



the Skyscraper

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What Makes It Go

Friday, June 12, 7:00pm
at Seagrave Memorial Observatory

Exploring Volcanoes on Earth and in other parts of the Solar System by Steven Carey

Volcanoes have played a fundamental role in the evolution of the Earth. They build new landmasses, contribute gases to the ocean and atmosphere, impact global climate, and pose significant geohazards to human populations. Interplanetary exploration has provided a wealth of information about volcanic activity on planets and moons in other parts of our solar system. Although some similarities exist, there are fascinating differences in the way volcanoes grow and behave far from Earth. This talk will provide a tour of volcanism throughout our Solar System and examine what controls the shape, composition, and eruptive behavior of volcanoes on different planets and moons. An interesting observation is that no other planet or moon in the Solar System, apart from the Earth, appears to be governed by the phenomenon of plate tectonics. Why is that?

URI Graduate School of Oceanography geological oceanographer Steven Carey is an internationally recognized expert on explosive volcanism. During the past three decades he has studied volcanoes in 12 different countries including Mt. St. Helens in the United States, Mt. Vesuvius in Italy, and Krakatau in Indonesia. He has authored more than 100 publications in the field of volcanology and is active on committees of the International Association of Volcanology and Chemistry of the Earth's Interior. Currently he serves on the Science Advisory Committee for the Ocean Exploration Trust and sails frequently as the chief scientist on the research vessel E/V Nautilus. This summer he will be co-leading a cruise of the Nautilus to the Galapagos Islands in the Pacific.

Phases of the Moon

Full Strawberry Moon
June 2 16:19

Last Quarter Moon
June 9 15:41

New Moon
June 16 14:05

First Quarter Moon
June 24 11:03



President's Message

by Bob Horton

Skyscrapers recently completed a series of workshops on beginning astronomy, offered to both members and the public. The topics ranged from learning the constellations, observing the sky with binoculars and small telescopes, observing the sun, and understanding the sky coordinate system.

These workshops were well attended and enjoyed all. They were obviously a success, because we have been getting requests for more workshops. A few people have also requested more advanced offerings, such as CCD imaging and image processing. I am happy to report that we have already begun planning for another series of workshops to be offered this coming fall. If there is a topic you would like to see offered, please let me know.

This was also a very satisfying experience for our instructors, too. On behalf of Skyscrapers, I would like to thank Conrad Cardano, Steve Siok, Ian Dell'Antonio and Francine Jackson for volunteering as workshop instructors. I also wish to thank all of our members that helped out by answering questions and for operating our telescopes on the nights these workshops were offered.

Now that the summer season is approaching, we have some other activities to look forward to. On July 18th, Skyscrapers

will be offering a "Pluto Party" and cookout to celebrate the New Horizons mission to Pluto. This will be just days after the closest approach, and we hope to show some close-up images of Pluto taken by NASA's New Horizons spacecraft. Additionally, weather

permitting; we will outfit one of our telescopes with a CCD camera so that we can show our own images of distant Pluto within the constellation of Sagittarius. We will have more information in our next newsletter.



Saturn is now prominently placed for observing during Saturday night open nights at Seagrave Observatory. Jim Hendrickson captured this snapshot of the ringed planet through the 8-inch Clark refractor.



The *Skyscraper* is published monthly by Skyscrapers, Inc. Meetings are held monthly, usually on the first or second Friday or Saturday of the month. Seagrave Memorial Observatory is open every Saturday night, weather permitting.

Directions

Directions to Seagrave Memorial Observatory are located on the back page of this newsletter.

Submissions

Submissions to The Skyscraper are always welcome. Please submit items for the newsletter no later than **June 19** to Jim Hendrickson, 1 Sunflower Circle, North Providence, RI 02911 or e-mail to jim@distantgalaxy.com.

E-mail subscriptions

To receive The Skyscraper by e-mail, send e-mail with your name and address to jim@distantgalaxy.com. Note that you will no longer receive the newsletter by postal mail.

President

Bob Horton Robert_Horton@brown.edu

1st Vice President

Steve Siok ssiok@cox.net

2nd Vice President

Kathy Siok kathys5@cox.net

Secretary

Tina Huestis qthuestis@gmail.com

Treasurer

Ed Haskell haskell.ed@gmail.com

Members at Large

Ian Dell'Antonio ian@het.brown.edu

Tracy Prell katbqp@msn.com

Trustees

Jim Crawford jcrawford@cox.net

Tom Thibault DeepSpaceViewer@aol.com

Matt Ouellette matt80844@yahoo.com

Public Outreach Coordinator

Francine Jackson Francine_Jackson@brown.edu

Public Relations Spokesperson

Francine Jackson Francine_Jackson@brown.edu

Observatory Committee Chairperson

Jim Crawford jcrawford@cox.net

Membership Activities Coordinator

Pat Landers pblanders5@gmail.com

Librarian

Alex Bergemann astroalex@verizon.net

Historian

Dave Huestis dhuestis@aol.com

Archivist

Jim Crawford jcrawford@cox.net

Editor

Jim Hendrickson jim@distantgalaxy.com

The Sun, Moon & Planets in June

This table contains the ephemeris of the objects in the Solar System for each Saturday night in June. Times are in Eastern Daylight Time calculated for Seagrave Observatory (41.845N, 71.590W).

