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NOVAC
THE NEWSLETTER OF
THE NORTHERN VIRGINIA
ASTRONOMY CLUB
DECEMBER 2014

Message from New NOVAC President, Terry Cabell

My best wishes to all of you this Holiday Season. I hope your commitments still provide you with sufficient time to enjoy the company of your family and friends, and that the New Year offers you the opportunity to pursue everything that brings you peace, joy and contentment.

2015 will mark the 35th anniversary of the founding of the Northern Virginia Astronomy Club.

"To observe, and help others observe." With those simple words as their guide, a small group of amateur astronomers began what is now the largest regional astronomy club in the world.

Although as I grow older I'm less certain of many things, I have no doubt that the first NOVAC members had no inkling that, three and a half decades later, over one thousand members in hundreds of households throughout the Washington, DC area would belong to NOVAC. Neither could those first members envision the role computing devices would play in how many of us conduct our astronomy observing sessions. We observe with a wide variety of equipment, and many of us image using a host of technological wonders that were unimaginable back in 1980. We communicate with other amateur astronomers via websites and social networks, letting us coordinate our activities and compare what we learn in real time. But, regardless of how we observe, we all share a deep and abiding passion for the night sky.

Notice of Phil Wherry's decision not to seek another term as President of NOVAC reached me while I was sharing some hot chocolate in a Warrenton restaurant with my wife at 1:00 AM this past Sunday morning. We'd just come off the field at Crockett after a successful public night event. My subsequent nomination for the position of President occurred eleven hours later, and my election six hours after that. Thus, while you may have learned of my taking on the role of President for 2015 in the last few days, my knowledge precedes yours by only a few hours.

So, in the midst of plans for the upcoming holidays, it might come as no surprise to you that I've taken some time to think rather more seriously about NOVAC, and how I can contribute to the club's continued success. That we have an exceptionally well run organization is indisputable. The hard work, skills and dedication dozens of our members provide are the foundation of that success. And we need to count on the talents and commitment of NOVAC members in the future to

Continued on p. 2

Message from New NOVAC President *Continued from p. 1*

help us fulfill our mission: observing and helping others observe.

Wednesday, I attended a seminar on Social Security and Medicare benefits. I will be sixty years old in 2015, and it's time I started paying attention to my retirement. While I listened to the seminar lecturer, though, I realized that what I was facing was the same transition the majority of our members also face. We are all getting older, and most NOVAC members are either retired, or rapidly approaching retirement age. And in that simple fact lies a challenge to all NOVAC members: what will we do in the coming years to ensure our organization continues to thrive? How will we attract new members, who have the fresh ideas, new perspectives and expertise with the new tools—both virtual and real—that are the hallmark of our 21st Century civilization? Quite simply, how do we bring both young and old to appreciate with us our love of the night sky?

Fortunately, we have a myriad of new technologies and communications media to get the word out about NOVAC; what we do and what we have to offer to the general public. And we've made a genuine start via Facebook, MeetUp, our enhanced NOVAC website and a host of other avenues.

But this effort requires time and attention, and—most importantly—the participation and support of NOVAC's membership.

Every one of us in NOVAC receives something different when we spend time under a clear, dark sky. The objects we see have numbers and names, and in that they are the same for each of us. But what we derive from our efforts is unique to each member. And when we offer to share what we see with others we are doing that much more. Outreach advances our mission, whether it's your next door neighbor taking a peek through your scope at Saturn, kids looking at the Sun through a solar scope at a hometown event or a crowd of over 700 being wowed by a huge Dobsonian at Astronomy Day, all are ways we reach out to the public, and—we hope—give them something new to think about.

Finding new ways to seek out those opportunities is the mission I am asking all of you to consider in the New Year. Whether it's at home, a community event or in the your local school, an informal seminar on imaging, a workshop on how to use equipment or spending time at one of our many observing fields, giving someone new to our avocation the chance to see what we see is a gift we should always try to offer. Not only because it provides someone the opportunity to see something new and marvelous, but also because it offers the chance to bring into our organization new people of all ages who can help us to preserve and expand that sense of wonder at what waits patiently over all our heads each night when the Sun sets.

Additionally, I hope you will give some thought to how NOVAC can do a better job of bringing the night sky down to Earth, and share your ideas with others. Elizabeth Erickson, our Outreach Coordinator, and I welcome your suggestions on Outreach activities. And I look forward to your thoughts on how our experienced members can share their knowledge with other members, as well as ways we can do a better job of providing convenient opportunities for all of our members to observe.

Please feel free to e-mail me with your concerns, ideas, suggestions or questions. I would enjoy hearing from you. That's the only way I can know I'm on target to ensure my primary goal: serving the membership of NOVAC. I can't go wrong if I focus on that, and I look forward to your help in seeing I do it.

