in carbonaceous chondrite meteorites. Other later steps in planet formation have previously been dated fairly precisely.

Two stars have been found with rapid accretion of gas, extended disks, bright infrared emission, and in one case jets, all characteristics of young stars forming planets. But they are old stars. This implies it may be possible to **form planets twice**.

A survey made by **Chandra** (orbiting X-ray observatory) of 9 giant galaxies with disturbances in their gas, which probably indicate that they have central black holes with powerful jets doing the disturbing, showed that the central black holes were spinning at nearly the speed of light. This indicates that rapid spin may cause powerful jets.

**Mars Science Lab**, a long-range rover, is scheduled to launch in fall of 2009. The 50 proposed landing spots have been narrowed to 6: an ancient channel carved by catastrophic floods, an area of clay, a deeply gullied region, a former river delta, a place rich in hematite and sulfates, and near the currently operating rover Opportunity.

A correlation has been found between higher incidence of **cosmic rays** (as recorded in ice cores) and increases in deaths from cancer in a study of 140 years of health records. The peaks in deaths occur 28 years after the cosmic rays, and may be caused by the rays damaging genes.

The first reversed-polarity sunspot at high latitudes has been observed, which means a **new solar cycle** has begun. It is expected to peak in sunspot intensity in 2011 or 2012.

The United Nations approved a proclamation designating 2009 as the **International Year of Astronomy**, celebrating 400 years since the telescope was first turned to the sky. The International Astronomical Union proposed this in 2002, and 99 countries and 14 organizations have pledged their participation.

**Space shuttle** Atlantis's mission to the International Space Station (ISS) was postponed (again) until February 7 due to problems with fuel sensors. The plugs that transmit signals from the fuel sensors through the skin of the fuel tank are being changed to a new design, as they are believed to sometimes lose contact when subjected to liquid hydrogen.

A remembrance service is being held at the memorial at Kennedy Space Center in Florida on February 1, the 5th anniversary of the space shuttle **Columbia** accident.

**SOHO** marked 10 years of observing the Sun from space. The **Mars rovers** Spirit and Opportunity completed 4 years of roving in January.

The **Mars Scout** mission planned for launch in 2011 was delayed by NASA to 2013 (the next alignment of Mars with Earth) for what may be the worst excuse yet. A mission evaluation committee was found to have a conflict of interest and had to repeat 4 months of work with new membership.

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