Object	Date	RA	Dec	Const	Mag	Size (")	Elong	Phase(%)	Dist(S)	Dist(E)	Rise	Transit	Set
Sun	6	4 54.9	22 35.4	Tau	-26.8	1,891.6	0° W	100	-	1.01	05:11	12:45	20:18
	13	5 23.8	23 10.4	Tau	-26.8	1,889.9	0° W	100	-	1.02	05:10	12:46	20:22
	20	5 52.9	23 25.4	Tau	-26.8	1,888.8	0° W	100	-	1.02	05:10	12:47	20:24
	27	6 22.1	23 20.2	Gem	-26.8	1,888.1	0° W	100	-	1.02	05:12	12:49	20:25
Moon	6	19 55.4	-16 35.6	Sgr	-12.6	1,901.5	138° W	87	1.02	-	22:48	04:00	09:17
	13	2 15.6	10 22.5	Cet	-10.7	1,912	46° W	15	1.01	-	03:10	10:09	17:16
	20	8 39.3	13 21.4	Cnc	-10.3	1,824	41° E	12	1.01	-	09:16	16:14	23:05
	27	14 07.1	-11 04.9	Vir	-12.2	1,823.4	118° E	74	1.02	-	15:59	21:21	02:39
Mercury	6	4 18.1	17 47.6	Tau	3.1	11.9	10° W	4	0.47	0.57	04:56	12:04	19:12
	13	4 13.8	16 54.5	Tau	1.9	10.6	18° W	13	0.45	0.64	04:28	11:33	18:39
	20	4 23.5	17 34.5	Tau	0.9	9.1	22° W	26	0.43	0.74	04:08	11:17	18:27
	27	4 47.7	19 21.2	Tau	0.2	7.7	22° W	42	0.39	0.88	03:57	11:15	18:33
Venus	6	8 12.4	22 30.4	Cnc	-4.2	23.6	45° E	50	0.72	0.72	08:32	16:02	23:31
	13	8 39.5	20 37.9	Cnc	-4.3	25.7	45° E	46	0.72	0.66	08:40	16:01	23:22
	20	9 03.9	18 30.5	Cnc	-4.3	28.1	45° E	42	0.72	0.6	08:45	15:58	23:09
	27	9 25.3	16 13.5	Leo	-4.4	30.9	44° E	37	0.73	0.55	08:48	15:51	22:53
Mars	6	5 04.8	23 22.5	Tau	1.5	3.7	2° E	100	1.54	2.56	05:19	12:54	20:28
	13	5 25.7	23 48.3	Tau	1.5	3.6	1° E	100	1.55	2.57	05:10	12:47	20:23
	20	5 46.5	24 03.6	Tau	1.5	3.6	2° W	100	1.56	2.57	05:02	12:40	20:18
	27	6 07.2	24 08.5	Gem	1.5	3.6	3° W	100	1.57	2.58	04:55	12:33	20:11
Ceres	6	20 55.3	-25 11.8	Cap	8.3	0.6	125° W	98	2.92	2.21	00:20	04:43	09:06
	13	20 54.8	-25 47.2	Cap	8.2	0.6	132° W	98	2.93	2.14	23:55	04:15	08:35
	20	20 53.1	-26 27.3	Cap	8.1	0.6	139° W	99	2.93	2.08	23:29	03:46	08:03
	27	20 50.2	-27 11.1	Cap	7.9	0.6	146° W	99	2.93	2.03	23:02	03:16	07:29
Jupiter	6	9 20.3	16 28.1	Cnc	-1.8	34.1	62° E	99	5.37	5.76	10:03	17:07	00:10
	13	9 24.6	16 07.8	Leo	-1.7	33.6	57° E	99	5.37	5.86	09:41	16:44	23:46
	20	9 29.2	15 45.6	Leo	-1.7	33.1	51° E	99	5.37	5.95	09:20	16:21	23:21
	27	9 34.0	15 21.9	Leo	-1.7	32.6	46° E	100	5.37	6.03	08:59	15:58	22:57
Saturn	6	15 55.7	-18 09.4	Lib	0.1	18.4	165° E	100	9.98	9	18:46	23:40	04:35
	13	15 53.7	-18 04.3	Lib	0.1	18.3	158° E	100	9.98	9.03	18:16	23:11	04:05
	20	15 51.9	-17 59.7	Lib	0.2	18.2	151° E	100	9.98	9.08	17:47	22:42	03:36
	27	15 50.2	-17 55.9	Lib	0.2	18.1	144° E	100	9.98	9.14	17:17	22:12	03:08
Uranus	6	1 13.0	7 02.9	Psc	5.9	3.4	55° W	100	19.99	20.55	02:33	09:00	15:28
	13	1 13.9	7 08.4	Psc	5.9	3.4	62° W	100	19.99	20.45	02:06	08:34	15:02
	20	1 14.7	7 13.1	Psc	5.9	3.5	68° W	100	19.99	20.34	01:39	08:07	14:35
	27	1 15.4	7 17.1	Psc	5.8	3.5	75° W	100	19.99	20.23	01:12	07:40	14:09
Neptune	6	22 46.6	-8 36.6	Aqr	7.9	2.3	95° W	100	29.96	29.86	01:03	06:34	12:05
	13	22 46.6	-8 36.5	Aqr	7.9	2.3	102° W	100	29.96	29.74	00:36	06:07	11:38
	20	22 46.6	-8 37.1	Aqr	7.9	2.3	109° W	100	29.96	29.63	00:08	05:39	11:10
	27	22 46.4	-8 38.3	Aqr	7.9	2.3	115° W	100	29.96	29.52	23:41	05:12	10:42
Pluto	6	19 04.1	-20 34.7	Sgr	14.1	0.3	150° W	100	32.89	32	22:08	02:52	07:36
	13	19 03.4	-20 36.2	Sgr	14.1	0.3	157° W	100	32.89	31.95	21:40	02:24	07:08
	20	19 02.8	-20 37.8	Sgr	14.1	0.3	164° W	100	32.89	31.92	21:12	01:56	06:40
	27	19 02.0	-20 39.4	Sgr	14.1	0.3	170° W	100	32.9	31.9	20:44	01:28	06:11

New Horizons Spacecraft to Encounter Pluto

by Dave Huestis

Basic astronomical knowledge seems to be lacking among the general population these days. However it has been my experience that almost everyone knows that Pluto, an icy world out in the depths of our solar system, was kicked out of the planet club. The International Astronomical Union (IAU) that governs such things decided to modify the definition for a planet, and Pluto no longer qualified as one. A new term, dwarf planet, was introduced. This reclassification became official on August 24, 2006.

Interestingly enough, just seven months prior, on January 19, NASA launched the New Horizons spacecraft to explore the planet Pluto and its five known moons. Pluto has an eccentric orbit that varies from 2.7 billion miles out to 4.6 billion miles from the Sun, so it is understandable that the journey takes a long time. And that journey is almost completed. On July 14, at around 7:50 a.m. EDT, this small piano-sized craft will cruise by Pluto, passing approximately 7,800 miles above the surface at about 31,000 miles per hour. At the time of close encounter, the Earth will be a distant three billion miles away. New Horizons' radio signal, travelling at 186,282 miles per second, will take almost four and a half hours to reach mission control.

Not only will New Horizons obtain detailed images of Pluto and its moon Charon, but also it will map features of the other four moons as well. Instruments will record a wide-range of data, including Pluto's surface and atmospheric composition and temperature. Charon's surface will be analyzed, and instruments will determine if it has an atmosphere. The astronomical community will learn more about Pluto during this mission than they have since its discovery in 1930. It will be an exciting time in (dwarf) planetary exploration.

The Seagrave-Lowell Pluto Connection

As historian for Skyscrapers, Inc, the Amateur Astronomical Society of Rhode Island, I am privileged to share a special Rhode Island connection to Pluto with you of which only a few people are aware.

First, let's briefly examine the history of

Pluto's discovery. A wealthy Boston astronomer, Percival Lowell, started a search for "Planet X" in 1905 using his observatory out in Flagstaff, Arizona. Why the search for an unknown object? Because of small perturbations in Neptune's orbit, it was suggested another "Trans-Neptunian planet" existed. Lowell, with his mathematics background, and with the help of colleagues, tried to derive a possible orbit. They even took photographic plates in 1906 of an area of sky where they thought planet "X" might be located, but with no results.

During my research on the life of Frank Evans Seagrave (1860-1934), the original owner of Seagrave Memorial Observatory in North Scituate, I uncovered many unique and fascinating details about this Rhode Island astronomer. Seagrave was a frequent visitor to Harvard College Observatory (HCO) in Cambridge, Massachusetts during the first decade of the 1900s. And though Lowell spent most of his time out at Flagstaff, he did have an office in Boston. My research revealed that Seagrave and Lowell not only corresponded, but also they became good friends. They both had a flair for mathematics, and both loved astronomy.

Seagrave was very well known up at HCO, having sent many letters to Director E.C. Pickering containing computations for the orbits of comets (including Halley's Comet in 1910) and asteroids. And Seagrave contributed these same calculations to many of the astronomical journals of the time.

I do not know when Lowell and Seagrave first met, but from 1915 – 1917, when Seagrave was "working" as an assistant at HCO, it is apparent they had become fast friends. I have copies of a couple of postcards between them in January and February 1915. Seagrave was trying to compute a new asteroid's orbit. He wrote, "My Dear Friend. Well how do you do. Hope you arrived safe at Flagstaff. I am at work on that asteroid orbit and will send figures to you when finished. Thank you very much for all you have done and are doing for me. Let us hear from you. Hope you will find X."