Clearest of skies,
Terry Cabell
president@novac.com

Upcoming NOVAC Meetings

January 11
Star Clusters
Speaker: Ed Witkowski

February 8
Topic &
Speaker TBA

March 8
Exploring the H II Regions of Galaxies
Speaker: Loren Anderson

April 12
The Physics of Space
Speaker: Sten Odenwald

Monthly meetings are normally held at 7 p.m. on the second Sunday of each month (except for the month of May, when the meeting is held on the first Sunday) in Room 163 of the Research Building on the campus of George Mason University. More info at www.NOVAC.com.

The *NOVAC Newsletter* is the official publication of the Northern Virginia Astronomy Club and is published quarterly. The NOVAC Newsletter is available to members of NOVAC as a regular membership benefit.

Membership

Membership in the Northern Virginia Astronomy Club is $35.00 per year and is open to anyone interested in astronomy or the sciences. Additional memberships at the same address are $10.00 per person. Membership in the Astronomical League is free with NOVAC membership and includes the *Reflector* magazine plus access to their Observing Awards.

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Submissions to the newsletter

NOVAC members are invited to submit articles for publication in the *NOVAC Newsletter*. The editor reserves the right to edit all materials submitted. Send article submissions to the Editor, Chris Lee, at newsletters@novac.com.

A Conversation With…
Yvette Johnson

Club member David Werth interviewed NOVAC's Recording Secretary Yvette Johnson

NOVAC: How did you discover NOVAC and what led you to join the club?

Yvette: In 2006, I learned that the planets were moving farther away from each other and it prompted me to think, if they are moving apart then where are they moving to? I then became interested in learning more about Astronomy and being around like minded individuals. I did a Google search on Astronomy and NOVAC was one of the top search results. From there, I learned about the general body meetings and attended my first meeting in October 2006.

NOVAC: How long after you joined NOVAC did you take on the leadership role of club secretary?

Yvette: After attending the first meeting in October 2006, I became Secretary in January 2007.

NOVAC: What aspect of that role do you like the best?

Yvette: I like being involved in the logistics and operations of the club.

NOVAC: Are you an observer and if so what equipment do you use?

Yvette : I am not an active observer and use the member's scopes during our outreach events.

NOVAC: Would you like to get into observing in the future?

Yvette: I would like to be an observer when I move into a larger home where I can store my equipment!

NOVAC: You have been a huge help in coordinating the catering for our big public events. What got you started in that role?

Yvette: The board decided to merge the annual picnic with Astronomy Day in 2007 or 2008. There was then a new need to cater for Astronomy Day and I volunteered to fill that need. Over the years since then, the Star Gaze coordinator thought it would be a good idea to cater that event as well since it was similar in outreach to Astronomy Day.

NOVAC: One area you have had a big impact for NOVAC is in building membership via social media. Tells us about your experience in using MeetUp to attract new members.

Yvette: It is a fulfilling experience assisting the Meetup members with learning more about the club and seeing the transition to becoming a paid NOVAC member. I keep track of the monthly public events on our NOVAC site, such as the Monthly Observing nights at Crockett & Sky Meadows and our general body meetings and then post these public events onto the Meetup site. I then monitor if the Monthly Observing nights will be cancelled or are a Go and then update the Meetup members on the status of the event.

NOVAC: What do you think the future holds for you and NOVAC?

Yvette: In the future, I will continue to be active in NOVAC either as a board member or general member and I will continue to teach family, friends, and associates about NOVAC and its benefits. I believe NOVAC will continue to grow and impact the community and create the spark for future leaders and scientists. ✶

Wild Weather on WASP-43b

by Trudy E. Beh, M.A

You thought finding planets around stars hundreds of light-years away was spectacular, exceeded only by determining their sizes and orbits.

Well, in the ongoing exoplanet version of the game "can you top this?" comes another phenomenal feat: discerning the weather on a distant exoplanet—including sensing water vapor in its atmosphere.

The planet is WASP-43b, orbiting a deep orange dwarf (at spectral class K7, as orange as a star can be without being a red dwarf) a tenth the size of the Sun, and with a cooler surface temperature (maybe 7,500°F compared to 10,000°F for the Sun, a G2 star). A whopping 260 light-years away in the constellation Sextans, you'd need an 8-inch telescope under dark skies even to pick out the host star (magnitude 12.4).

Like just about every other exoplanet discovered so far, WASP-43b is no vacation spot. The planet is the size of Jupiter but twice as massive. Indeed, the planet is slightly more than a tenth the diameter of the star itself.

Worse, it is in a nearly circular orbit less than a million miles from its star's surface—closer than four times the distance of the Moon from Earth: so close that it orbits the star in a year of just 19.5 hours. Its day is also 19.5 hours long because the planet's rotation is tidally locked: one side always faces the star and suffers permanent day while the other side has permanent night.

What does ah that mean for its weather?

To find out, a team of astrophysicists—including Jonathan Fortney at the University of California, Santa Cruz (UCSC)—combined two observational techniques for the first time and dove deeply into the data.

Emission and transmission

The team secured several precious days of observing time on the Hubble Space Telescope in November and December 2013 to obtain measurements of the planet over three nearly consecutive orbits with Wide Field Camera 3. They also acquired data from three primary transits (where the planet crossed directly in front of the star) and two secondary eclipses (where it passed behind the star), observing in the thermal (heat) near infrared at wavelengths of 1.1 to 1.7 micrometers (μm) using an instrument called the G141 grism. They supplemented the HST observations with high-precision observations from NASA's Spitzer infrared space telescope at slightly longer wavelengths (3.6 and 4.5 μm).

During transits, they measured how the host star's light filtered through the planet's atmosphere—a technique called transmission spectroscopy—to determine the abundance of any water vapor in the atmosphere where the day side transitions to the night hemisphere. Also at different points during transits, they used a technique called emission spectroscopy to monitor the heat emitted at night by the planet itself.

Using custom software run on the Hyades supercomputer cluster at UCSC, they used the extracted spectra to provide a comprehensive view into WASP-43b's atmosphere, including how temperatures change with height around the planet. They were also able

Continued on p. 5

Wild Weather on WASP-43b *Continued from p.4*

to map temperatures and water abundances in the atmosphere at different longitudes across the planet's day and night sides—an entirely new technique.

"The emission spectrum shows strong evidence for water absorption," the authors wrote in The Astrophysical Journal Letters. The Spitzer data also suggest that carbon monoxide and carbon dioxide exist in the atmosphere. The place seems to be too hot for clouds.

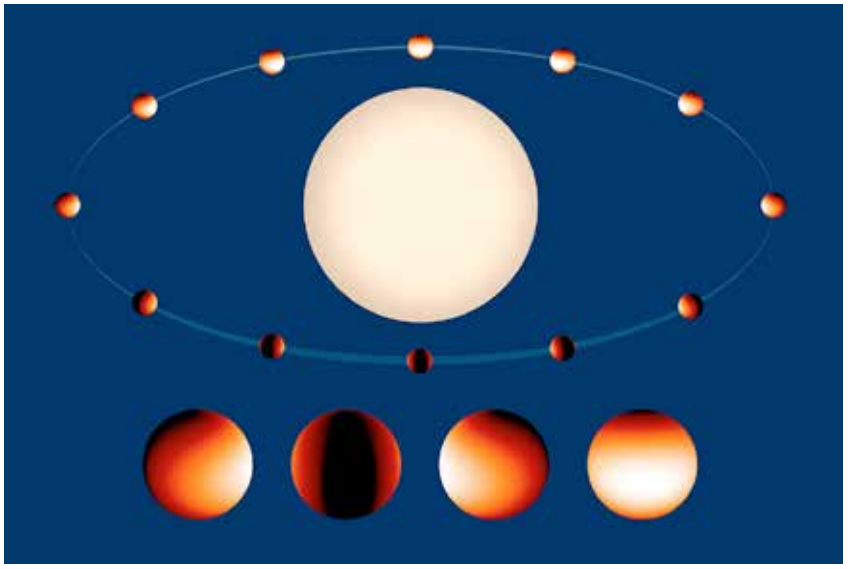
Easier than measuring Jupiter

Studying the exotic inferno WASP-43b 260 light-years away actually may shed light on our own solar system.

"Even though Jupiter is much closer to Earth, the composition of its atmosphere is actually harder to study than WASP-43b's." Fortney explains. "Our own solar system's giant planet is so cold that most of its important molecules are hidden in clouds far below the visible atmosphere. The high temperatures of 'hot Jupiters' such as WASP-43b make studying their atmospheres easier."

How hot? WASP-43b's day side is hot enough to melt iron (2,700°F); the night side is much "cooler"—at 900°F it would "only" melt lead. For perspective, that makes the night side as comfortable as Mercury's day side—maybe worse, because of WASP-43b's humid atmosphere. Because heat is so poorly distributed through its atmosphere, fierce hot winds roar from the day side to the night side.

The team hopes that their measurements can reveal more about the conditions under which planets form. "These observations with Hubble show us that we can understand the makeup and weather of giant planets around other stars with current telescopes,"



Artist's conception (not to scale) shows exoplanet WASP-43B orbiting its orange dwarf host star. The four images below show close-ups of the planet at points in its orbit 90 degrees apart. (Transits and eclipses are not shown.)

