Star Gazer News

Newsletter of the Delmarva Stargazers
www.delmarvastargazers.org

From the Prez….

This will be a short article. April is and will be very busy for me at work and left very little extra time. At our April meeting, Doug Towner did a presentation on his experience at Kitt Peak National observatory a near Tucson, Arizona. His wife gave him an evening on a Kitt's Peak 20 inch Ritchie–Chrétien telescope for his birthday present. The night in February was cold but well worth it. Doug showed pictures of Comet Garrad, M3, M13, M42 and M51 that he had observed.

Chuck Jennings did a presentation of his family trip to The Winter Star Party in the Florida Keys. From his pictures, the sky was great and the water was beautiful. He talked about the program they had for children and the time he had with old friends.

Jerry did the 'Object of the Month' on the neutron stars and some of the observing that he has done with club solar scope of the sun during the past month.

At our May meeting, Doug and Chuck will present the experience on making their 14 inch mirror blank from plate glass. Doug will also discuss his technique on cooling a large mirror blank. Don will present the 'Object of the Month'.

After the April meeting we worked on the plans for the Spring star party. We had hot dogs, soup, chili and the Fish Fry on Saturday evening. Lee Clarke who did a presentation on radio astronomy will not be at our star party but will keep his radios running. He bought a new pro solid state recorders for the ELF system which will allow him to record 12 hours continuously on battery power, a first for him on the ELF band. If he gets any good hits, he hopes to email zipped portions, or drag-and-drop to a server. He stated that he is battling a Communist China (for real) 50,000 watt radio station 1190 AM in Leesburg that broadcasts communist propaganda and it bleeds into ELF.

I hope many of you made the star party and had a good time. As of April 19th , Thursday and Friday look promising and Saturday will have to wait. We still need nominees for President–Elect and Secretary. Please consider volunteering for one of those offices. Thanks!

Upcoming Events:

Meeting !	**May 1st**	**7 PM**	**SHWC**
Observing !	**May 18-19th**	**Dusk**	**Equestrian Cntr**

This is the easy PoP Quiz

1. How far have spacecraft from Earth traveled into space?
   a. A bit more than one Light-year
   b. A bit more than one Light-month
   c. Somewhat less than one Light-day
2. How have astronomers learned most of what they know about the stars, galaxies, and the universe?
   a. By sending robotic space probes out to explore the depths of space beyond our solar system.
   b. By analyzing light and other electromagnetic radiation from space that reaches the vicinity of Earth.
   c. Through controlled laboratory and in situ experiments.
3. If you could travel in a space-ship at the speed of light away from the solar system, how long could you see the sun?
   a. 3 years
   b. 30 years
   c. 300 years
4. Approximately how many stars does the Andromeda Nebula contain?
   a. 100,000
   b. 100,000,000
   c. 100,000,000,000
5. What term do we use for the average distance between Sun and Earth?
   a. Astronomical Unit
   b. Astronomy Unit
   c. Light Year
6. How old is the earth?
   a. 5,000,000 years
   b. 5,000,000,000 years
   c. No one knows
7. To reach another planet, a spacecraft must be aimed:
   a. At the planet
   b. Midway between the two
   c. Where the planet will be when the spacecraft reaches it

Easy PoP Quiz answers

1. c. Somewhat less than one Light-day
2. b. By analyzing light and other electromagnetic radiation from space that reaches the vicinity of Earth.
3. b. 30 years
4. c. 100,000,000,000
5. a. Astronomical Unit
6. b. 5,000,000,000 years
7. c. Where the planet will be when the spacecraft reaches it

INSTRUMENTAL ADVANCES

An excerpt from
A POPULAR HISTORY OF ASTRONOMY DURING THE NINETEENTH CENTURY
BY
AGNES M. CLERKE
1908

It is impossible to follow with intelligent interest the course of astronomical discovery without feeling some curiosity as to the means by which such surpassing results have been secured. Indeed, the bare acquaintance with *what* has been achieved, without any corresponding knowledge of *how* it has been achieved, supplies food for barren wonder rather than for fruitful and profitable thought. Ideas advance most readily along the solid ground of practical reality, and often find true sublimity while laying aside empty marvels. Progress is the result, not so much of sudden flights of genius, as of sustained, patient, often commonplace endeavour; and the true lesson of scientific history lies in the close connection which it discloses between the most brilliant developments of knowledge and the faithful accomplishment of his daily task by each individual thinker and worker.