Seems it wasn't an asteroid but a com-

et, for Lowell sent a response to Seagrave on March 3, 1915 saying, "So the Harvard 'harvest on their plates' have made an asteroid into a comet! That's going some. And I am told The Herald tried to credit us with the transformation. No! No! we are only astronomers, not astro-misnomers. I wish this definition, which I just dropped off the end of my obliging pen, had occurred to me yesterday when I wired a modest denial of such ultra-heavenly powers with a 'please correct' to the Herald."

Lowell died at age 61 on November 12, 1916. The search for "Planet X" ended. Seagrave continued his correspondence with Dr. Slipher, the new Director of Lowell Observatory. On April 23, 1917, Seagrave wrote to Slipher, "Have you taken any observations of Mellish's latest Comet? I want some positions. The computed orbit is away off, and I wanted to see what I could make out of it. Three positions, say a week apart. How are you getting along these days since Dr. Lowell died? I do miss him so. I am yours."

In a follow-up letter in an obvious response to Slipher's answer, Seagrave wrote, "Thank you so much for your letter that I received Sunday morning. If you should at anytime find any conspicuous object that you think is "X" please send me some positions. Dr. Lowell many times promised me that I should be the first one to work on its orbit when discovered."

The search for Planet "X" resumed in 1929. Finally, on February 18, 1930, Clyde Tombaugh discovered Lowell's distant world by "blinking" photographic glass plates he had meticulously exposed. As Clyde told Skyscraper members when he visited Seagrave Observatory for Astro Assembly in 1987, until he informed his colleague Dr. C. O. Lampland across the hall from his office and then his boss V.M. Slipher, for 45 minutes he was the only person in the world who knew of the new planet's existence.

This monumental discovery was announced to the world on March 13, 1930. Seagrave, now 70 years-old, hadn't been asked to compute Pluto's orbit as had been promised. In a letter to Dr. Slipher in Flagstaff on March 14, 1930, Seagrave wrote,

“Can you send me some positions of planet X, the newly discovered one beyond the planet Neptune. Many years ago (say from 1912 to 1915) the late Dr. Lowell promised me that if the Lowell Observatory ever found X that he would let me be one of the first to compute its orbit ... Thank you in advance for anything you can send me in relation to this most interesting planet. I am yours. Frank E. Seagrave.”

Well, Seagrave didn't immediately receive an answer to his query. One month later, on April 15, 1930, an impatient Seagrave sent another letter to Dr. Slipher at Lowell Observatory in Flagstaff. He wrote. “About the middle of March I sent you a letter asking for some photographic positions of the outer Neptunian planet, or the new Asteroid, or the new Comet, whatever it proves to be. Up to date I have never heard from you. I am wondering why as the newspapers all mention positions secured during January and February. The last time I was with Dr. Percival Lowell was late in September 1916. At that time he was getting ready to leave Boston (I was at the Lowell Observatory Office, 53 State St, Boston with him.) for Flagstaff, and was to stop at three or four places on the way to lecture. He showed me his computations in relation to the outer Neptunian planet, and said to me, ‘Seagrave, if the Lowell Observatory is the Observatory that will first find this planet, you will be the first one to compute its orbit.’ No writing to this effect. Only a verbal statement. I am wondering why you did not send me some positions as you seem to have sent some to Dr. Miller of Sproul. Dr. Van Biesbroeck of Yerkes Observatory sent me four positions. From two of these positions one of March 16 and one of March 20, I have computed approximate circular elements as per enclosed sheet. The enclosed look ‘OK’ and all check ‘OK’. Here Seagrave supplies some formulas and provides the sheet of elements. In closing, Seagrave writes, “I shall hope to hear from you soon, and tell me the very latest. Is it ‘X’, an Asteroid of enormous size, or a Comet great in size and nearly 40 units from the Sun. I am yours. Frank E. Seagrave.”

Slipher finally responded to Seagrave on April 19. “It was my aim to get off to you yesterday some of the early positions of Lowell's Transneptunian object, apparently planet X, but the day was not long enough. In fact, as you can imagine the days have for weeks all been too short for us to get done what should have been done, and we, in consequence have had to appear unfriendly



DEPARTMENT OF ASTRONOMY
Box 4500/Las Cruces, New Mexico 88003
Telephone (505) 646-4438



27 January 1987
To members of Skyscrapers:

Regarding my thoughts on the discovery of the planet, Pluto, 57 years ago, it is still very vivid to me on that 18th day of February 1930. One year earlier, I was assigned to search for Lowell's predicted Planet X with a new wide angle 13-inch photographic telescope.

I had searched thru about one-third of the Zodiac Belt by examining many pairs of 14x17 inch plates, scanning thru about 4-million star images under the Blink-Comparator. On a pair of plates I had taken in eastern Gemini in January, I encountered one star-like image that shifted position 1/8th of an inch in a 6-day interval. The Earth's orbital motion produces a 'parallax' effect. This amount of shift indicated that the object was about one billion miles beyond the orbit of Neptune. Instantly, it was a tremendous thrill.

After observing the apparent motion for a few weeks, the discovery was announced to the world on the 13th of March 1930. A few weeks later, the 9th planet of the solar system was named 'Pluto'.

Clyde W. Tombaugh

Clyde Tombaugh visited Skyscrapers in 1987 and presented us with this letter and signed photograph.



or discourteous to many good people like yourself. And just now your second letter has come to hand with your orbit, for which we thank you.”

Slipher went on to say that “it seemed to me that we here should determine for it a preliminary orbit. This because it seemed best for Lowell Observatory to find it out and make it known if the object were thus shown to be less important than it had appeared. Dr. Lowell and the Observatory had put so much into the problem as to appear to justify this policy.” He went on to say,

“The enclosed positions are being mailed to you in advance of any other person (this is, of course, in confidence). And I hope you will feel that we have tried to be fair. We of course realized at the outset that you who compute orbits were better equipped to do such work, but the reasons given above decided our course. We hope that you will get from these early places and other more recent ones an improved orbit, and needless to say we shall be greatly obliged to you for letting us know what results you get. With best wishes. V.M. Slipher”

As the months went by and more observations were made, Seagrave continued to receive new positions to compute a more refined orbit for Lowell’s “Planet X.” Only a few individuals know of Seagrave’s Lowell and Pluto connection. I hope to remedy that oversight when I publish Seagrave’s biography.

So as the New Horizons spacecraft explores this distant world, think about Frank Seagrave’s contributions in calculating Pluto’s orbit by hand 85 years ago. This Rhode Island astronomer helped to pave the way for our quest for knowledge in the far reaches of the solar system.

While Pluto is merely a tiny speck as seen through the largest of the telescopes in Rhode Island, there are many other more prominent celestial objects to view that will impress you with their beauty. Let the volunteers at all the Rhode Island observatories (<http://www.theskyscrapers.org/free-public-observing-at-seagrave-memorial-observatory>) help you explore the heavens during free public open nights.

Keep your eyes to the skies.



Dave Huestis is Skyscrapers Historian and has been contributing monthly columns to local newspapers for nearly 40 years. See more at <http://theskyscrapers.org/dave-huestis>

Celebrate the Pluto Encounter

by Francine Jackson

Sometimes it seems we can grow old waiting for events to happen in science; but, then, when it occurs, it’s as if it began yesterday, such as, for example, New Horizons, which is finally about to perform its magic on our outer neighborhood object Pluto.

Launched the same year Pluto received its demotion as a full-fledged planet, New Horizons left Earth on January 19th, 2006, and except for a trial run at Jupiter to test its main equipment, has not been doing an awful lot. While passing by Jupiter, however, the fairly small craft returned information on our largest planet’s atmosphere, magnetosphere, and some of its satellites. Jupiter also aided in the continuation of New Horizons’ trip, giving it a gravity assist, which increased its velocity by about 9,000 miles per hour.

From that short stint at Jupiter to just a few months ago, New Horizons had been hibernating, saving itself – except for minor checks – until, this past December, it

returned to working mode, in anticipation of its historic pass around one of our more elusive solar system bodies.

First discovered in 1930 by Clyde Tombaugh – who, after telling his boss, took the rest of the day off – most of Pluto’s information was pure conjecture. Other than its distance from the Sun, which gave us its revolution time, all other information was beyond our comprehension – until 1978, when James Christy, utilizing a new form of equipment for astronomy, a computer, announced the discovery of a satellite that, not only orbited exceedingly close to Pluto, but was half the planet’s diameter. Charon, in one swift moment, began what was to be finalized in 2006 – the demotion of Pluto as a full-fledged planet, and the introduction of a new solar system category: Dwarf planet.

Formally the only “planet” not to have been visited by spacecraft, Pluto is now the second dwarf planet that will have its surface identified. We can’t forget Ceres, which

is being orbited by Dawn, and will be for the next several months. Pluto’s mission, however, is merely a flyby. Its mission has already begun, but hold your breath for the real close-up date in mid-July. We at Seagrave are planning on having a celebration of this historic event, on July 18th, so please, mark your calendars. For those of us waiting what appeared to be forever for this event, or for you young astronomy lovers who were barely born when New Horizons was launched from Earth, this is one mission we can’t afford to pass up. We will publish the details very soon.



Francine Jackson is Skyscrapers Public Relations Spokesperson, writes the weekly newsletter for Ladd Observatory, teaches astronomy at Framingham State and serves as planetarian at the University of Rhode Island. See more at <http://theskyscrapers.org/francine-jackson>

Asteroid 1613 Smiley

by Pete Peterson

Sunday, 3 May 2015

Tonight's sky has scattered cloud but along about 20:00 it appeared to have cleared. Since Jim Hendrickson's requested a yardstick for his new camera using asteroid 1613 Smiley I'm going to chance it. Out at 20:15. The breeze is light and the seeing's good. Temperature's 50°F. Setup runs smoothly.

1613 Smiley is a 31.5 km sized main belt

asteroid now 16.3 magnitude and 2.2 AU distant. Discovered on September 16, 1950, it is named after American astronomer Charles Hugh Smiley. The RMS residual on the ephemeris is 0.47". Imaged from 20:57 – 21:10 before cloud closed in. 6 frames were successfully taken at 3 minute exposure, 2X2 binning, -15C cooling 1 Hz guiding (on a 12.6 mag star). Frames 1, 3 & 5 show dRA & dDEC = 0'. The weakest of these 3 frames

had a S/N = 23:1 and FWHM = 3.9" Photometry confirms magnitude = 16.3 (red).

Image

Asteroid 1613 Smiley 20:57 – 21:15 EDT, 3 May 2015

N is up, E is left. FOV is 21' X 15'

Meade LX200GPS 14" SCT at f/5.87 SBIG ST-8XME with AO-8

Wishing Star Observatory



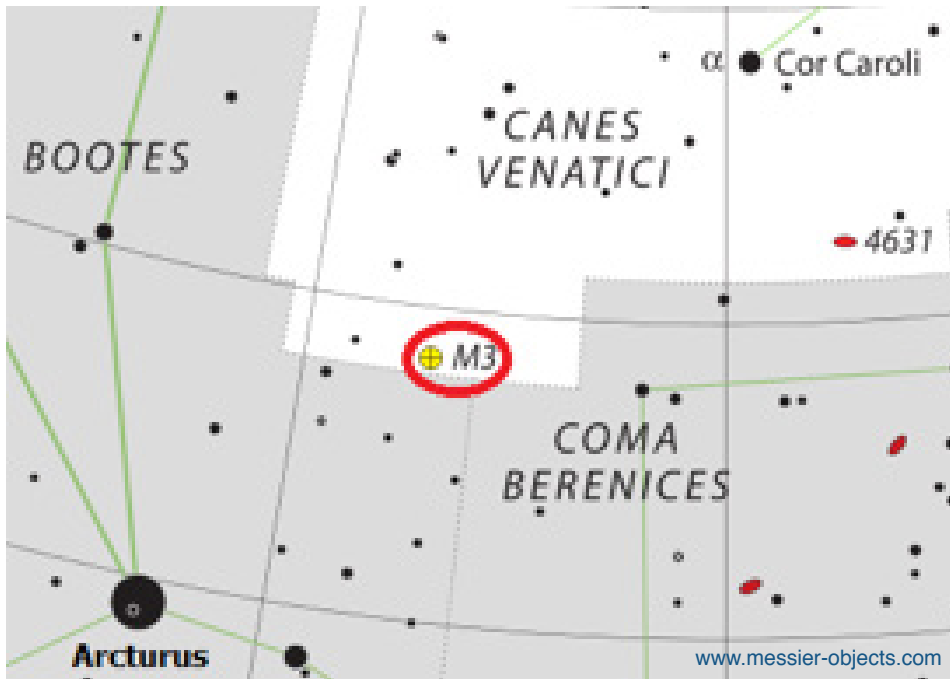


Photo by Neil Fleming

Globular Cluster in Canes Venatici Messier 3 (NGC 5272)

by Glenn Chaple

As May gives way to June, backyard astronomers begin to anticipate the arrival of summer's globular clusters, and with good reason. The globular-laden constellations Ophiuchus, Scorpius, and Sagittarius are beginning to show up in the early evening sky. We needn't wait for this globular onslaught. Already well-placed for after-sunset viewing is Messier 13 in Hercules - grandest of all the northern sky globulars. Also available is Messier 3 in Canes Venatici. Compared to M13, it's slightly fainter (magnitude 6.2 to M13's 5.8) and smaller (18 arcminutes to 20 arcminutes). Looks can be deceiving, as M3 is about half again as distant as M13 (33,000 LY to 26,000 LY) and is intrinsically the larger of the two.

M3 is my globular cluster of choice at public star parties. Conveniently placed between zeta (ζ) Herculis and eta (η) Herculis in the "Keystone" of Hercules, it's quick and easy to locate - something I consider when a line of people is waiting by my telescope.

When time constraints aren't an issue, I like to place M3 on the observing menu. It isn't really all that hard to find, being bright enough to be easily spotted in binoculars and finderscopes (it's even been seen without optical aid by keen-eyed observers in dark-sky locations). To capture M3, point your telescope midway between alpha (α)

Canum Venaticorum (Cor Caroli) and alpha (α) Bootis (Arcturus), but slightly closer to the latter (refer to the accompanying finder chart). A low-power sweep should pick up a roundish smudge of light. Switch to higher magnification, and you're in business!