CREDIT: NASA, ESA, AND Z. LEVAY (STSCI)

Fortney says. "Thus, they are an important step towards characterizing the atmospheres of more Earth-like worlds with future, specialized space telescopes." ✶

The University of California High-Performance AstroComputing Center (UC-HIPACC), based at the University of California, Santa Cruz, is a consortium of nine University of California campuses and three affiliated Department of Energy laboratories (Lawrence Berkeley Lab, Lawrence Livermore Lab, and Los Alamos National Lab). UC-HiPACC fosters cohaborations among researchers at the various sites by offering travel and other grants, co-sponsoring conferences, and drawing attention to the world-class resources for computational astronomy within the University of California system. More information appears at http://hipacc.ucsc.edu

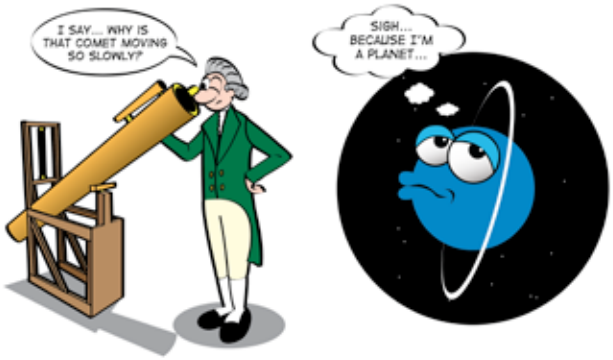
Further reading: The findings appeared in two articles: "A precise water abundance measurement for the hot Jupiter WASP 43-b" in the October 1, 2014 issue ApJ Letters, and "Thermal structure of an exoplanet atmosphere from phase-resolved emission spectroscopy," in Science on October 9.See also the NASA press release "Hubble reveals most detailed exoplanet weather map ever" at http://www.spacetelescope.org/news/heic1422/ . A time-lapse video of the data as WASP-43b rotates/revolves appears at http://astro.uchicago.edu/~kbs/wasp43b.html

Why did it take so long to discover Uranus?

Right in Plain Sight

If you know where to look, and your eyes are strong enough, you might be able to see Uranus without a telescope or binoculars. It's not very bright and barely large enough, but it does sometimes appear in our night sky.

In spite of this, Uranus wasn't officially discovered until 1781. Ancient Babylonians knew about ah of the planets from Mercury to Saturn long before that. Why did it take so long for people to find lonely Uranus?



What to Call It?

Actually, it wasn't a matter of finding it. It was a matter of knowing that it was a planet. The story of Uranus's discovery is full of people not realizing what they were seeing. People may have seen Uranus as early as 128 B.C. but, each time they saw it, they said it was a star.

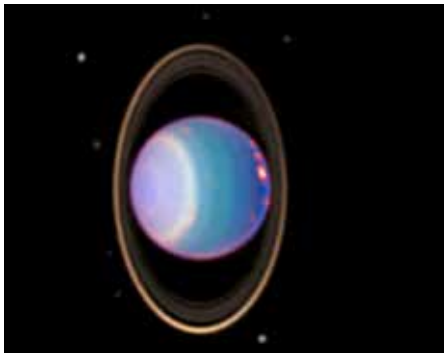
In fact, the man who we credit with discovering the planet got it wrong too! Sure, he knew it wasn't a star, but he didn't think it was a planet either. On March 13, 1781, William Herschel—an amateur astronomer—located an object in the night sky. After measuring it, he determined that this object moved too quickly to be a star. It had to be a comet, he thought.

A Great Debate

Herschel told other astronomers about the new "comet." They were confused. The problem was that a comet as bright as this object would have to be pretty close to the sun, but a comet that close to the sun would have to be moving through the sky much faster than this thing was moving. It also didn't have a coma or a tail like comets have.

These other astronomers began to study the object too. They figured out that its orbit was pretty close to circular—just like the orbit of a planet. That was enough for most of them to call it a planet. By 1783, Herschel also accepted that it must be a planet. After he tried to name it after King George III, the planet was named Uranus, after the Greek god of the sky. ✶

Sir William Herschel.



Hubble telescope image of Uranus.
CREDIT:NASA/JPL/STSCI.

Uranus leads the way to the discovery of Neptune

The discovery of Uranus played a big role in the discovery of the planet farthest from the Sun—Neptune. Ever since Uranus was discovered, astronomers kept close tabs on where Uranus was in the sky.

They noticed that Uranus did not behave like they thought it should. Its orbit seemed to be gently tugged by some far-off object. Two clever astronomers named John Crouch Adams and Urbain Le Verrier used those slight tugs to predict where such an object might be located.

