

# IO – June 2018

## The Newsletter of the Eugene Astronomical Society

PO Box 7264  
Springfield, OR 97475

Next Meeting: *Thursday, June 21*

### **Astronomical Distance Measurement**

At our club meeting on June 21st, Jerry Olton will talk about distance measurement, starting with how Eratosthenes measured the circumference of the Earth using the angle of shadows in two distant cities, and extending through parallax measurements to redshift measurements to the analysis of the cosmic microwave background that defines the visible edge of our Universe. If you've ever wondered how we know that Earth is 93,000,000 miles from the Sun or that our Sun is 27,000 light-years from the core of the Milky Way galaxy, this presentation is for you.

## EAS

### **President**

Diane Martin (541-554-8570)

### **Secretary**

Jerry Olton (541-343-4758)

### **Additional Board members**

Jim Murray

Oggie Golub

Andy Edelen

Annual Club Dues \$25

Meetings at 7:00 at the

Science Factory, Eugene



EAS is a proud member of the  
Astronomical League

## First Quarter Friday Report

Our First Quarter Friday for May 18<sup>th</sup> was clouded and rained out, as was our Saturday backup date. Our next First Quarter Friday will be on June 15<sup>th</sup>.

First Quarter Fridays have been scheduled for 2018. The chosen dates are:

June 15 (6% lit)

July 20 (60% lit)

August 17 (45% lit)

September 14 (29% lit)

October 12 (15% lit)

November 9 (5% lit)

December 14 (44% lit)

## June Meeting Report

At the May meeting, Bernie Bopp gave a detailed look at several new-generation telescopes being built and the stated missions for each of them.

Bernie began with a look back at the previous stage of "monster scope" building, which culminated with the 200-inch Palomar telescope. This iconic scope, something of a monument to the scientific endeavor, was the largest in the world for more than 25 years; its design and design principles (large single-piece primary mirror, equatorial mount, traditional dome structure) continued and expanded upon the long-standing principles of observatory building and were the apotheosis of that design philosophy, holding sway for almost four more decades. Even the 4-meter Mayall telescope on Kitt Peak, built by 1973, continued the design trends exemplified by the Palomar telescope.



Telescope and observatory design changed with the Multiple Mirror Telescope in Arizona, finished in 1979. This telescope introduced three new principles of earthbound observatories: the use of multiple (later, segmented) mirrors working as a single unit—in the case of the MMT, this involved six 72-inch mirrors acting as a single 4.5-meter scope; a computer-driven alt-azimuth mounting (which was less cumbersome than the old equatorial mounts); and adaptive optics (which use an artificial star as a means of correcting the figure of the telescope optics, allowing for real-time corrections to eliminate the effects of atmospheric turbulence). These principles have come to be used in almost all modern telescopes, from the twin Keck telescopes in Hawaii to those telescopes still in their planning stages.

Meanwhile, a revolution was also occurring in the manufacture of large telescope mirrors. Even the 200-inch Palomar telescope used new low-expansion glass (which prevents even minute changes in the mirror's surface figure from temperature changes) and a honeycombed back surface (which allowed for a lighter mirror with the rigidity of a solid piece of glass). The later development of spin-casting—the rapid rotation of the molten mirror glass, which brings the mirror much closer to its finished parabola—allowed for much shorter production times for large mirrors. Mirrors are spun throughout the entire casting process to avoid stresses in the finished glass, from a peak temperature of 7000° F through the cooling process, which can take several months.

These revolutions in design and construction have made the current wave of "monster" telescopes possible, and Bernie focused on four upcoming observatory projects in particular (he also noted that, for all their learning, astronomers tend toward really mundane names for their new toys).

The first of these, in terms of its expected date of first light—when the optics first gather starlight—is the Giant Magellan Telescope (GMT), to be situated at Las Campanas Observatory in northern Chile. This telescope, already underway and expected first light as soon as 2023, will use seven 8.4-meter mirrors to work as a single 24.5-meter mirror; this will allow for a resolution of up to 10 times that of the Hubble Space Telescope. Although coming in at a cost of about US \$1 billion, this is approximately a tenth of the cost of the upcoming James Webb Space Telescope.