It would be easy to fill a volume with the detailed account of the long succession of optical and mechanical improvements by means of which the observation of the heavens has been brought to its present degree of perfection; but we must here content ourselves with a summary sketch of the chief amongst them. The first place in our consideration is naturally claimed by the telescope.

This marvellous instrument, we need hardly remind our readers, is of two distinct kinds—that in which light is gathered together into a focus by *refraction*, and that in which the same end is attained by *reflection*. The image formed is in each case viewed through a magnifying lens, or combination of lenses, called the eye-piece. Not for above a century after the "optic glasses" invented or stumbled upon by the spectacle-maker of Middelburg (1608) had become diffused over Europe, did the reflecting telescope come, even in England, the place of its birth, into general use. Its principle (a sufficiently obvious one) had indeed been suggested by Mersenne as early as 1639; James Gregory in 1663 described in detail a mode of embodying that principle in a practical shape; and Newton, adopting an original system of construction, actually produced in 1668 a tiny speculum, one inch across, by means of which the apparent distance of objects was reduced thirty-nine times. Nevertheless, the exorbitantly long tubeless refractors, introduced by Huygens, maintained their reputation until Hadley exhibited to the Royal Society, January 12, 1721, a reflector of six inches aperture, and sixty-two in focal length, which rivalled in performance, and of course indefinitely surpassed in manageability, one of the "aerial" kind of 123 feet.

The concave-mirror system now gained a decided ascendant, and was brought to unexampled perfection by James Short of Edinburgh during the years 1732-68. Its resources were, however, first fully developed by William Herschel. The energy and inventiveness of this extraordinary man marked an epoch wherever they were applied. His ardent desire to measure and gauge the stupendous array of worlds which his specula revealed to him, made him continually intent upon adding to their "space-penetrating power" by increasing their light-gathering surface.

These, as he was the first to explain, are in a constant proportion one to the other. For a telescope with twice the linear aperture of another will collect four times

(Continued on page 5)

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NASA Helps Europe Study a Comet–Up Close and Personal

Dr. Tony Phillips

Europe's Rosetta spacecraft is on its way to intercept comet 67P/Churyumov-Gerasimenko. Comets have been intercepted before, but this mission is different. Rosetta aims to make history by landing a probe on the comet's surface while the mother ship orbits overhead.

"Rosetta is the European equivalent of a NASA flagship mission," explains Claudia Alexander, project scientist for the U.S. Rosetta Project at NASA's Jet Propulsion Laboratory. "It will conduct the most comprehensive study of a comet ever performed."

Rosetta's payload contains 21 instruments (11 on the orbiter, 10 on the lander) designed to study almost every aspect of the comet's chemistry, structure, and dynamics. Three of the sensors were contributed by the U.S.: Alice (an ultraviolet spectrometer), IES (an ion and electron sensor), and MIRO (a microwave sounder).

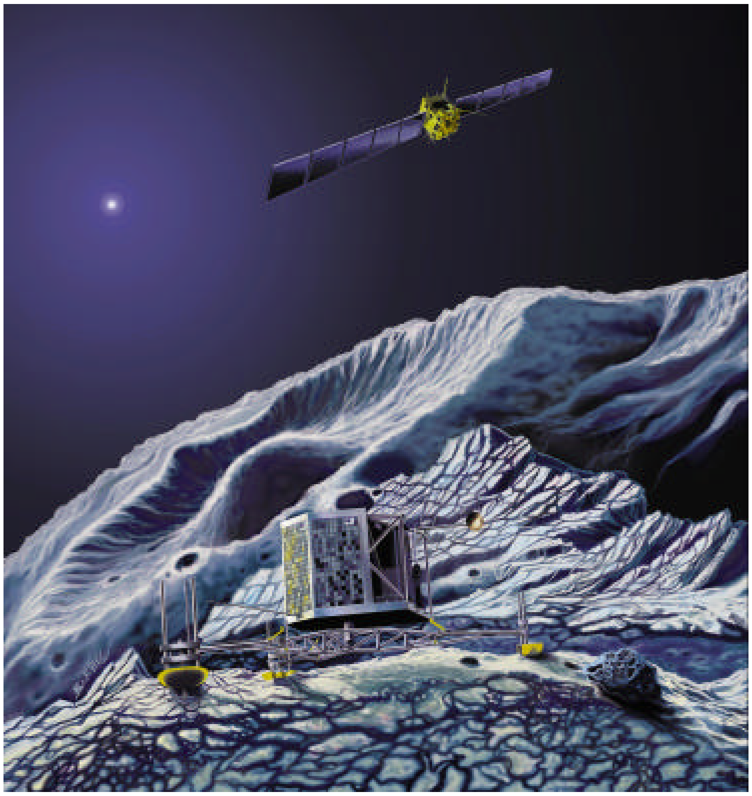
The main event of the mission will likely be the landing. The 100-kg lander, which looks a bit like a cross between NASA's old Viking Mars landers and a modern microsatellite, will spend two weeks fastened to the comet's icy surface. The European-built probe will collect samples for analysis by onboard microscopes and take stunning panoramic images from ground level.