Sure enough, when two other astronomers pointed their telescope in the location Le Verrier predicted, they found Neptune! Adams technically made his prediction first, but Le Verrier was the first to have his prediction confirmed. This is a great example of the scientific method at work.

This article was provided by NASA's Space Place. Kids, parents and educators can find fun facts, activities and more at http://spaceplace.nasa.gov

When Will Betelgeuse Explode?

By Phil Plait, Bad Astronomy

If there's one star in the sky people know about, it's Betelgeuse*.

Marking the right shoulder of the hunter Orion — remember, he's facing us, so it's on our left — this orange-red star is one of the brightest in the night sky. It's been studied for as long as we've had telescopes, yet for ah our advanced technology and know-how, details about it are maddeningly vague. We don't even have a good determination of how far away it is!

Still, there's a lot we do know: It's a red supergiant, a star that started out life already a lot bigger, more massive, and far more luminous than the Sun. Stars like that go through their nuclear fuel extremely rapidly; while the Sun is only approaching middle age at 4.5 billion years old, Betelgeuse is dying now at an age of less than 10 million years old. And when it does finally give up the ghost, it'll do so with a bang. A very, very big bang: It'h go supernova, one of nature's most dramatic and ridiculously violent events.

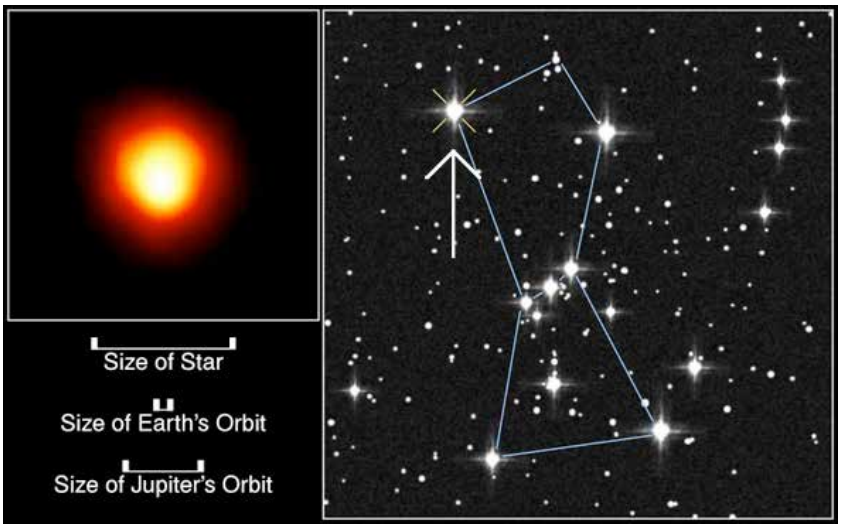
But *when*? A lot's been written about that. If you believe pseudoscientists and crackpots, you might have thought 2012 was our last chance to see it. Sometimes the news spreads that it'll go any day now. Somehow, oddly, despite ah that nonsense you can still see Betelgeuse shining in the sky.

However, the thing is, it really *will* explode one day. We don't really know when, exactly, which is why I usually hedge my bet by saying it could be tonight, but more likely it'll be hundreds of thousands of years from now… a million years, tops.

As a scientist, that date range is a little bothersome. That's why I was delighted to read a research paper trying to nail down this very fact. While it's still a bit iffy, and details are still elusive, the astronomers who did the research were able to make a much more refined prediction: Betelgeuse will go boom in about 100,000 years.

Orion—A magnificent photograph of the constellation of Orion, with Betelgeuse glowing ruddily at the upper left. In my opinion, this is the best photo of Orion ever taken.

PHOTO BY ROGELIO BERNAL ANDREO, USED BY PERMISSION



Betelgeuse is just ridiculously huge. Note the solar system sizes to scale below it on the left.

PHOTO BY ANDREA DUPREE (HARVARD-SMITHSONIAN CFA), RONALD GIHILAND (STSCI), NASA AND ESA

Wow. That's sooner than I would have thought. It's still a long way off, of course, but in a galactic sense that's a blink of the eye.

This prediction depends on a lot of things, so the astronomers had to make determine many basic facts about the star as best they could (generally depending on the previous work of others). It's ah pretty amazing, so let

** OK, fine, a lot of people know Polaris, too. And I guess, if you want to be picky, they've heard of the Sun as well. But still. Betelgeuse!*

me list them out for you with brief comments:

Distance: Betelgeuse is likely to be about 200 parsecs (650 light years) away. Different methods yield different distances, which has been frustrating, but a recent paper gives what may be this best result.

Age: Models of the star's evolution over time yield an age estimate of about 8.5 million years. That's a bit older than I would have expected, but quite reasonable. Compare that to the Sun's age of 4.56 billion years, and you'll see why I say stars like Betelgeuse don't live long!