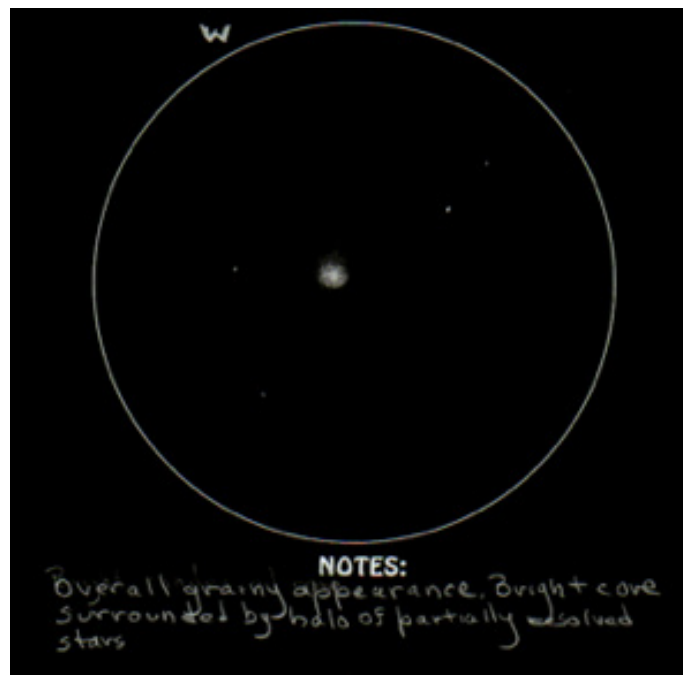
While most globular clusters require apertures of 6 inches and above to resolve their individual stars, M3 can be partially resolved in small-aperture scopes. The ac-

companying sketch shows its appearance as seen through a 4.5-inch reflector. Visible is the core and a smattering of stars near its outer edge. Large telescopes bring the outermost reaches of M3 into view - a spectacular sight, as an image taken by Amateur Telescope Makers of Boston President Neil Fleming shows. Rotate the Fleming photo about 30 degrees clockwise, and scale and orientation of both fields will be identical.

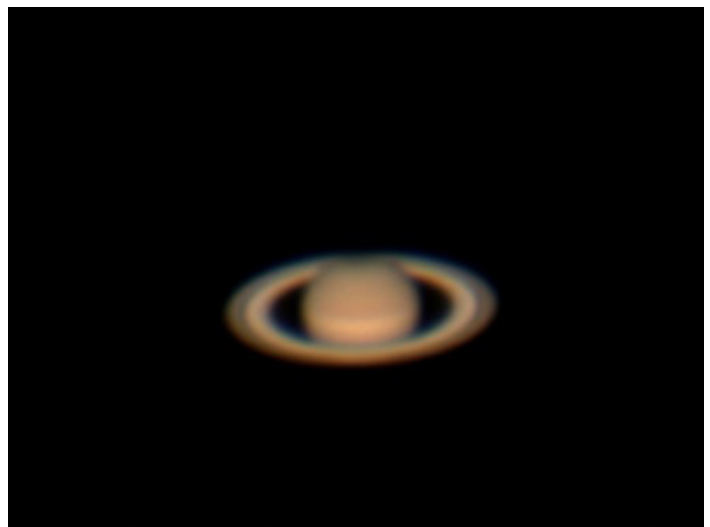
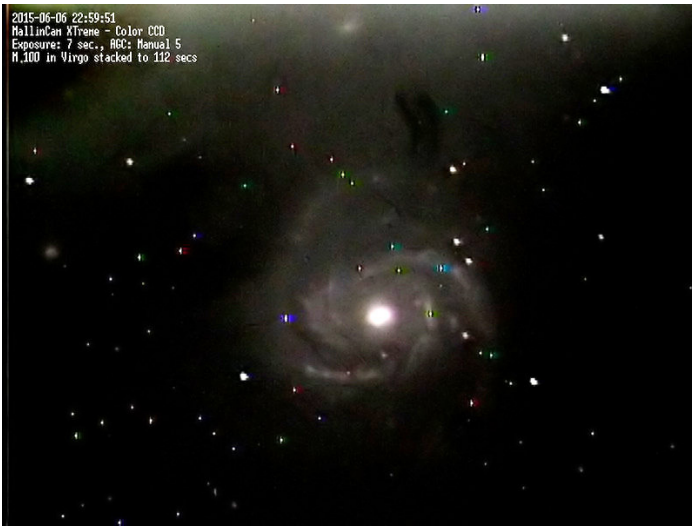
Think of this as you gaze at M3. You're looking at a half million stars packed into a sphere just 190 light years across!



Glenn Chaple is a member of the Amateur Telescope Makers of Boston, American Association of Variable Star Observers, and contributes the monthly "Observing Basics" column for Astronomy Magazine. See more at <http://theskyscrapers.org/glenn-chaple>



4.5-inch f/8 reflector at 100X (Sketch by G. Chaple)



Here's a Saturn & some deep sky images from Saturday, June 6 by Steve Hubbard. Seeing was pretty poor and Saturn is low to the horizon. Imaged using 14 Meade SCT. and ZWO color imager. The deep sky images were with the same scope and a MallinCam. The detail are in the upper left hand corner. The brightness in the upper areas are artifacts from the video imaging system.

Board of Directors Meeting Minutes — 4/18/15

Attendees: Linda Bergemann, Conrad Cardano, Jim Crawford, Ian Dell-Antonio, Ed Haskell, Jim Hendrickson, Bob Horton, Tina Huestis, Francine Jackson, Bobby Napier, Matt Ouellette, Tracy Prell, Tom Rinaldi, Steve Siok, Tom Thibault, and Matt White.

Bob Horton, President: Bob called the meeting to order at 3:00 p.m. at Seagrave Observatory. He raised the first item on the agenda: the beginners' workshop series.

New Members Programming: Francine reported that she had the following programs lined up: "The Sun" given by Ian, "The Night Sky" by Francine, "Sky Motions" by Steve, "The Telescope" by Bob, and "Binocular Astronomy" by Conrad. • Tom offered to run a workshop on basic astrophotography. • Francine commented that if there were enough interest in these workshops, additional topics can be added. • The concept would be to offer this series on Saturday evenings to coincide with the public observing. • The strategy would be to cycle through the topics and then to start over again, which would limit the need to create new material. Also it would make sense to check back on how well the series ran following the first full cycle. • Bob raised the point that this series should be advertised to the public. • It was decided that the workshops would be free for members and \$5 for nonmembers. • The workshops would begin at 8:00 p.m. (one hour before sunset), but that the sun spotter topic needed to begin earlier at 6:00 p.m. • It was decided that the workshop series could start once there was enough time for advance publicity. • The following schedule was determined: May 2 for Conrad's workshop, May 9 for Bob, May 16 for Steve, May 30 for Ian, and June 1 for Francine.

16-inch Mount: A discussion of the status of the 16-inch mount was raised. • Options suggested were to use an older mount from Brown, cleaning a potentially dirty encoder, or checking the battery. • Bob suggested a Saturday work session to troubleshoot the problem and that he would coordinate the details.

Monthly Meeting Programs: Steve informed the group that May's speaker could not make the date as originally intended. It was suggested that T.J. Del Santo and a program on clouds/meteorology would be an ideal substitute.

