Ogden Astronomical Society • Ogden Utah

THE STAR DIAGONAL

THE JOURNAL OF THE OGDEN ASTRONOMICAL SOCIETY

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The President's Message

Hi All
For the March meeting we will have a show and tell. Please bring your projects, pictures, or anything astronomical to share with the group.

I am pleased to announce that we have been accepted to the NASA Night Sky Network. We should be receiving some material for presentation at star parties by the end of March. I would like to thank those that volunteered to help; we will need more people to get involved with this project. I will bring more information to the March meeting and we can discuss how we want to implement the program. Also we will need to select a Coordinator and an Assistant Coordinator at the meeting. You can get more information from their website at http//nightsky.jpl.nasa.gov/ .

March 19, 20 will be the first of this years star parties. Thanks to David Dunn for making the arrangements with Golden Spike National Monument for this event. The plan will be about the same as in years past; we have a permit to set up in the parking lot over the two nights. Camping will be in the parking lot, no campfires. They will leave the restrooms open for us at night and turn off the outside lights. This event is billed as a Messier Marathon and some will be working on that, but we don't have any marathon activities planned as a group. Everyone is welcome to join us and spend their time viewing at leisure. I will have my Motorhome there so anyone wanting a break from the cold is welcome. We should be able to arrange for a stew or chili and hot chocolate or coffee around midnight. Directions to Golden Spike National Monument - take I-15 exit 368 and go west on highway 13 about 3 miles to Corinne. Take highway 83 west for about 18 miles, go west on 7200 north and follow the signs. If you need any more information let me know. I hope to see you there!

Thanks,
Lee Priest
President
Ogden Astronomical Society

OAS Minutes, 12 Feb 04

OAS President Lee Priest opened the meeting at 7:30.

Announcements/Discussion

The proposed schedule of OAS activities was posted in the February Star Diagonal and about half is posted to the OAS Yahoo newsgroup calendar. (It's all posted now.) The three Dinosaur Park event dates are firm - the rest have to be worked out.

Dave Dunn spoke on the Golden Spike star parties, one in March and one in November. These events are described as "Messier Marathons", but there is no great pressure to count and scoot to the next object. It's a dark site with pretty decent facilities.

The group site is reserved for the Dead Horse Point star party on 14, 15 May and some have reserved individual sites.

The OAS will get permits to use Telescope Hill starting on Wednesday on the two Monte Cristo star parties.

As usual, the OAS will suspend monthly meetings on the two Monte Cristo months - July and August. Those star parties and their potluck socials take the place of the meetings at Ott Planetarium.

The September meeting will be election night for OAS Steering Committee members for the coming year. Both Lee and Cliff will have served their two terms as

president and vice-president, so there will be new officers in those positions. Jim Seargeant expects to retire and either move away or be on the road most of the time, so will not run for Secretary. (Doug Say will probably be around to anchor the new committee, but that's just a guess.) In May, a committee will be formed to line up nominees for the steering committee positions. Anyone interested in serving as an OAS officer should step forward.

NASA's Night Sky Network was briefly discussed. (From their web site: "We are a nationwide coalition of amateur astronomy clubs bringing the science, technology and inspiration of NASA's missions to the general public. We share our time and telescopes to provide you with unique astronomy experiences at science museums, observatories, classrooms, and under the real night sky.")

Dr. Stacy Palen exhibited painfully cute T-shirts being sold as part of a student fundraiser.

Gary Liptrot showed off the Celestron eyepiece and filter set kit he got from Amazon. In November, 03, Cliff Peterson had sent a notice to the OAS Yahoo mailing list that the set was available and Gary ordered one. Normally, these sets are available at this kind of price only along with a telescope order. (I checked, and as of 29 Feb 04, Amazon still had four sets available - see http://www.amazon.com/exec/obidos/tg/detail/-/B00006RH5I/103-4676165-3176634. The price is $99.80 including shipping. - Jim Sgt.)

Doug Say showed his 15X70 Baraskas with red dot finder and parallelogram mount that he made for them. Doug also described a new theory of physics by James Putnam.

Deloy Pierce described his troubles in getting Ektachrome processed by Inkleys and asked if anyone knew of a lab that processed it locally.

Jim Seargeant and Dale Hooper then described how they focus and polar align their cameras and telescopes for CCD imaging. Jim's uses a manual approach aided by small video cameras and dial indicators. Dale uses computer programs - FocusMax and PoleAlignMax - to automate the processes. (See http://users.bsdwebsolutions.com/~larryweber/.)

Upcoming Events

11 Mar 04, 7:30 PM	OAS meeting, Ott Planetarium, WSU
19, 20 Mar 04	Golden Spike Star Party

Every Wed night, weather permitting - Ott Planetarium Star Party

The calendar section of the OAS Yahoo group is now complete for the year. We will keep it updated as changes occur.