The European Extremely Large Telescope is the second of these telescopes expected to be finished, with first light projected for 2024. This telescope will be also be situated in Chile, on Cerro Armazones, and will use 798 smaller mirror segments—each with its own collimating mechanism—to create a 39.3-meter mirror. This will allow for a resolution of up to 16 times that of HST, collecting 100 million times more light than the unaided eye and up to 13 times more than the Keck telescopes.

The third major telescope project is the imaginatively-named Thirty-Meter Telescope (TMT). The primary optic of the TMT will comprise 492 hexagonal mirror segments with (surprise!) a 30-meter overall size. This will provide a resolution twelve times that of the HST, with first light expected in 2027. However, this project has been the center of controversy—planned originally for the summit of Mauna Kea, construction has been halted by lawsuits from environmentalists and native-rights groups, all of whom object to the crowding and free usage of a sacred mountaintop. As a result, the TMT may actually find its home on La Palma in the Canary Islands, alongside a number of other major telescopes (including the 4.2-meter William Herschel Telescope).

The final telescope project Bernie discussed was actually a smaller scope with a specific mission. Unlike the three previously-mentioned telescopes, which will have varying uses (searching for exoplanets, imaging primordial galaxies, etc.), the Large Synoptic Survey Telescope (LSST) will be primarily a photographic instrument. Featuring a single 8.4-meter f/1.2 primary, the LSST will be employed to image the entire sky over the span of several days, then starting over and reimaging the same areas of sky. The LSST will use a three-mirror system (with the unique primary mirror being ground into two separate curves rather than a simple parabola), plus a 3.2 gigapixel camera, to take a 15-second exposure of a 3.5-degree field every twenty seconds. This will result in a staggering 30 terabytes of data per night, with the expectation that the data will be released into the public domain for use in numerous projects; the data will also be processed on-site, as fast as one minute after exposure. The primary purpose of all this data will be to catch transient phenomena—near-earth objects, novae and supernovae, variable stars, gamma-ray bursts, and the like—with enough speed to allow for further study of those objects.

Thanks, Bernie, for the fascinating talk!

## EAS Outreach Calendar

June 26 – Boys and Girls Club – (Presentation only)

July 11 – Shorewood Senior Living – (Presentation only)