Large Remote-Controlled Telescope: Bob raised the next major item on the agenda, which was the topic of a large (24 – 27 inch) remote controlled telescope on site at Seagrave. A discussion ensued on the merits of modifying an existing structure or constructing a new building. The subject of handicap accessibility and restroom facilities were raised. • Bob noted that grant money should be sought for this project. Ian suggested that Skyscrapers as the lead institute might be viewed more favorably (than Brown) when applying for grants. Champlin Foundation is a likely prospect for grant funding. Ed suggested that there could be a benefit of having different versions that might be suitable vs. one single proposal. Also that some grants required matching funds. Ian noted that Brown has some money that could be available. • Ian said that Brown is exploring possible infrastructures in other states, as well as partnering with other local colleges. • Bobby mentioned that it could be useful to see if a donation of adjoining property might be a possibility. • The subject of a time line was raised, to which Ian noted that Brown did not have any particular time frame for this project. • Instrument size was discussed. A 20-inch would be adequate, but a 24-inch would be more comfortable for users. Ian commented that there is a variance between a 24- and 27-inch with dual mounts that could introduce more difficulty in switching instruments. • Steve suggested a milestone approach to portion out the process into three, six, nine, and twelve month intervals. • Bobby offered to check with the town on any potential limitations, regulations or other concerns. • Bob said that he would contact the abutting property owner to explore options. • It was agreed that Tom will lead/assemble a committee to work on the feasibility issues. • Ian will lead the grant funding efforts. • The topic of tax exempt status was raised.

Miscellaneous: It was noted that the box on the kiosk needed to be replaced, and also that it needs information that changes with the season (including the beginners' workshop series). • Steve suggested the concept of creating a "passport" promotion with stamps for visits to astronomy destinations in New England. He raised the possibility that students at Roger Williams may be interested in printing a booklet. This idea is somewhat similar to geo-caching and could promote an increase in traffic as well as a

networking with other like-minded places. • The suggestion of installing a sign on the nearby road was raised, but concerns about security and the fact that Seagrave is not generally open were reasons against it. • The subject of the dead tree was discussed, and it was agreed that it needed to be taken down for safety. • The topic of Fios and associated fees was brought up. Tracy offered to pay for the first year and will donate \$1,000 toward it (e.g., switches, cables). • Jim C. has a schedule to remove the left-over lumber from the Eagle Scout project. He will also install a top cap on the deck railing for stabilization. It was agreed to keep the chain on the deck to prevent public access. • Matt W. offered to explore a PC for speakers, including a wireless router. • Jim C. reported that the port-a-john will be installed on/or before Wednesday. • Ian mentioned the Science Olympiad and astronomy event for high school and junior high students. • Steve told the group that the Rhode Island PBS interviewed/ filmed a visit to the Clark. • Bob mentioned that he was planning on attending the N.E.A.F. event in New York and if others were interested in going with him to meet back at Seagrave tomorrow.

Submitted by Tina Huestis, Secretary

Skyscrapers May Meeting Minutes — 5/1/2015

President Bob Horton called the Skyscrapers' May meeting to order at 7:24 p.m.

President Bob Horton welcomed everyone to the Skyscrapers' May monthly meeting. Bob mentioned that the newsletter noted the passing of our oldest member, Chet Siok (age 99), and requested a moment of silence in his memory.

Treasurer Report: Ed Haskell reported that there were no new members to introduce. He noted that Michael Perpall was not present and will be voted on at the next meeting in which he is in attendance.

Public Relations Chair, Francine Jackson: Francine gave an update on the new workshop series for beginners starting this month (see the newsletter for further details). These programs are free to members (\$5 donation for nonmembers) and will cover the basics in astronomy. All sessions will be held at Seagrave (rain or shine) on Saturday evenings from 6:00 – 7:00 p.m. • Tomorrow night, May 2nd, Conrad Cardano will present the first workshop, "Binocular Astronomy." Participants are requested

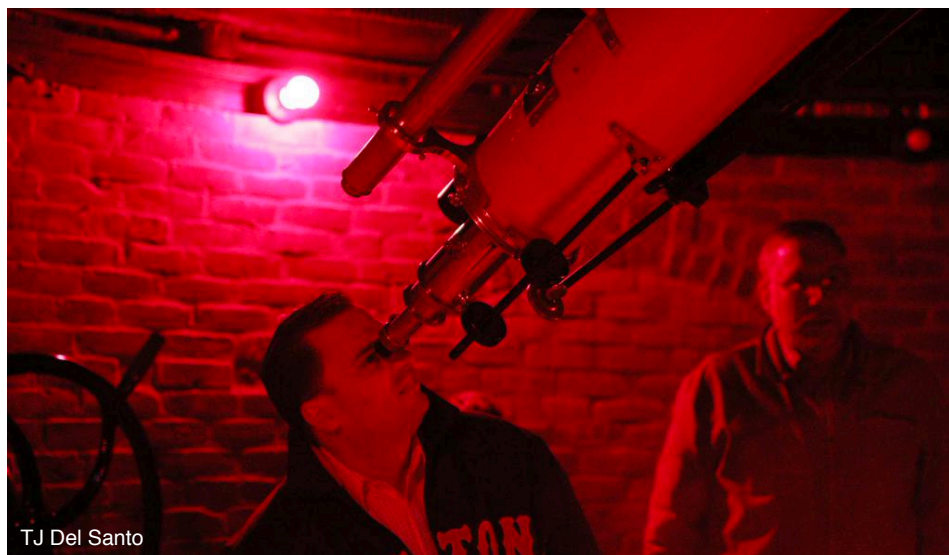
to bring their own binoculars. • “Telescopic Astronomy,” given by Bob Horton, is scheduled for May 9. The workshop will explain the value of observing with small scopes, what objects one can expect to see, and how to set-up an instrument properly. • Steve Siok will present the next workshop, “Sky Motions,” on May 16. He will explain how the sky moves, how to use a star atlas, and the various terms used to find one’s way around the sky. • On May 30, Ian Dell-Antonio will present the topic, “The Sun,” and will discuss the basics of how to observe it safely. • Francine Jackson will run “The Night Sky” workshop on June 6th, which will be cover constellations visible at this time of year as well as their associated mythologies.

Second Vice President Report: Steve Siok reported on upcoming monthly meeting speakers. June’s program will feature URI’s Steven Carey, who will talk about tectonics on Earth and the icy moons of the outer planets. • In July, Alex Bergemann will speak about his Eagle Scout project, the construction of the Meeting Hall exterior porch. • In August, Don Parker will discuss

celebration and will feature a members’ show & tell. If you are interested in presenting in December, contact Steve Siok. • Steve also reported that he has been working diligently on Astro-Assembly 2015 programming. This year’s event will be held on the first Saturday in October (10/3). There will also be informal talks on Friday evening (October 2). If anyone is interested in presenting one of those talks, please contact him.

Trustee Report: Jim Crawford reported that the 16-inch telescope is back to being fully operational. He explained that the instrument had been down during the winter and that, with Conrad Cardano’s help last weekend, the new base is now functioning well. • Bob remarked that tomorrow evening the Observatory will be open and Jupiter will be well placed for observing.

For the Good of the Organization: Gerry Dyck showed his spectroscope that he brought to the meeting. Through it one could see the emission lines of mercury (cast from the overhead lights). He noted that the Skyscrapers’ website posted “how to” instructions for constructing a spectroscope. • Dave Huestis, Historian for



T.J. Del Santo

the differences and similarities of refractor lenses and reflector mirrors. • Steve reported that the following future programs are in development but have no dates at present: Alan Sliski to talk about refurbishing an Alvan Clark telescope; Soren Meibom, from the Harvard Smithsonian CFA, to give an update on gyrochronology, (the new technique to determine stellar ages); and Meredith Hughes, from Wesleyan University, to speak about the telescope at Van Vleck Observatory. • The December monthly meeting will include a Holiday pot luck cel-

Skyscrapers, reminded everyone that the organization celebrated its Centennial in 2014 and commemorative mugs are still available for a \$5 donation.

The meeting adjourned at 7:38. Submitted by Tina Huestis, Secretary.

T.J. Del Santo, WPRI-TV meteorologist presented the program “The Beauty in Our Sky: A look at Optical Phenomena and an Exploration of Clouds.” T.J. Del Santo has worked at Channel 12 for the last 18 years and, prior to that time, was employed at the Harvard Smithsonian Astrophysical

Cash Flow YTD 2015:2
4/1/2015 through 5/15/2015

Category Description	4/1/2015-5/15/2015
INFLOWS	
Donation	
Chet Siok	215.00
Misc Donation	1,535.35
Refreshment Donation	5.00
TOTAL Donation	1,755.35
Dues	
Family	58.38
Junior	15.00
Regular	294.40
Senior	149.15
TOTAL Dues	516.93
Misc Income	
Interest Inc	3.15
TOTAL Misc Income	3.15
TOTAL INFLOWS	2,275.43
OUTFLOWS	
Trustee Expense	
Property Maintenance	87.00
TOTAL Trustee Expense	87.00
Utilities	
Electric	15.95
Porta-John	99.00
TOTAL Utilities	114.95
TOTAL OUTFLOWS	201.95
OVERALL TOTAL	2,073.48

Cash and Bank Accounts - As of 5/15/2015:4
As of 5/15/2015

Account	5/15/2015 Balance
Bank Accounts	
Capital One Bank	12,375.54
Checking	12,219.96
PayPal Account	276.93
TOTAL Bank Accounts	24,872.43
Cash Accounts	
Cash Account	0.00
TOTAL Cash Accounts	0.00
Asset Accounts	
Earmarked Donations	863.71
Preservation Fund	631.62
TOTAL Asset Accounts	1,495.33
OVERALL TOTAL	26,367.76

Observatory as a computer specialist for the Chandra X-Ray Telescope. The evening’s presentation began with an explanation of the term “meteorology” (the study of weather) and, more specifically, the study of meteors. T.J. informed us that the word “meteor” referred to anything that fell from the sky, including precipitation like rain (hydrometeors) and snow (frozen hydrometeors). He explained that the Sun causes our weather (due to the wide contrasts of temperatures on the planet) and that most of it occurs in the Troposphere (located 7.5 miles above). T.J. identified the various cloud formations, specifically noting the types that would: interfere the most with observing, be the likely cause of thunderstorms, or signal a spell of fair weather. He closed his talk with an understanding of other weather phenomena, such as tornados, halos, sun dogs, rainbows, and the green flash.

Astronomy Workshops: Spring 2015

Skyscrapers hosted a series of Astronomy Workshops for Beginners in May and June 2015 with the aim of introducing newcomers to the basic concepts of astronomy, the night sky, and optical aids for observing. The workshops were a huge success, with over 50 members and guests attending, and most of them occurred on clear Saturday evenings, allowing attendees to remain for regular observing hours at Seagrave Observatory.

Another series of workshops is already being planned for late summer/autumn. If you have ideas on what you'd like to learn from these workshops, contact Francine Jackson at francine_jackson@brown.edu.

May 2: Binocular Astronomy with Conrad Cardano





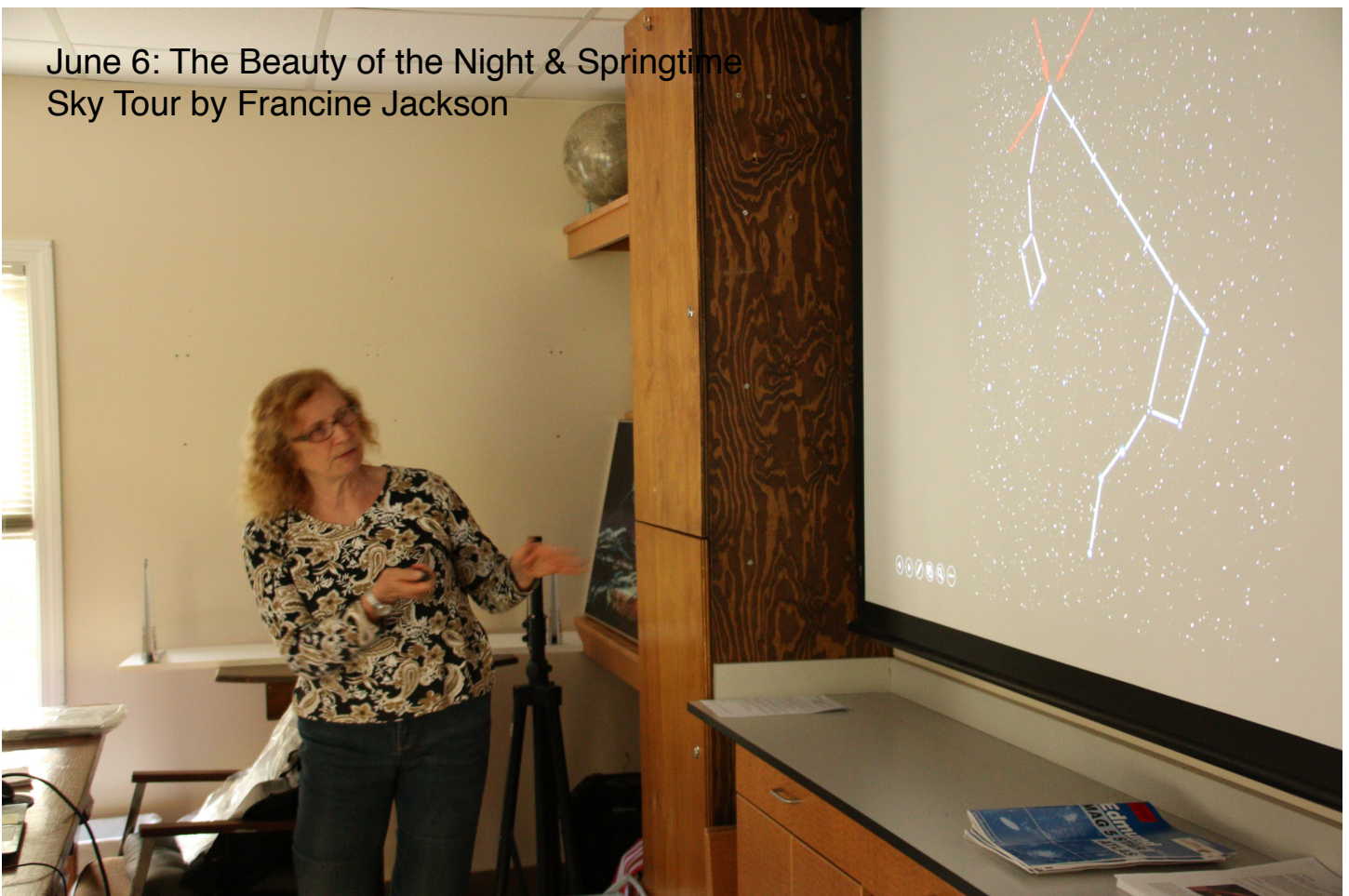
May 9: Using a Small Telescope with Bob Horton



May 16: Celestial Coordinates by Kathy & Steve Siok



May 30: Our Star, the Sun by Ian Dell'Antonio & Francine Jackson



June 6: The Beauty of the Night & Springtime Sky Tour by Francine Jackson



The "G" in GOES Is What Makes It Go

by Ethan Siegel

Going up into space is the best way to view the universe, eliminating all the distortionary effects of weather, clouds, temperature variations and the atmosphere's airflow all in one swoop. It's also the best way, so long as you're up at high enough altitudes, to view an entire 50 percent of Earth all at once. And if you place your observatory at just the right location, you can observe the same hemisphere of Earth continuously, tracking the changes and behavior of our atmosphere for many years.

The trick, believe it or not, was worked out by Kepler some 400 years ago! The same scientist who discovered that planets orbit the sun in ellipses also figured out the relationship between how distant an object needs to be from a much more massive one in order to have a certain orbital period. All you need to know is the period and distance of one satellite for any given body, and you can figure out the necessary distance to have any desired period. Luckily for us, planet Earth has a natural satellite—the moon—and just from that information, we can figure out how distant an artificial satellite would need to be to have an orbital period that exactly matches the length of a day and the rotational speed of Earth. For our world, that means an orbital distance of 42,164 km (26,199 miles) from Earth's center, or 35,786 km (22,236 miles) above mean sea level.

We call that orbit geosynchronous or geostationary, meaning that a satellite at that distance always remains above the exact same location on our world. Other effects—like solar wind, radiation pressure and the moon—require onboard thrusters to maintain the satellite's precisely desired position above any given point on Earth's surface. While geostationary satellites have been in use since 1963, it was only in 1974 that the Synchronous Meteorological Satellite (SMS) program began to monitor Earth's weather with them, growing into the Geostationary Operational Environmental Satellite (GOES) program the next year. For

40 years now, GOES satellites have monitored the Earth's weather continuously, with a total of 16 satellites having been launched as part of the program. To the delight of NASA (and Ghostbusters) fans everywhere, GOES-R series will launch in 2016, with thrice the spectral information, four times

the spatial resolution and five times the coverage speed of its predecessors, with many other improved capabilities. Yet it's the simplicity of gravity and the geostationary "G" in GOES that gives us the power to observe our hemisphere all at once, continuously, and for as long as we like!

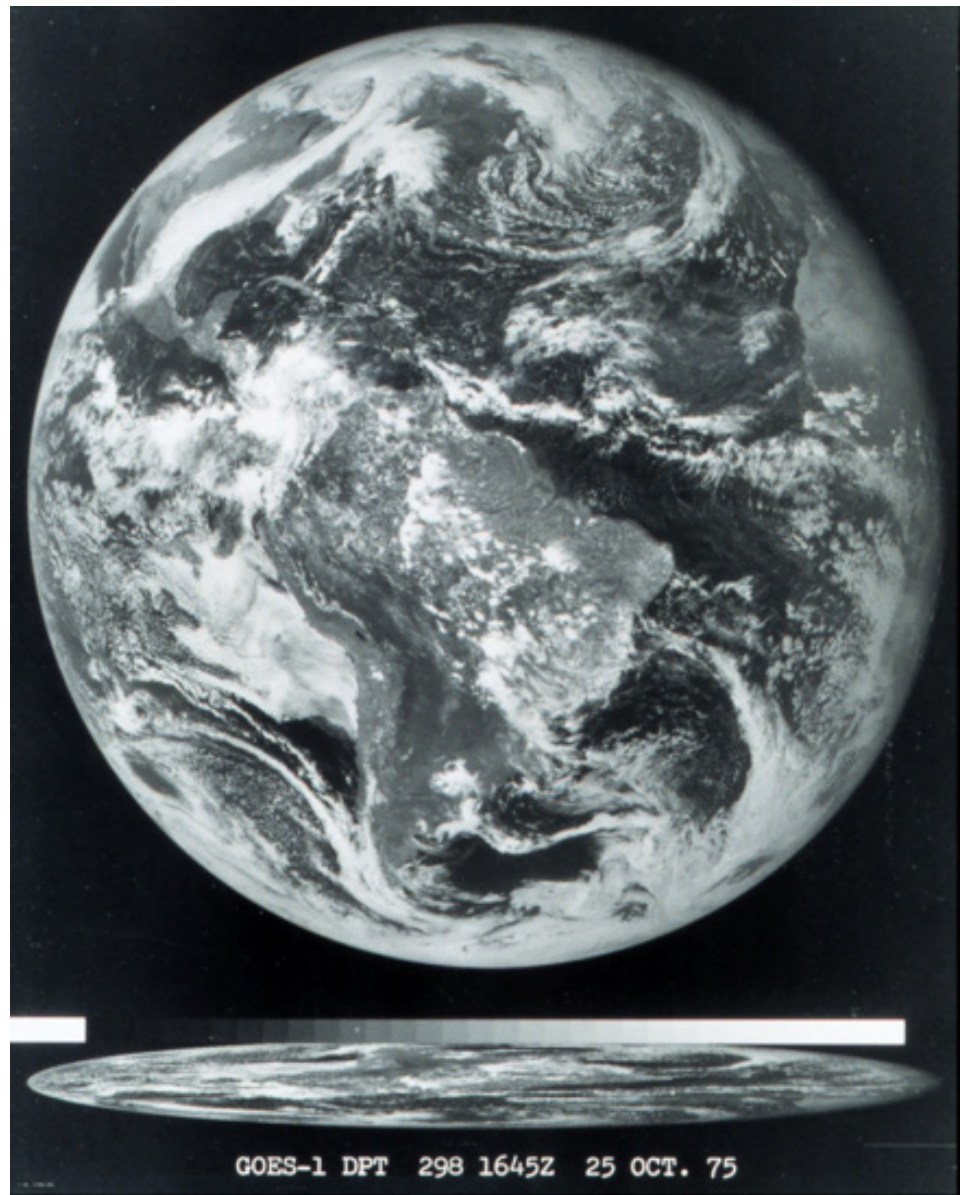


Image credit: National Oceanic and Atmospheric Administration, of the first image ever obtained from a GOES satellite. This image was taken from over 22,000 miles (35,000 km) above the Earth's surface on October 25, 1975.

Directions to Seagrave Memorial Observatory

From the Providence area:

Take Rt. 6 West to Interstate 295 in Johnston and proceed west on Rt. 6 to Scituate. In Scituate bear right off Rt. 6 onto Rt. 101. Turn right onto Rt. 116 North. Peeptoad Road is the first left off Rt. 116.

From Coventry/West Warwick area:

Take Rt. 116 North. Peeptoad Road is the first left after crossing Rt. 101.

From Southern Rhode Island:

Take Interstate 95 North. Exit onto Interstate 295 North in Warwick (left exit.) Exit to Rt. 6 West in Johnston. Bear right off Rt. 6 onto Rt. 101. Turn right on Rt. 116. Peeptoad Road is the first left off Rt. 116.

From Northern Rhode Island:

Take Rt. 116 South. Follow Rt. 116 thru Greenville. Turn left at Knight's Farm intersection (Rt. 116 turns left) and follow Rt. 116. Watch for Peeptoad Road on the right.

From Connecticut:

- Take Rt. 44 East to Greenville and turn right on Rt. 116 South. Turn left at Knight's Farm intersection (Rt. 116 turn left) and follow Rt. 116. Watch for Peeptoad Road on the right.
- or • Take Rt. 6 East toward Rhode Island; bear left on Rt. 101 East and continue to intersection with Rt. 116. Turn left; Peeptoad Road is the first left off Rt. 116.

From Massachusetts:

Take Interstate 295 South (off Interstate 95 in Attleboro). Exit onto Rt. 6 West in Johnston. Bear right off Rt. 6 onto Rt. 101. Turn right on Rt. 116. Peeptoad Road is the first left off Rt. 116.



47 Peeptoad Road
North Scituate, Rhode Island 02857