Map of the Universe

(The following was posted to the OAS Yahoo newsgroup mailing list by John Sohl. A cool graphic indeed! - Jim Sgt.)

The latest issue of the Planetarian has a cool graphic on the front of it that I thought you'd like to see. It is a map of the "entire" universe. You can see it at: http://www.astro.princeton.edu/~mjuric/universe/

You can get details by going to the e-print publication that is linked at the top.

John

Mercury

(The following article is from Mark Durrwachter. He will try to work through all of the planets in the coming months. - Jim Sgt.)

Orbital characteristics

Avg Dist from the Sun	0.387AU	37 million miles
Mean radius	57,910,000 km	35983.6 Miles
Eccentricity	0.20563069	
Orbital period	87d 23.3h	
Synodic period	115.88 days	
Avg. Orbital Speed	47.8725 km/s	
Inclination	7.004°	
Number of satellites	0	

Physical characteristics

Equatorial diameter	4879.4 km	3031.67 Miles
Surface area	7.5 × 107 km2	
Mass	3.302×1023 kg	
Mean density	5.43 g/cm3	
Surface gravity	2.78 m/s2	
Rotation period	58d 15.5088h	
Axial tilt	0°	
Albedo	0.10-0.12	
Escape Speed	4.25 km/s	
Avg. Surface temp.: Day	623 K	661.73 degrees Fahrenheit
Avg. Surface temp.: Night	103 K	-274.27 degrees Fahrenheit

Surface temp.

Min	mean	max
90 K	440 K	700 K
-297.67 F	332.33 F	800.33 F

Atmospheric characteristics

Atmospheric pressure	trace
Potassium	31.7%
Sodium	24.9%
Atomic Oxygen	9.5%
Argon	7.0%
Helium	5.9%
Molecular Oxygen	5.6%
Nitrogen	5.2%
Carbon dioxide	3.6%
Water	3.4%
Hydrogen	3.2%

Mercury is the closest planet to the Sun. This is the second-smallest planet within Earth's solar system. Upon the celestial sphere, Mercury ranges from -0.4 to 5.5, in apparent magnitude; Mercury is sufficiently "close" to the Sun that telescopes rarely examine it. Mercury has no natural satellites The only spacecraft to approach Mercury was Mariner 10 (1974-5) only 40-45% of the planet has been mapped.

The astronomical symbol for Mercury is a circle on top of a short vertical line with a cross below and a semicircle above the circle.

Physical characteristics

Atmosphere

Mercury has only trace amounts of an atmosphere. The atmosphere of Mercury is extremely thin; indeed, gas molecules in Mercury's atmosphere collide with the surface of the planet more frequently than they collide with each other; for most purposes Mercury should be considered as being airless. The "atmosphere" is primarily composed of oxygen, potassium, and sodium.

The atoms that compose Mercury's atmosphere are continually being lost to space, with the average "lifespan" of a potassium or sodium being approximately ~3 hours (during the Mercurian day -- and only half that at perihelion). The lost atmosphere is continually replenished by several mechanisms; solar wind captured by the planetary magnetic field, vapor produced by micrometeor impacts, direct thermal evaporation of the polar ice, and/or outgassing.
Temperature and sunlight
The mean surface temperature of Mercury is 452K, but it ranges from 90-700K; by comparison, the temperature on Earth varies by only ~11K (with respect only to solar radiation; not climate or season). The sunlight on Mercury's surface is 6.3 times more intense than that on Earth, a total irradiance of 3566W/m2.

Terrain
Mercury's cratered surface appears very similar to Luna. Mercury's most distinctive surface feature (of what has been photographed) is Caloris Basin, a impact crater ~1350km in diameter. The planet is marked with scarps, which apparently formed billions of years ago as Mercury's core cooled and shrank causing the crust to wrinkle. The majority of Mercury's surface is covered with plains of two distinct ages; the younger plains are less heavily cratered and probably formed when lava flows buried earlier terrain. In addition, Mercury has "significant" tidal bulges.
See also: List of craters on Mercury

Interior composition
The planet has a relatively large iron core (even when compared to Earth) and is, therefore, much denser; Mercury's composition is approximately 70% metallic and 30% silicate. The average density is 5430kg/m3; which is slightly less than Earth's density. The reason that Mercury, with so much iron, has less density than Earth; is that, the overall mass of Earth compresses the planet and creates a high density. Mercury only has 5.5% of Earth's mass. The iron core fills 42% of the planetary volume (Earth's core only fills 17%). Surrounding the core is a 600km mantle.