July 13 – Dorris Ranch – **Star Party**

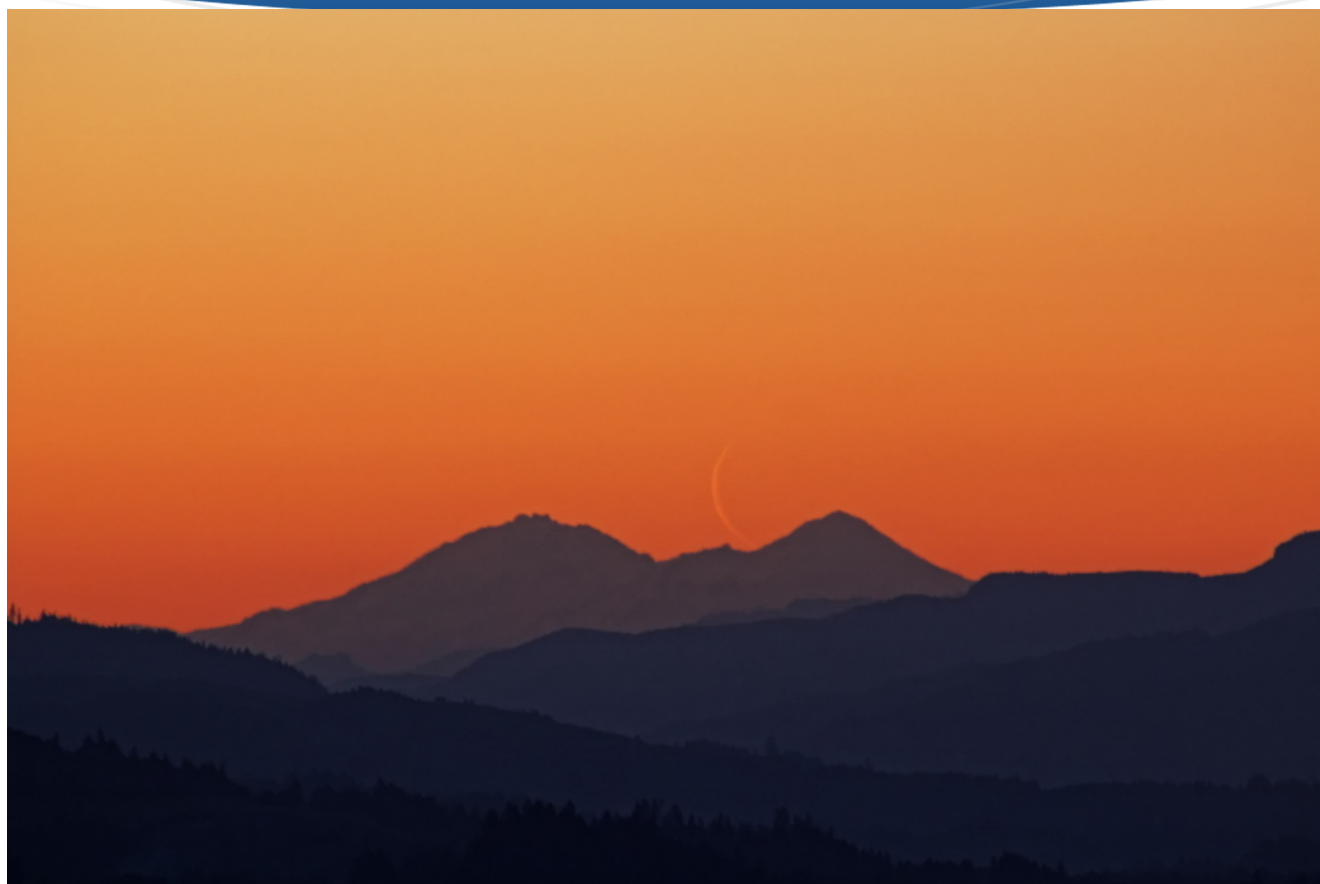
July 16 – Camp Lutherwood – (Presentation only)