Mass: The best estimates of the mass of Betelgeuse give about 20 times that of the Sun (more or less). That's a lot; as you get more massive, stars get more rare, and only a handful get this hefty.

Radius: This is where we start getting into "yikes" territory: Betelgeuse is a staggering 890 (± 200) times wider than the Sun! Bear in mind the Sun is over 100 times wider than the Earth and you may realize what a behemoth this star is. That's a radius — a radius — of over 600 million kilometers! Replace the Sun with Betelgeuse, and it would stretch nearly to the orbit of Jupiter. The Earth would be engulfed.

Rotation: Stars tend to rotate slowly. When they expand, as Betelgeuse did long ago, they slow down (this is called conservation of angular momentum, like when an ice skater draws in his or her arms and spins more rapidly). Betelgeuse is huge, so unsurprisingly it spins very slowly, only once every 8.4 years. The Sun spins about once a month, for comparison.

Luminosity: Betelgeuse is bright. It shines with the energy of 125,000 times that of the Sun. Holy wow. That's why it can be hundreds of light years away and still be one of the brightest stars in the sky. At that distance, you'd need a telescope to see the Sun at ah.

Mass loss: When massive stars use up the hydrogen fuel in their core, they start to fuse helium into carbon. This generates a lot of heat, which causes the outer parts of the star to expand (hot gases expand, after ah). Betelgeuse is pretty bloated, which means gravity at its surface is pretty weak. The star is also incredibly luminous, so a gas molecule on its surface feels a strong outward force from the light, and only a weak force from gravity holding it down. The result: Betelgeuse blows a very strong wind of material away from it. It loses about a millionth of the mass of the Sun every year. That may not sound like much, but the Sun loses less than a trillionth of its mass every year. Betelgeuse blasts out *a million times as much material as the Sun*. That's not a solar wind. It's a gale.

The supernova: Using ah these data, plus what we know about how stars evolve over time, the astronomers find that in about 100,000 years, Betelgeuse will run out of helium to fuse. The steps after that are a bit complicated, but essentially, it will begin to fuse ever-heavier elements on ever-shortening timescales, until it tries to fuse silicon into iron. This spells doom for the star, because it robs the star of the energy needed to support itself. The core collapses, heats up beyond imagining, and explodes. Ka**BLAM**! No more Betelgeuse.

The aftermath: First, repeat after me: WE ARE IN NO DANGER, EVER, FROM BETELGEUSE.

At that distance, even the titanic detonation of a supergiant star poses no major threat. It'll be bright, as bright as the full Moon! But it's too far away to hurt us. Also? 100,000 years is a long time.

Mind you, it'll launch octillions of tons of matter into space in ah directions at a decent fraction of the speed of light. But as it plows through the thin soup of stuff in space it'll slow down. The astronomers in the paper estimate the shock wave will take *six million years* to reach us, and will be moving at a mere 13 kilometers per second. It'll slam into the Sun's outgoing solar wind, and the two will wrestle, but the shock itself will stop well outside the Earth's orbit.

We're safe.

But holy cow, that'll be a show. But you'll have to wait a hundred millennia for the opening curtain.

I'm not that patient. Statistically speaking, a galaxy hosts a supernova every century or so. The Milky Way hasn't had one pop off for a long time, so we're bound to get one sooner or later that we can study. We may get a thousand or so before Betelgeuse finally loses it. Some will almost certainly even be closer than Betelgeuse is. Again, we're in no real danger from a nearby supernova, and it would be nice to see one at a relatively proximate distance. Oh, what we'd learn!

…But poor Orion. Once Betelgeuse goes, and fades away over a few months, he'll be missing his right shoulder. I wonder what myths we'll have to modify to accommodate for that?

Tip o' the neutrino detector to Tod Lauer. ✶

This content distributed by the AAVSO Writer's Bureau

Phil Plait writes Slate's Bad Astronomy blog (http://www.slate.com/blogs/bad_astronomy.html) and is an astronomer, public speaker, science evangelizer, and author of Death From the Skies!

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Blast from the past—*This article originally appeared in the Nov./Dec. 1995 issue of the NOVAC Newsletter.*

The Recreational Astronomer: Family Astronomy

By Jon Stewart-Taylor

Welcome back to the Recreational Astronomer. In this issue, I'll describe a night of Family Astronomy as it happened this summer. Along the way I'll point out some of the important techniques and attitudes that keep Family Astronomy focused on the Family, and help make the night a successful and positive experience for everyone. August 25th, 1995 was a very special night for us, not just because it was perfect weather for astronomy, but because we turned it into a night of Family Astronomy. At noon the weather was beautiful, and I was hoping it would continue through the evening. I knew that Kathleen would have the kids (5-year-old Gregory, 3-year-old Fiona, and 12-month-old America) out at a friend's house until almost dinner time, so I planned to get home a little early to get everything ready to go. In Family Astronomy, the emphasis has to stay on the Family, rather than the Astronomy, and the astronomy things to pack are a small minority compared to the Family things. Dinner was the first step: sandwiches for simplicity, several "fun" snacks (defined as almost anything they don't get every day), water and boxes of juice, and lots of napkins for spills. Next was America's diaper bag, and Gregory and Fiona's pajamas. After that it was toys and activities (both active and quiet) for the kids, and lots of blankets to make nests for them when it was time for bed. Everything was arranged near the door for fast loading into the car.

When Kathleen arrived, I met her in the parking lot and asked if she wanted to go to Savage for an observing session. She looked at the weather, looked at me, and said yes. What if she hadn't? Well, the 'scope and other astronomy stuff weren't out of the basement yet, and most of the other things would be just as useful for a picnic at a playground or park as for an observing session. But she did agree, and took the kids in to use the potty while I loaded the car. Fifteen minutes later we were heading for the toll road.

From Reston to Savage is a long drive for young ones, so we played one of their favorite story tapes (Anansi, read by Denzel Washington). After the tape ended we were still about 20 minutes from the site, and the children were getting hungry, so we gave them each a small bag of dry cereal and raisins. We arrived well before dusk, and walked around the site with the older kids, showing them where they were and weren't allowed to go, and telling them why.

After that, Kathleen kept an eye on the children while they ran around like wild ferrets, and I unloaded the car. Dinner came out first, then the kid's toys and blankets for their nests. We ate dinner while admiring the stars as they came out. As the dusk deepened, we broke out the glow-in-the-dark bracelets. Not only do the kids love them, but they let us keep track of where they are in the dark.

The weather was unusually clear, with the temperature about 80. There were small patches of clouds at the west and south horizons, but they cleared as it got darker. As the darkness deepened, we could tell it would be an extraordinary night. We reached limiting magnitude 4 shortly after dusk. By full twilight, the Milky way was showing very clearly. We watched for satellites, and saw 3 or 4 in the first hour.

I unpacked the scope, but just to get it started cooling for later. Rather than trying to use the scope, we chased the kids, and just watched the sky. By this time the clouds had completely disappeared. We saw several meteors in Sagittarius and Scorpius heading west, and told some Coyote stories to the kids: "Why There are Meteors" and "How the Stars Were Made."

As Gregory and Fiona started to settle down, I started finding some objects which would interest them in the scope. Jupiter was first, and Gregory commented on the 4 moons. Fiona wasn't quite sure what to make of it. Next I found M6 and M7. I also found it's hard to use a Telrad while holding a wiggly 1-year-old. The open clusters weren't as successful with the children, but Kathleen liked them. Mostly we lay on blankets and just looked at the brilliant stars, and the Milky Way as it flowed overhead.

After that I spent a lot of time carrying America, and helping to get Gregory and Fiona into their pajamas, and settled in their nests. They weren't sleepy yet. We told them they could stay awake and watch for meteors as long as they wanted, but they had to stay in their nests. It was a big treat for them to stay up late. An hour or so past their usual bedtimes it seemed like they were getting too sleepy to function, but too excited to sleep, so we put a tape of their usual bedtime music in the boombox. That finally settled them down, and they were asleep within 15 minutes.

For the next hour Kathleen and I took turns playing with the distressingly

unsleepy but charmingly cheerful America, and looking through the scope. Before Scorpius and Sagitarius started getting too low, we found M8 and M20. M8 was large, with the dark lane visible in the nebulosity, and the cluster large and bright to the side. With higher power the dark lane was larger but fainter, and the nebula details were easier to see. M20 was also bright, while higher powers showed the trifurcation.

The temperature fell gradually to the mid 60s as evening progressed, so we added layers of clothing, and put another blanket over Gregory and Fiona. There was very little moisture in the air, and no dew on the optics or Telrad. Our next target was M11, with a detour through the Scutum star cloud. I'd never seen field like that: pushing the scope around was a bit like watching snowflakes through a car windshield. Kathleen was entranced, and chose it as her favorite view of the night. When we did view M11 it was beautiful, with one brighter star against many fainter ones.

America finally nodded off while I was finding M13 in the scope. Viewed through at our highest power the cluster appeared as what Kathleen called a "Queen Anne's lace." M57 was clear at low power, and a lopsided doughnut filling half the field at high power. M31 had M32 and M110 in the same field. M32 easier to see than 110 perhaps because it was more compact. M110 large and diffuse. M31 was very big, even though it was still rather low in the sky in the eyepiece it extended 2 or 3 field-widths to each side, a bright core with arms trailing off to both sides. We ended the night with h and x Perseus (the double cluster).

Kathleen was starting to get cold. There was still no dew when we quit at 11:30, which probably helped her stay warmer and last longer, but even in August we should have brought another layer of clothes for her, perhaps a sweat suit to go over her jeans and some heavy socks. We packed up the scope first, then the picnic stuff, and the kids went (sleepily and complainingly) into their car seats last.

After an unhurried drive we arrived home around 1:00 am.

What made the night so successful? Remembering to keep the Family first, with the children's needs foremost, then Kathleen's. We were in a safe area, with room for the children to play, and things for them to do. Everybody was kept warm and comfortable. The Astronomy was kept at the right level for each of the family members (for the children easily observable things, satellites, meteors, Jupiter, bright clusters. For Kathleen we kept to the major "tourist attractions." We tried to allow for changing needs throughout the night (layers of clothing for everybody, the kids' PJs and nests), and to know when to change activities, and when it was time to stop. It also helped that the weather was as perfect as I've ever seen it.

With a little bit of planning, you can have a wonderful evening with your Family. And, if you do it right, you might get in a little observing as well. ✶

International Year of Light 2015

On 20 December 2013, The United Nations (UN) General Assembly 68th Session proclaimed 2015 as the International Year of Light and Light-based Technologies (IYL 2015).

This International Year has been the initiative of a large consortium of scientific bodies together with UNESCO, and will bring together many different stakeholders including scientific societies and unions, educational institutions, technology platforms, non-profit organizations and private sector partners.

The International Astronomical Union (IAU) recognize the importance of light for astronomy and supports that technology in the achievement of greater energy efficiency, in particular by limiting energy waste, and in the reduction of light pollution, which is key to the preservation of dark skies. The IAU is therefore a supporter of the IYL2015.

In particular, the IYL2015 Steering Committee invited the IAU to organise activities under the Cosmic Light theme for the IYL2015.

The IAU Executive Committee recognise the importance of the IYL2015 and support it via the Executive Committee Working Group on the IYL2015. ✶

INTERNATIONAL YEAR OF LIGHT 2015

COSMIC LIGHT IAU

For more info:
http://www.iau.org/iyl/

"To observe, and to help others observe"

NOVAC is a non-profit, all-volunteer organization chartered to advance amateur astronomy in Northern Virginia. Member benefits:

Access to dark sky observing sites
NOVAC maintains agreements that provide club members with year-round access to observing sites away from city lights. **www.novac.com/wp/observing/**

Monthly meetings
Monthly meetings are normally held at 7 p.m. on the second Sunday of each month [except in May when the meeting is held the first Sunday] in Room 163 of the Research Building on the campus of George Mason University. Each meeting features a lecture on an interesting topic by a local expert. See the meeting web page or future newsletters for a schedule of speakers. **www.novac.com/wp/outreach/meetings/**

Quarterly newsletter
The NOVAC newsletter provides information specifically for NOVAC members, as well as general interest articles on such topics as observing reports, equipment reviews, upcoming events, amateur telescope making (ATM) projects, and more.
www.novac.com/wp/members/newsletter/

High-quality telescopes to borrow
NOVAC members may borrow one of the club's several loaner telescopes at no charge. Members may choose from among three 6 in. reflectors, two 10 in. f/6 reflectors, an 8 in. SCT, and a hydrogen-alpha solar scope. Binoculars are also available for loan.
www.novac.com/wp/members/loaner-scope/

Club website
Up to date information about club events and activities is maintained on the club website at **www.novac.com**.

Large club library
NOVAC maintains a well stocked library from which members may borrow by contacting John Deriso (**librarian@novac.com**). A full list of titles is available on the club website.
www.novac.com/wp/members/library

Private email listserv
Members keep up with current club information by subscribing to the NOVAC email list, without fear of flame wars or spam emails.

Public outreach opportunities
Several times each year volunteers from NOVAC present astronomy programs to schools, churches, Scout troops and other public groups. Contact **outreach@novac.com** or fill out the outreach form on the NOVAC website to request a program or help in supporting an event. **www.novac.com/wp/outreach/outreach-form/**

Membership in the Astronomical League
Through NOVAC's membership in the Astronomical League (AL), NOVAC members gain access to the AL's newsletter, services and observing programs.
www.astroleague.org

Discounts on astronomy magazines
Subscriptions to *Sky & Telescope* and *Astronomy* magazines are offered to club members at a considerable discount.
Contact Rebecca Stone: **treasurer@novac.com**

Mentor Program
Young or old, new or experienced, this program is for everybody. If you would like to meet with a mentor, think you would like to be a mentor, or have any questions about the program, contact: **mentor@novac.com**.

See your Membership Guide for more details about member benefits.
http://www.novac.com/wp/members/