

## Lorna Jane Simmons-Bugbee

1931—2009

Passed peacefully in her sleep at home on January 10, 2009, Lorna was a longtime supported and a lifetime member of the University Lowbrow Astronomers. Her generosity, joy and love of science are known to all who met her. She delighted in helping others and relaying stories of her life. She is a special part of our club and will always be!

The Questar she donated to the club will be dedicated and named “Lorna” in her honor at a special ceremony on March 14, 2009.

Rest Peacefully, Sweet Lady!

### For Lorna

*Adapted from: The Old Astronomer to His Pupil by Sarah Williams*

Pronounce it right! Its: Tycho Brahe, She would know him when they meet,  
When she shares our later science, sitting humbly at his feet;  
He may know the law of all things, yet bet ignorant of how  
We've been working toward completion, working from then to now.

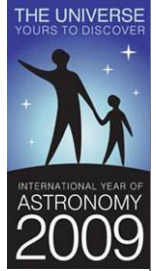
You may tell that German College that their honor comes to late,  
But they must not waste repentance on the grizzly savant's fate.  
Though her soul may set in darkness, it will rise in perfect light,  
She has loved the stars too fondly to be fearful of the night.

She must say good-bye, to her friends, for she cannot longer speak;  
Draw the curtain back for Venus, ere her vision grows too weak:  
It is strange the pearly planet should look red as fiery Mars, --  
God will mercifully guide her on her way amongst the stars.

*Adapted by Mark S Deprest*

# PHYSICS

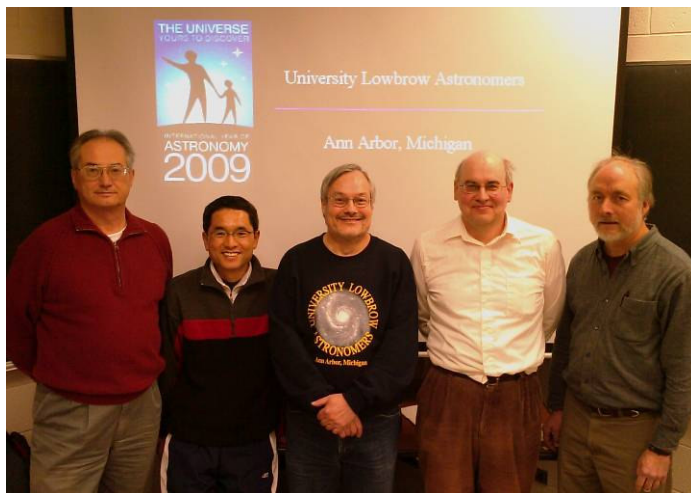
## UNIVERSITY OF MICHIGAN



MARCH 14, 2009

## PRESENTS

## Today's Saturday Morning Physics Speaker



### University Lowbrow Astronomers

Ann Arbor-based astronomy community

#### Amateur Astronomy: From Ann Arbor to the Universe

Astronomy is not just for the professionals. Everyone can explore planets, comets, star clusters and galaxies using backyard telescopes and binoculars. In this talk, the University Lowbrow Astronomers will show us how.

#### Short biography:

The University Lowbrow Astronomers is a diverse group of amateur astronomers, ranging from high school students to retirees, and beginners to experienced observers. The group is involved in many activities, which include stargazing and building telescopes.

From its beginnings in the late 1970's, the group has been open to both university and non-university members. In 1979 Dr. Joseph Patterson, then a post doc with the U-M Astronomy Department, proposed an agreement between the university and the Lowbrow Astronomers. In exchange for restoring and maintaining the observatory, the Lowbrows would receive full use of the 24-inch McMath Telescope at the Peach Mountain Observatory. This unique partnership has served as a catalyst for advancing amateur astronomy in southeast Michigan.

The Peach Mountain Observatory has fueled both the long-term growth of the Lowbrow Astronomers and its service to the community. For many years the group has conducted observing sessions for the public about twice a month, weather permitting. These sessions sometimes attract hundreds of visitors. Additionally, the Lowbrow Astronomers have conducted demonstrations and other events at the University of Michigan Exhibit Museum of Natural History, the Ann Arbor Hands-On Museum, as well as at other locations throughout southeast Michigan.

To join the club or for more information about club activities, see their homepage at  
<http://www.umich.edu/~lowbrows/>

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Saturday Morning Physics

<http://www.saturdaymorningphysics.org>

## The Best Sixty Dollars I Ever Spent

*by Doug Scobel*

If bigger is better, then it follows that smaller is worse, right? Not always. I'm referring to the latest addition to my telescope collection, a 65 mm refractor. Though it's not very big, I've found it to be a very nice performer. And with only a sixty dollar initial investment, it represents some of the best money I've ever spent!

Late in 2007 a couple of us Lowbrows caught wind of a little scope that Bill Burgess of Burgess Optical Company was making available to folks. Originally, he was trying to develop and sell a small, lightweight 65 mm f/5.6 ED refractor that he was going to name the "ED 65 Backpacker". The objective lens was to have one or both of the achromat's elements made of extra-low dispersion glass (I believe FLP53), hence the "ED" in the lens designation. But Bill ran into trouble with the lens cells he had made up for his initial production run of around a hundred units. Apparently, the non-adjustable cell didn't align the two elements correctly and virtually none of the units could be collimated. Rather than try to correct the defect and sell them as he originally intended, he simply decided to cut his losses and make them available to interested buyers for a song – only \$25.00 shipped! Several Lowbrows took advantage of the offer, with yours truly being one of them. Here's a picture of what the \$25.00 got us (plus a lens cap and a small, soft carrying case that are not pictured here):



*What our \$25.00 bought us (minus lens cap and carrying case) – less than two bucks per part! All images by the author.*

The only real drawback was that the scope arrived sans focuser. But we figured for a measly \$25.00 investment for the guts of the scope we should be able to locate a commercially available focuser and still finish the scope for a very attractive price.

More about the focuser later. The first order of business was to figure out how to modify the lens cell so that we could collimate the scope. After all, if the lens couldn't produce an image worth focusing on, then we wouldn't need a focuser. The Internet to the rescue! Another Backpacker purchaser Mike Overacker developed and posted on the Internet detailed instructions for modifying the lens cell. As of this writing those instructions can still be found at <http://www.astronomyreviews.com/ed65/ed65fix.htm>. The modifications involve adding thin, aluminum foil spacers to hold the front lens element stationary, drilling and tapping holes in the cell body to accommodate adjusting screws for centering the rear lens element, and replacing the metal mid-optic spacing ring with neoprene O-ring material. Fellow Lowbrow Clay Kessler, another Backpacker purchaser, works at a machine shop (in fact he's part owner), and he graciously offered to do the drilling and tapping of the screw holes in the lens cell for us. Overacker's instructions also indicated where to get the little adjusting screws and the O-ring material (<http://www.smallparts.com>), so after Clay did the machining, and a group order to SmallParts, we had everything we needed to modify our cells. Because Clay did the hard part for us, the rest of the assembly of the lens into its modified cell was relatively simple and straightforward.

Now on to the focuser. We didn't have any luck finding a focuser to fit the unusually small 70 mm tube used on this scope. At least none that didn't require machining an adapter to make it fit. All the focusers we found were made for a considerably larger tube. This time it was Bill Burgess to the rescue. After a number of requests by some Backpacker purchasers he made available a focuser to fit it for under \$35.00 shipped. It was a decent, two inch, rack-and-pinion unit, with compression rings and a 1.25 inch adapter. So a number of us jumped on that offer too. Installation wasn't perfectly straightforward, because it was ever so slightly oversized for the tube. Again, as luck would have it, Mike Overaker posted instructions for shimming and installing the focuser, too. His instructions can still be found at:

<http://www.astronomyreviews.com/ed65/ed65focuser.htm>. Using his instructions, and a strip of thin brass I found at Rider's Hobby, I was able to finish assembly of my scope.

Now if you know me then you know that I like to differentiate my scopes so that they stand out from the crowd somewhat. This little scope was no different. I really didn't like the vanilla white color, and that dreadful lavender purple logo on the lens hood just had to go. But what color? I always liked the deep, anodized aluminum colors that Williams Optics uses on some of their scopes, so I checked my local auto parts store to see what kind of automotive colors they had. I found this nice, deep red spray paint that when applied over silver simulates anodized aluminum. Eureka!

Also, I was not too thrilled with the blackening of the scope's innards. The tube had a single baffle inside, but the flat black paint they used wasn't terribly flat. Moreover, the focuser had internal threads, but was left unpainted (you can see some of the sheen inside the focuser in the photo below). Too much opportunity for internal reflections.

I disassembled the scope, masked and sprayed the inside of the tube and focuser with Krylon™ ultra-flat black, and applied the silver undercoat and red topcoat to the exterior of the tube and lens hood. Some black flocking applied to the interior of the lens hood finished the scope off. It now has its own unique look, and that awful logo is gone forever! Below are some pictures of how I masked and painted everything, and the finished product:



*Left to right: The Dupli-Color™ “Metalcast” paint I used; Masking the focuser before spraying the inside flat black to reduce internal reflections; After spraying the inside of the tube flat black, masking the outside prior to applying the final color.*



*My finished ED 65 Backpacker. Ain't it purdy?*

Before evaluating the scope's optical performance, I had to collimate the lens. It was trickier than I imagined it would be. As expected, the collimation was way off, with very comatic-looking stars across the field of view. But I found that a very small adjustment of the collimation screws had a profound impact on the resultant image. It was all too easy to overshoot and now have all the stars pointing in a different direction. My difficulty was compounded by the scope being mounted on my photo tripod. It just wasn't solid enough to keep it pointed at the test star (I like to use Polaris because it stays put) while working with the adjusting screws. Fortunately, I had a spare, foot-long dovetail for my Vixen GP-DX mount, so I cut it in half, and mounted it to the bottom of the scope. That made all the difference in the world. With the scope mounted good and solid, I was able to crank the magnification as much as I needed to get the collimation as good as I could get it.

So how does the Backpacker perform? Very nicely in my opinion. It definitely displays a fair amount of false color around the moon, planets, and bright stars at high power. Still, the views are pleasing. It splits the double double, AKA Epsilon Lyrae, cleanly. Banding on Jupiter is easy, and Saturn's rings are nice and sharp. But where it excels is at low to medium magnifications on deep sky objects. Now it only has 65 millimeters of aperture, so you won't be hunting down 12<sup>th</sup> magnitude galaxies with it. But it works very nicely on big, bright, and chunky objects. I brought it with me to the Black Forest Star Party last fall, and had some very memorable views through it. The Pleiades was fantastic, and I could even make out the Merope nebula. M31 was a beautiful sight, too, as the entire galaxy fits neatly within the field of view. With a 24 mm eyepiece and an oxygen-III filter, the North America nebula was easily visible. And with that same setup, the field of view was large enough to hold the entire Veil Nebula end-to-end. Large open clusters were very nice, too, including the very large NGC 752 (the "BASS" cluster), which was simply gorgeous. And of course M42, the great nebula in Orion, was spectacular! The Trapezium was easily split into four stars, and the entire sword region and then some fit easily in the field of view. My biggest disappointment was that I couldn't see the Horsehead Nebula silhouetted against IC 434 using a hydrogen-beta filter. (Now in case you're thinking ol' Scobel is losing it, don't worry - that was supposed to be a joke!)

Here are a couple additional technical points. I measured the aperture in the lens cell and indeed it is 65 millimeters. I'm not exactly sure of the focal length though. It was advertised as f/5.6, which would put the focal length at 364 millimeters. I did not attempt to measure the focal length (I do mirrors, not lenses!) but I did an experiment with my camera's exposure meter. The exposure reading with the scope attached, and with a camera lens set at f/5.6, matched exactly, so it must be pretty close to f/5.6. Also, none of my eyepieces come to a focus with just the focuser - there isn't enough out-travel. So I bought a 1.25 inch diagonal on Astromart which did the trick. With it I can use all of my 1.25 inch eyepieces, plus it makes observing much more comfortable regardless of where the scope is pointing in the sky. I'm sure that the focuser was designed that way - you'd never want to use a small refractor like this without a diagonal.

I and others were thinking that a small scope like this ought also be ideal for astrophotography. I checked to see if my trusty old Olympus OM-1 film (yes, I said "film"! ) camera would come to a focus. Much to my delight I found out that it does. I've since done some experimenting with it and come up with a few decent images. Nothing near as good as folks get nowadays using CCD cameras and DSLRs, but considering my comparatively miniscule investment I'm quite happy with my results so far. Here are a few sample images I shot with it from the dark skies of Cherry Springs State Park at last year's Black Forest Star Party:



*Left to right: North America and Pelican nebulae; The Pleiades; Orion's sword, including M42/43 and the Running Man nebula.*

In case the above images whet your appetite, I'm planning a newsletter article on how I'm doing Astrophotography with the Backpacker. And of course I've been doing it "the Lowbrow way" (in other words on the cheap), so you may want to pay close attention should you want to do the same with yours. Stay tuned.

All in all, I just love this little sixty dollar scope. No, it's not perfect by any stretch. High magnifications instantly reveal its optical shortcomings. And yes, there were additional costs, such as a couple dollars for small parts from SmallParts, twenty-five dollars for the diagonal, and about ten bucks worth of spray paint. But still I completed the entire scope for under \$100.00, which is still pretty dang inexpensive. The real question is – how are the views? In my opinion, priceless!

*Footnote: If you purchased one of these scopes and would like a helping hand getting it assembled and/or collimated, then just let me know. I would be more than happy to provide advice and/or help you out with it. - Doug*

### **HECKLING OPPORTUNITY**

All Lowbrows are invited to the Saline Library on Sunday March 1, 2-3+pm. Mike LoPresto was obviously desperate for a speaker when he asked me to give the final "Science Sunday" lecture. Mike is Saline's real astronomer, a professor at Henry Ford Community College. A few years ago, he appeared at my front door to pick up his daughter who was hanging out with my daughter. He saw my poster of M42, and he told my wife – "that's the Orion Nebula." I was not there at the time, so when my wife relayed the story I had to find out who that guy was. Later I was able to meet Mike and his astronomer dad as well. They are great people.

My lecture is an excuse to show my astropix. I hope to give a tour of the universe, teaching simple concepts along the way. We start at earth and end with distant galaxies. There are only about 35 pix, so there's plenty of time for the audience to ask questions. I won't be going into the detail of imaging+processing unless folks ask. The goal is to keep it pretty general.

For more information, see: <http://saline.lib.mi.us/sdlscientists.htm>

## Walking Inside a Photon

By Tom Ryan

One of the best and most beautiful things about Astronomy is the way its study has shed light on the mysteries of the world in which we live. Astronomy has given us ordinary things, like helium balloons (an element first seen in spectrographs of, and named for, our nearest star, Helios), and it has given us larger things, like the understanding that we are not the center of the Universe, and that the laws which govern us here on Earth also extend to the farthest points we can see.

One of Astronomy's first applications was economic in nature. It provided a schedule for successfully planting and harvesting crops in ancient Sumer (the Biblical land of Shem), after populations grew too large to be supported by hunting and gathering. Along with Geometry, Astronomy enabled the priests of that country to re-establish property lines after the yearly river floods washed away the stone markers.

The Sumerians, prodigious writers and record-keepers, drew a direct line between astronomy and the laws of men. They believed that all of the laws governing behavior which could be made, and that means all laws, contradictory or not, resided in Heaven, and it was the duty of the God of each City to go to the celestial Library and select the set of laws which would govern that city and hence make it prosper.

We're still trying to find those laws today.

In the Middle Ages, Galileo's discovery of the moons circling Jupiter destroyed the Earth-centered view of the world, and, because society's order on Earth was seen as a reflection of the order in God's Universe, threatened the central authority of the Church. The resulting conflict led to a better understanding of the limits on the application of science, and eventually to the widespread use of the Scientific Method. It is to this that we owe our present prosperity, and to which three billion people owe their existence.

Astronomy may not be governing society's laws anymore (not, at least, since Nancy Reagan's astrologer left the White House), but it is still telling us about the very large and the very small in the world in which we live. Dark matter and dark energy were discovered with telescopes, not particle accelerators. Astronomy is even a window into the mysterious world of Quantum Mechanics.

In 1920, Michelson mounted four six-inch flats on a twenty foot beam at the end of the 100" Hooker telescope on Mount Wilson, to increase the effective diameter of the telescope's primary mirror and thus interferometrically measure the diameter of Betelgeuse. The two flats on the ends of the beam were movable, and redirected the starlight to two other flats, positioned over the primary. These mirrors then directed the light down into the telescope, where the two beams combined at the telescope's focus. When the outer mirrors were close together, interference fringes formed at the beam's focus. When they were moved apart, the interference fringes disappeared. The star's angular diameter was calculated from the well-known formula,  $\alpha = 1.22\lambda/(\text{mirror separation})$ . In the case of Betelgeuse, the fringes disappeared when the mirrors were about ten feet apart, giving an angular diameter of 0".047 arc-seconds.

Why does this work? Light beams form stable interference fringes only when their wavelengths and, more importantly, their phases, are identical. A star is a copious emitter of photons, but they are not coherent, as in a laser beam. In a laser, all of the photons are marching in lock step. In a star's photosphere, they are about as random as can be, having been generated by thermal sources arrayed across the star's surface.

The answer lies in quantum mechanic's uncertainty principle, which states that the product of a photon's position and its momentum must be greater than a finite value. The smaller the one is, the larger the other must be. Michelson's interferometer was actually forming interference fringes between single photons. If you were to ask yourself, "What is the uncertainty in the value of the lateral momentum of a photon that originates on Betelgeuse and still enters my eye?" you would come up with a very, very small number. That means that the photon's lateral position must be very large. Ten feet wide, in this case. When Michelson's mirrors were farther apart than this, they couldn't capture single photons between them, and the interference patterns vanished.

Photons from smaller, more distant stars can be as large as the state of Texas. The uncertainty in their forward momentum makes them the thickness of a piece of paper. Thus, stellar photons resemble giant pancakes, or circular blankets, raining down on us from the sky.

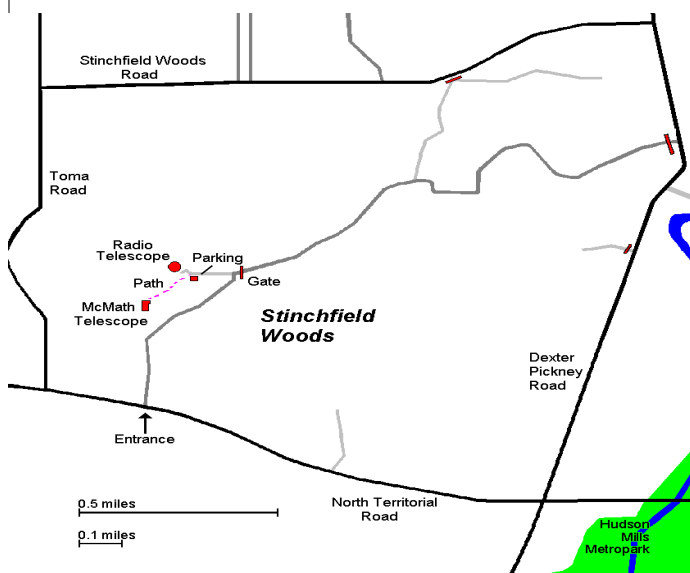
So, the next time you're out under the stars, realize that you're walking around inside of single photons.



**Places & Times**

Dennison Hall, also known as The University of Michigan's Physics & Astronomy building, is the site of the monthly meeting of the University Lowbrow Astronomers. Dennison Hall can be found on Church Street about one block north of South University Avenue in Ann Arbor, MI. The meetings are usually held in room 130, and on the 3<sup>rd</sup> Friday of each month at 7:30 pm. During the summer months and when weather permits, a club observing session at the Peach Mountain Observatory will follow the meeting.

Peach Mountain Observatory is the home of the University of Michigan's 25 meter radio telescope as well as the University's McMath 24" telescope which is maintained and operated by the Lowbrows. The observatory is located northwest of Dexter, MI; the entrance is on North Territorial Rd. 1.1 miles west of Dexter-Pinckney Rd. A small maize & blue sign on the north side of the road marks the gate. Follow the gravel road to the top of the hill and a parking area near the radio telescopes, then walk along the path between the two fenced in areas (about 300 feet) to reach the McMath telescope building.



**Public Open House / Star Parties**

Public Open Houses / Star Parties are generally held on the Saturdays before and after the New Moon at the Peach Mountain observatory, but are usually cancelled if the sky is cloudy at sunset or the temperature is below 10 degrees F. For the most up to date info on the Open House / Star Party status call: (734)332-9132. Many members bring their telescope to share with the public and visitors are welcome to do the same. Peach Mountain is home to millions of hungry mosquitoes, so apply bug repellent, and it can get rather cold at night, please dress accordingly.

**Membership**

**Membership dues in the University Lowbrow Astronomers are \$20 per year for individuals or families, \$12 per year for students and seniors (age 55+) and \$5 if you live outside of the Lower Peninsula of Michigan.**

**This entitles you to the access to our monthly Newsletters on-line at our website and use of the 24" McMath telescope (after some training).**

**A hard copy of the Newsletter can be obtained with an additional \$12 annual fee to cover printing and postage. Dues can be paid at the monthly meetings or by check made out to University Lowbrow Astronomers and mailed to:**

**The University Lowbrow Astronomer c/o Yasuharu Inugi  
2918 W Clark Rd #203  
Ypsilanti, MI 48197**

Membership in the Lowbrows can also get you a discount on these magazine subscriptions:

Sky & Telescope - \$32.95 / year

Astronomy - \$34.00 / year or \$60.00 for 2 years

For more information contact the club Treasurer. Members renewing their subscriptions are reminded to provide the renewal notice along with your check to the club Treasurer. Please make your check out to: "University Lowbrow Astronomers"

**Newsletter Contributions**

Members and (non-members) are encouraged to write about any astronomy related topic of interest.

Call or Email the Newsletter Editor: **Mark S Deprest (734)223-0262 or [msdeprest@comcast.net](mailto:msdeprest@comcast.net)** to discuss length and format. Announcements, articles and images are due by the 1<sup>st</sup> day of the month as publication is the 7<sup>th</sup>.

**Telephone Numbers**

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**Lowbrow's Home Page**

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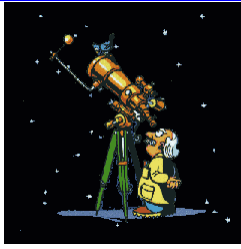
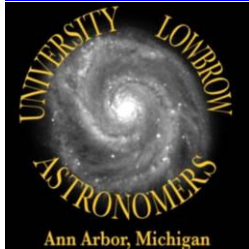


## University Lowbrow Astronomers

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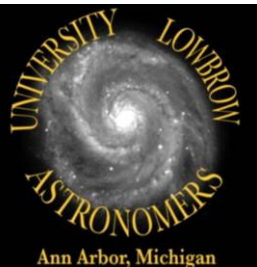
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### Reflections & Refractions



### Website

[www.umich.edu/~lowbrows/](http://www.umich.edu/~lowbrows/)



University Lowbrow Astronomers  
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## Meeting schedule for 2009:

March 20 – Pat Sitzer, space debris

April 17 – Elections and swap meet

May 15 – Belinda Lee, Night Sky Network

June 19 – TBD

July 17 – John Kirchhoff, Rider’s Hobby annual demo at Eastern Michigan University.

August 21 – Jack Lousma, form NASA astronaut

September 18 – TBD

October 16 – Mark Deprest & Friends, Okie-Tex Star Party report

November 20 – John Kirchhoff, Astrophotography

December 18 – TBD

There will be a special presentation on Sunday October 11 by the author of “Turn Left at Orion” and Vatican astronomer, Brother Guy Consolmagno. His topic will be “Are Asteroids Fluffy?”

## Open House Dates:

March – 14, 21, 28

April – 18, 25

May – 16, 23

June – 20, 27