July 20 – First Quarter Friday – **Star Party**

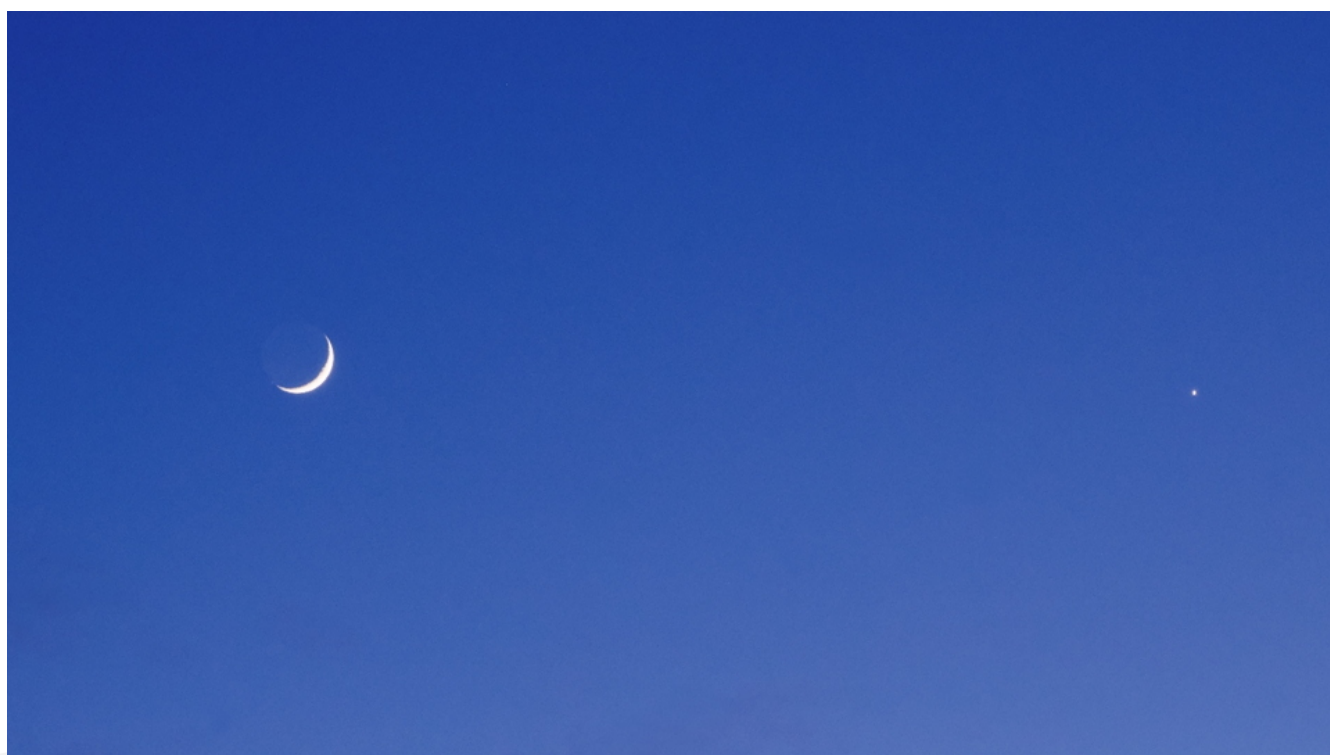
July 25 – Camp Wilani – **Star Party**

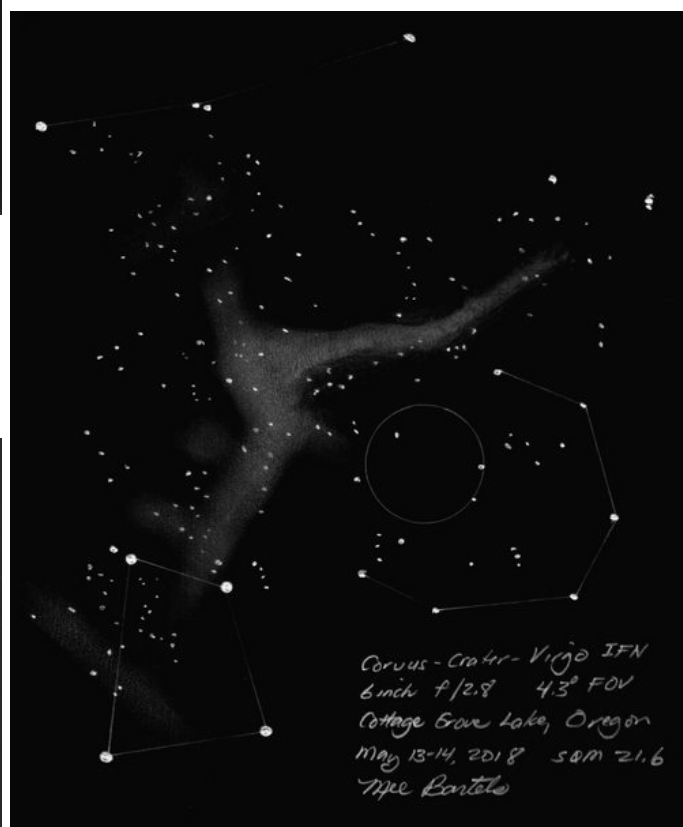
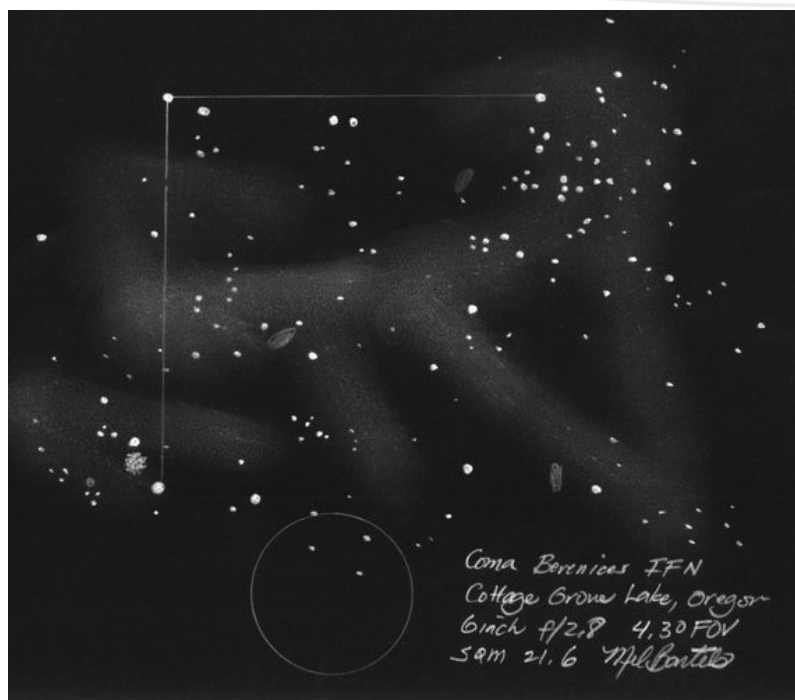
August 4 - **Dexter Dark Sky Party**