Mercurian orbit
The orbit of Mercury is eccentric, ranging from 46M-70Mkm in radius. The slow precession of this orbit around the sun could not be completely explained by Newtonian Classical Mechanics, and for some time it was thought that another planet might be present in an orbit even closer to the sun (sometimes referred to as Vulcan) to account for this perturbation. Einstein's General Theory of Relativity provided the explanation for this small discrepancy instead, however.

Mercurian rotation
At certain points on Mercury's surface, an observer (standing upon one of the tidal bulges) would be able to see the Sun rise about halfway, then reverse and set, then rise again; all within the same Mercurian day. This is because approximately four days prior to perihelion, Mercury's orbital velocity exactly equals its rotational velocity; such that the Sun's apparent motion ceases; and, at perihelion, Mercury's orbital velocity exceeds the rotational velocity; thus, the Sun appears to retrograde. Four days after perihelion, the Sun's normal apparent motion resumes.

Until radar observations in 1965 proved otherwise it was thought that Mercury was tidally locked with the Sun, rotating once for each orbit and keeping the same face directed towards the Sun at all times. Instead, Mercury has a 3:2 spin-orbit-coupling, rotating three times for every two revolutions around the Sun; the eccentrity of Mercury's orbit makes this resonance stable. The original reason astronomers thought it was tidally locked was because whenever Mercury was best placed for observation, it was always at the same point in its 3:2 resonance, so showing the same face, which would be also the case if it was totally locked. Mercury rotates 59 times slower than Earth.

Because of Mercury's 3:2 spin-orbit-coupling; although a sidereal day (the period of rotation) lasts ~58.7 Earth days, a solar day (the length between two meridian transits of the Sun) lasts ~176 Earth days.

The Mercurian magnetosphere
Despite its slow rotation, Mercury has a relatively strong magnetosphere; with 1% of the magnetic field strength generated by Earth. It is possible that this magnetic field is generated in a manner similar to Earth's, by a dynamo of circulating liquid core material;

current estimates suggest that Mercury's core is not hot enough to liquefy nickel-iron, but it is possible that materials with a lower melting point such as sulfur may be responsible. It is also possible that Mercury's magnetic field is a remnant of an eariler dynamo effect that has now ceased, the magnetic field becoming "frozen" in solidified magnetic materials.

Why Mercury has so much iron
Mercury has a higher iron percentage than any other object within the system. Several theories have been proposed to explain Mercury's high metallicity.

One theory suggests that Mercury originally had a metal-silicate ratio similar to common chondrite meteors and a mass approximately 2.25 times its current mass, but that early in the solar system's history Mercury was struck by a planetesimal of approximately 1/6 that mass. The impact would have stripped away much of the original crust and mantle; leaving the core behind. A similar theory has been proposed to explain the formation of Earth's Moon, see giant impact theory. Alternately, Mercury may have formed very early in the history of the solar nebula, before the Sun's energy output had stabilized. Mercury starts out with approximately twice its current mass in this theory; but, as the protostar contracted, temperatures near Mercury could have been between 2500-3500K; and possibly even as high as 10000K. Much of Mercury's surface rock would have vaporized at such temperatures, forming an atmosphere of "rock vapor" which would have been carried away by the nebular wind. A third theory, similar to the second, argues that the outer layers of Mercury were "eroded" by the solar wind over a longer period of time.

Ice on Mercury
Radar observations first indicated, in 1992, that there is frozen water ice at Mercury's north pole. Such water is believed to exist at the permanently shaded bottoms of craters, where it is deposited by comets and/or gases from the planetary core.

The Exploration of Mercury
Mercury has been known since at least the time of the Sumerians (3rd millennium BC), who called it Ubu-idim-gud-ud. The earliest recorded detailed observations were made by the Babylonians, who called it gu-ad or gu-utu. It was given two names by the ancient Greeks, Apollo when visible in the morning sky and Hermes when visible in the evening, but Greek astronomers knew that the two names referred to the same body. Heraclitus even believed that Mercury and Venus orbited the Sun, not the Earth. Observation of Mercury is severely complicated by its proximity to the Sun; it is only visible from Earth at sunrise or sunset.

The only spacecraft to approach Mercury was Mariner 10 (1974-75) A mission to Mercury has been approved by NASA, named MESSENGER (MErcury Surface, Space ENvironment, GEochemistry, and Ranging), which will launch in 2004 and reach Mercury in 2009.

Japan and the ESA
Japan is planning a joint mission with the European Space Agency that would be the first to land a probe on Mercury. The mission entails three probes, two that would orbit and one that would land, to map the topography and study the origins of the planet. Russian Soyuz rockets would launch the probes starting in 2010. The probes would reach Mercury about four years later, with one of them landing on the planet, and the other two orbiting and charting its surface for a year.

Ref:
1 Discovering the Essential Universe by Neil F. