



# AU AstroNews

## The Newsletter of the Astronomical Unit

May 2016

Sponsored by the Santa Barbara Museum of Natural History



*Jerry Wilson and Ruben Gutierrez assist as judges at the County Science Fair at UCSB. Photo: Tom Totton.*

### OUR MAY GENERAL MEETING

Our May General Meeting will take place on Friday, May 6th at 7PM. Our speaker this evening will be fellow club member, Karl Blasius, who will talk about the “Early Mission of Curiosity in Crater Gale.” In Karl’s own words: “Since August of 2012 the Mars Science Laboratory Curiosity has been conducting a seemingly leisurely investigation of the geology and surface environment inside a large ancient crater, Gale, in the equatorial region of Mars. The landing site was chosen to investigate the evolution of the Martian surface environment from a warmer wet early phase to today’s extremely dry and cold conditions. The principal mission objective was to study from bottom to top Mt. Sharp, an eroded remnant of a huge stack of layered rocks which apparently overfilled the crater. After 3.5 years of exploration Curiosity is still at the foot of Mt. Sharp, but the scientific payoff has been a new level of understanding of the early wet period of Mars. In coming years Curiosity is expected to ascend Mt. Sharp studying the layers of exposed rock, like reading the pages of a book from Chapter 1 to the last page of the last preserved chapter (layers have apparently been lost to erosion above the summit of Mt. Sharp). Prepare for this great

journey of exploration by finding out what we have learned from the early mission on the floor of Crater Gale.”

### OUTREACH SUMMARY

Since the last outreach report, intrepid AU astronomy volunteers Mike Chibnik, Adrian Conrad, Tim Crawford, Ruben Gutierrez, Sean Kelly, Ken Kihlstrom, Chris Larson, Adrian Lopez, Pat & Chuck McPartlin, Janet & Martin Meza, Bonnie & Bruce Murdock, Max Neufeldt, Edgar Ocampo, Tom Totton, Richard Ustick, Tom Whittimore, and Jerry Wilson showed neat stuff in the sky to **1391** people.

### MAY OUTREACH EVENTS

The Telescope Workshop meets on Tuesday evenings at 7:30PM at the Broder Building at SBMNH. Contact Tim Crawford at [tcrawf3@cox.net](mailto:tcrawf3@cox.net) for information. Listen to the AU on the radio at KZSB 1290 AM at 9 AM on the second and fourth Monday of each month.

Here are the AU events scheduled so far for May. Don't forget Astronomy Day! To get the latest information on schedules, or directions, just contact Chuck at 964-8201 or [macpuzl@west.net](mailto:macpuzl@west.net)

### FRIDAY, MAY 6, 7 PM

Monthly meeting in Farrand Hall at SBMNH. Start with a quick planetarium show, then hear about Mars exploration.

### MONDAY, MAY 9, SETUP 8 AM: TRANSIT OF MERCURY!

Watch the planet Mercury transit the face of the Sun from 9 AM to 11:45 AM at the Camino Real Marketplace in Goleta, in the plaza by the theater.

### TUESDAY, MAY 10, SETUP 7 PM

Telescope Tuesday at the Camino Real Marketplace in Goleta. We set up in the central plaza by the theater.

**THURSDAY, MAY 12, SETUP 5 PM**

Telescopes for a Science Night at Montessori Center School, in the school complex across Fairview Avenue from the Goleta Public Library.

**SATURDAY, MAY 14, SETUP 9 AM:**  
**INTERNATIONAL ASTRONOMY DAY!**

*Solar telescopes and astronomy activities for Astronomy Day at the Camino Real Marketplace, 10 AM until 3 PM, then a planning meeting and dinner, followed by an evening Star Party from 7 PM to 10 PM at the Palmer Observatory SBMNH.*

**FRIDAY, MAY 20, SETUP 7 PM**

Telescopes for the monthly Public Telescope Night at Westmont College, at their observatory next to the baseball field.

**THURSDAY, MAY 26 - MONDAY, MAY 30**

Annual RTMC Astronomy Expo at Big Bear Lake. Hang out with 1000 or so of your favorite amateur astronomers at 7000 feet.

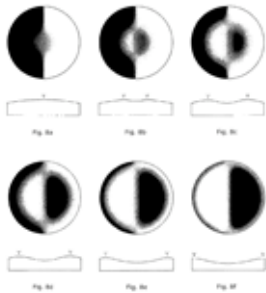
***From the Workshop...***

***The Foucault Knife-edge Test: Part II***

*Tim Crawford*

In our last installment we discussed some of the subtleties one can discern on the surface of a mirror by cutting the returning light from a source by a knife-edge. Let's continue to look at some of these

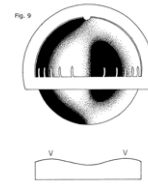
subtleties. Consider the figure to the left.