Contact Bruce Hindrichs ([brucehindrichs@yahoo.com](mailto:brucehindrichs@yahoo.com)) to volunteer!



Two Crescents. Above: Moon over Three Sisters, May 13<sup>th</sup>. Below: The Moon and Venus, May 17<sup>th</sup>. *Photos by Alan Gillespie.*





Springtime Integrated Flux Nebulae, clockwise from upper left: Across Coma Berenices; in Virgo, Corvus, and Crater; and in the Hydra/Sextans region. *Sketches by Mel Bartels.*



Above: The Milky Way from Antares (far right) through Sagittarius, including Saturn (center left) and Mars (left edge). Below: Jupiter through power lines. *Photos by Alan Gillespie.*





First Quarter Moon, May 21<sup>st</sup>. *Photo by Jim Murray.*

## Sun & Moon rise and set for June

Date	MoonRise	Moon Set	Twilight Begin	Sunrise	Sun Set	Twilight End
6/1/2018	23:30	08:09	03:15	05:32	20:49	23:07
6/2/2018		09:01	03:13	05:32	20:49	23:08
6/3/2018	00:10	09:57	03:12	05:31	20:50	23:10
6/4/2018	00:47	10:54	03:11	05:31	20:51	23:11
6/5/2018	01:19	11:54	03:10	05:31	20:52	23:13
6/6/2018	01:48	12:55	03:09	05:30	20:52	23:14
6/7/2018	02:16	13:58	03:08	05:30	20:53	23:15
6/8/2018	02:43	15:02	03:08	05:30	20:54	23:16
6/9/2018	03:11	16:09	03:07	05:29	20:54	23:17
6/10/2018	03:40	17:19	03:06	05:29	20:55	23:18
6/11/2018	04:14	18:31	03:06	05:29	20:55	23:19
6/12/2018	04:53	19:45	03:05	05:29	20:56	23:20
6/13/2018	05:39	20:56	03:05	05:29	20:56	23:21
6/14/2018	06:34	22:02	03:04	05:29	20:57	23:22
6/15/2018	07:37	22:59	03:04	05:29	20:57	23:22
6/16/2018	08:47	23:48	03:04	05:29	20:58	23:23
6/17/2018	10:00		03:03	05:29	20:58	23:24
6/18/2018	11:12	00:28	03:03	05:29	20:58	23:24
6/19/2018	12:23	01:03	03:03	05:29	20:59	23:24
6/20/2018	13:32	01:34	03:04	05:29	20:59	23:25
6/21/2018	14:38	02:02	03:04	05:29	20:59	23:25
6/22/2018	15:43	02:30	03:04	05:30	20:59	23:25
6/23/2018	16:47	02:58	03:04	05:30	20:59	23:25
6/24/2018	17:49	03:28	03:05	05:30	20:59	23:25
6/25/2018	18:49	04:01	03:05	05:31	21:00	23:25
6/26/2018	19:46	04:38	03:06	05:31	21:00	23:24
6/27/2018	20:39	05:19	03:06	05:31	21:00	23:24
6/28/2018	21:27	06:04	03:07	05:32	20:59	23:24
6/29/2018	22:10	06:55	03:08	05:32	20:59	23:23
6/30/2018	22:48	07:49	03:09	05:33	20:59	23:23