"First the lander will study the surface from close range to establish a baseline before the comet becomes active," explains Alexander. "Then the orbiter will investigate the flow of gas and dust around the comet's active, venting nucleus."

Rosetta's sensors will perform the experiments that reveal how the chemicals present interact with one another and with the solar wind. Alice and MIRO detect uncharged atoms and molecules, while IES detects the ions and electrons as the solar wind buffets the nucleus.

One problem that often vexes astronomers when they try to study comets is visibility. It's hard to see through the dusty veil of gas billowing away from the heated nucleus. The microwaves MIRO detects can penetrate the dust, so MIRO can see and measure its target molecules even when other instruments can't.

MIRO is one of several experiments focused on the comet's structural properties. It will determine the comet's dielectric constant, emissivity, and thermal conductivity to determine whether it is made of a powdery loose material, has a detectable layer of loose material, or is hard as rock.



"We want to find out whether comets have retained material from when the solar system formed," says Alexander. "If the ancient materials are still there, we can get an idea of what conditions were like at the dawn of the solar system."

Rosetta enters orbit in 2014. Stay tuned for updates!

Check out "Comet Quest," the new, free iPhone/iPad game that has you operating the Rosetta spacecraft yourself. Get the link at spaceplace.nasa.gov/comet-quest.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Rosetta's lander Philae will eject from the spacecraft, touch down on the comet's nucleus, and immediately fire a harpoon into the surface to anchor itself so it won't drift off in the weak gravity.

(Continued from page 3)
as much light, and will consequently disclose an object four times as faint as could be seen with the first, or, what comes to the same, an object equally bright at twice the distance. In other words, it will possess double the space-penetrating power of the smaller instrument. Herschel's great mirrors—the first examples of the giant telescopes of modern times—were then primarily engines for extending the bounds of the visible universe; and from the sublimity of this "final cause" was derived the vivid enthusiasm which animated his efforts to success.

It seems probable that the seven-foot telescope constructed by him in 1775—that is within little more than a year after his experiments in shaping and polishing metal had begun—already exceeded in effective power any work by an earlier optician; and both his skill and his ambition rapidly developed. His efforts culminated, after mirrors of ten, twenty, and thirty feet focal length had successively left his hands, in the gigantic forty-foot, completed August 28, 1789. It was the first reflector in which only a single mirror was employed. In the "Gregorian" form, the focussed rays are, by a second reflection from a small concave mirror, thrown *straight back* through a central aperture in the larger one, behind which the eye-piece is fixed. The object under examination is thus seen in the natural direction. The "Newtonian," on the other hand, shows the object in a line of sight at right angles to the true one, the light collected by the speculum being diverted to one side of the tube by the interposition of a small plane mirror, situated at an angle of 45° to the axis of the instrument. Upon these two systems Herschel worked until 1787, when, becoming convinced of the supreme importance of economising light (necessarily wasted by the second reflection), he laid aside the small mirror of his forty-foot then in course of construction, and turned it into a "front-view" reflector. This was done—according to the plan proposed by Lemaire in 1732—by slightly inclining the speculum so as to enable the image formed by it to be viewed with an eye-glass fixed at the upper margin of the tube. The observer thus stood with his back turned to the object he was engaged in scrutinising.

The advantages of the increased brilliancy afforded by this modification were strikingly illustrated by the discovery, August 28 and September 17, 1789, of the two Saturnian satellites nearest the ring. Nevertheless, the monster telescope of Slough cannot be said to have realised the sanguine expectations of its constructor. The occasions on which it could be usefully employed were found to be extremely rare. It was injuriously affected by every change of temperature. The great weight (25 cwt.) of a speculum four feet in diameter rendered it peculiarly liable to distortion. With all imaginable care, the delicate lustre of its surface could not be preserved longer than two years, when the difficult process of repolishing had to be undertaken. It was accordingly never used after 1811, when, having *gone blind* from damp, it lapsed by degrees into the condition of a museum inmate.

The exceedingly high magnifying powers employed by Herschel constituted a novelty in optical astronomy, to which he attached great importance. The work of ordinary observation would, however, be hindered rather than helped by them. The attempt to increase in this manner the efficacy of the telescope is speedily checked by atmospheric, to say nothing of other difficulties. Precisely in the same proportion as an object is magnified, the disturbances of the medium through which it is seen are magnified also. Even on the clearest and most tranquil nights, the air is never for a moment really still. The rays of light traversing it are continually broken by minute fluctuations of refractive power caused by changes of temperature and pressure, and the currents which these engender. With such luminous quiverings and waverings the astronomer has always more or less to reckon; their absence is simply a question of degree; if sufficiently magnified, they are at all times capable of rendering observation impossible.

Thus, such powers as 3,000, 4,000, 5,000, even 6,652, which Herschel now and again applied to his great telescopes, must, save on the rarest occasions, prove an impediment rather than an aid to vision. They were, however, used by him only for special purposes, experimentally, not systematically, and with the clearest discrimination of their advantages and drawbacks. It is obvious that perfectly different ends are subserved by increasing the *aperture* and by increasing the *power* of a telescope. In the one case, a larger quantity of light is captured and concentrated; in the other, the same amount is distributed over a wider area. A diminution of brilliancy in the image accordingly attends, *cæteris paribus*, upon each augmentation of its apparent size. For this reason, such faint

(Continued on page 6)

objects as nebulæ are most successfully observed with moderate powers applied to instruments of a great capacity for light, the details of their structure actually disappearing when highly magnified. With stellar groups the reverse is the case. Stars cannot be magnified, simply because they are too remote to have any sensible dimensions; but the space between them can. It was thus for the purpose of dividing very close double stars that Herschel increased to such an unprecedented extent the magnifying capabilities of his instruments; and to this improvement incidentally the discovery of Uranus, March 13, 1781, was due. For by the examination with strong lenses of an object which, even with a power of 227, presented a suspicious appearance, he was able at once to pronounce its disc to be real, not merely "spurious," and so to distinguish it unerringly from the crowd of stars amidst which it was moving.

Star Party Astro-pics by Cal

M13

Hercules Cluster

The Binary Star PoP Quiz

1.What percentage of stars belong to binary systems?
a. 3 - 6%
b. 10 - 20%
c. 35 - 50%
2. What is a visual binary system?
a. Binary system visible to the naked eye
b. Binary system visible to the telescope
c. An optical illusion created by two stars visible close to each other
3. What is the binary system identified from the alternating doppler shifts?
a. Spectroscopic binary system
b. Eclipsing binary system
c. Astrometric binary system
4. What binary system is best seen when the orbital plane is perpendicular to the line of sight?
a. Eclipsing binary system
b. Spectroscopic binary system
c. Visual binary system
5. What binary system has the orbital plane in the line of sight of the observer?
a. Eclipsing binary system
b. Spectroscopic binary system
c. Visual binary system
6. Which of these stars is an example for an eclipsing binary system?
a. Polaris
b. Alpha centauri
c. Algol
7. Astrometric binary systems are detected by,
a. Photometric measurements
b. Periodic 'wobble' in the proper motion
c. Telescopes with a high resolving power
8. Binary systems help astronomers determine,
a. The mass of the stars
b. The age of the stars
c. The distance to the stars
9. Planets in a binary star system,
a. Have not been detected by astronomers
b. Can orbit one or both stars
c. Cannot form stable orbits
10. An example for a X-ray binary system is,
a. A binary system of a normal star and a white dwarf
b. A binary system of white dwarf and a black hole
c. A binary system of two black holes

Binary PoP Quiz answers

1. c. 35 - 50% 2. b. Binary system visible to the telescope 3. a. Spectroscopic binary system 4. c. Visual binary system 5. a. Eclipsing binary system 6. c. Algol 7. b. Periodic 'wobble' in the proper motion 8. a. The mass of the stars 9. b. Can orbit one or both stars 10. a. A binary system of a normal star and a white dwarf

Astrophotos by Members and Friends

How to Join the Delmarva Stargazers: Anyone with an interest in any aspect of astronomy is welcome

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