In the upper trio, we notice that, moving from left to right, the shadow patterns reveal the extent and depth of the middle depression in our mirror. The lower trio shows how the shadow pattern tracks the depth of the mirror as it moves out

toward the edge. Notice, in all cases, the light-and-dark pattern “flips” at the edge of each depression. This is going to become very important later as these edges become the calipers for the “zones” on our mirror. They become the radii where the figure on our mirror has a change in curvature.

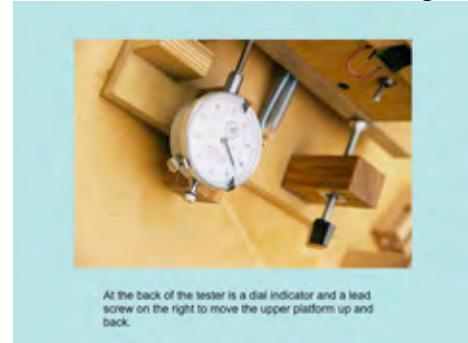
In our next figure we have placed some “pins” on these shadow locations. Notice that there is a change in curvature at the third pin from the center of our mirror. This pin is commonly placed where 50% of the light is collected by our mirror. Our mirror “grabs” 50% of incoming light inside this pin and 50% outside this pin. Now, remember that we are talking about the collecting area of our mirror here. Thus, the pin is actually located at 0.707 times the radius of our mirror. Make sense? Sure! 0.707 squared is 0.50! People are often surprised that this marker splits the collecting area exactly in half. But, it does! As you continue to add pins outside the third one, you can see that these pins are more closely spaced.



These mark, respectively, those locations where 70% and 90% of the light is collected by our mirror. There's a lot of area in these regions. And, because of this, we must make sure that our mirror is figured properly here!

It would be good to backtrack a bit here. Recall that a light source located at the center of curvature of a spherical mirror must return all the light back to the source. If a knife-edge cuts off the return light, the entire mirror will turn black. This is the property of a spherical mirror. But we have crafted a paraboloidal mirror, and this mirror has a host of radii of curvature, and each can be revealed by moving the source. You can think of the paraboloid as a surface defined by a host of “nested” spheres. And each of these spheres will have a specific radius of curvature. It was the genius of Leon Foucault to invent a test that could discern each of these radii and thus determine the location of each of the zones on the mirror.

To the left is a photo of the back end of a tester Tim Crawford built. It consists of a green LED light



source and a window into which either a Ronchi screen or a knife-edge can be placed. Both the source and the knife-edge move

At the back of the tester is a dial indicator and a lead screw on the right to move the upper platform up and back.

together. A mechanical “feeler” gauge allows the tester to sense very precisely the movement of the knife-edge from zone to zone. In our next installment we will discuss how the knife-edge data can be reduced so that the quality of the mirror may be diagnosed to a fraction of a wavelength of yellow light.



“Not another scratch?!” Photo: T. Totton.



“That’s right. The Big Bang was centered just about a quarter-mile down this road.” Photo: T. Totton.



“Mine, too, Ed. No bubble gum with my AstroCard, either.” Photo: T. Totton.

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AU **AstroNews**, the monthly publication of the **Astronomical Unit (AU)**, is mailed to the AU membership. For publishing consideration for the next month, submit astronomical items by the 20th of the current month!

### AU annual membership rates:

**Single = \$20 Family = \$25**

### AU mailing address:

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**May 2016**

| <b>Sunday</b> | <b>Monday</b>  | <b>Tuesday</b>                          | <b>Wednesday</b> | <b>Thursday</b>                   | <b>Friday</b>                          | <b>Saturday</b>   |
|---------------|--|---|------------------|-----------------------------------|--|---|
| 1             | 2  | 3                                       | 4                | 5                                 | 6<br>SBAU<br>GENERAL<br>MEETING<br>7PM | 7   |
| 8             | 9<br>MERCURY<br>TRANSIT!<br>8AM-NOON<br>CAMINO REAL<br>MARKETPLACE<br>TECH TALK<br>KZSB<br>(AM 1290)<br>9-10AM | 10<br>CAMINO REAL<br>MARKETPLACE<br>7PM | 11               | 12<br>MONTESSORI<br>SCHOOL<br>5PM | 13                                     | 14<br>ASTRONOMY<br>DAY 10-4PM<br>CAMINO REAL<br>MARKETPLACE<br>STAR PARTY<br>7:30-10PM<br>SBMNH |
| 15            | 16   | 17                                      | 18               | 19                                | 20<br>WESTMONT<br>COLLEGE<br>7PM       | 21  |
| 22            | 23<br>TECH TALK<br>KZSB<br>(AM 1290)<br>9-10AM   | 24                                      | 25               | 26<br>RTMC                        | 27<br>RTMC                             | 28<br>RTMC  |
| 29<br>RTMC    | 30<br>RTMC   | 31                                      |                  |                                   |  |   |

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