All times are for Eugene, Oregon Latitude 44° 3' Longitude 123° 06'



### Thank you, Storage Junction

Storage Junction has donated the use of a storage unit for us to hold our loaner telescopes when they're not in use. EAS would like to thank Storage Junction for their generosity and support for our group. Please give them a call if you need a storage space, and tell your friends. Storage Junction is located at 93257 Prairie Road (at the intersection of Hwy 99 and Hwy 36, 3 miles south of Junction City) Phone: 541-998-5177.



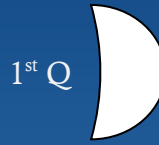
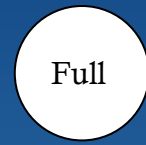
# Observing In June



Last Q



New

1<sup>st</sup> Q

Full

June 6, 11:32 AM	June 13, 12:43 PM	June 20, 3:51 AM	June 27, 9:53 PM
Mercury lost in Sun	Mercury Set: 9:47 PM	Mercury Set: 10:16 PM	Mercury Set: 10:27 PM
Venus Set: 11:31 PM	Venus Set: 11:31 PM	Venus Set: 11:27 PM	Venus Set: 11:21 PM
Mars Rise: 00:21 AM	Mars Rise: 11:57 PM	Mars Rise: 11:34 PM	Mars Rise: 11:10 PM
Jupiter Set: 4:07 AM	Jupiter Set: 3:38 AM	Jupiter Set: 3:09 AM	Jupiter Set: 2:41 AM
Saturn Rise: 10:12 PM	Saturn Rise: 9:42 PM	Saturn Rise: 9:13 PM	Saturn Rise: 8:43 PM
Uranus Rise: 3:22 AM	Uranus Rise: 2:55 AM	Uranus Rise: 2:28 AM	Uranus Rise: 2:01 AM
Neptune Rise: 1:46 AM	Neptune Rise: 1:19 AM	Neptune Rise: 00:51 AM	Neptune Rise: 00:24 AM
Pluto Rise: 11:06 PM	Pluto Rise: 10:38 PM	Pluto Rise: 10:10 PM	Pluto Rise: 9:42 PM

All times Pacific Standard Time (November 4, 2018 - March 9, 2019 = UT -8 hours) or Pacific Daylight Time (March 11 - Nov. 3, 2018 = UT -7 hours)

## Items of Interest This Month



Mercury visible in second half of month after sunset

**6/6** Io shadow transit 10:02 – 12:12 PM

**6/10** Venus, Castor, and Pollux line up

**6/13** Io shadow transit 11:56 PM – 2:06 AM

**6/15 First Quarter Friday star party**, Io shadow transit 6:25 – 8:35 (in daylight), Callisto passes above Jupiter's N. pole

**6/16** Beehive Cluster between crescent Moon and Venus, Io and Europa pass one another ~10:30 PM

**6/19** Vesta at opposition, visible by naked eye under dark sky (Mag 5.3), Venus passes Beehive Cluster

**6/20** Europa shadow transit 7:57 – 10:14 PM

**6/21** Summer solstice 3:07 AM

**6/22** Io shadow transit 8:19 – 10:29 PM

**6/25** Europa and Ganymede pass one another ~ 9:45 PM

**6/27** early AM, Moon passes within 1/2° of Vesta (closest approach ~2:45 AM.), Saturn at opposition (visible all night, but full Moon is only 1° away at Moon/Saturn rise), Europa shadow transit 10:34 PM – 00:51 AM

**6/29** Io shadow transit 10:14 PM – 00:24 AM

**7/2** Europa, Ganymede, and Callisto cluster 11 PM – midnight, form diagonal line 2:00 AM on 7/3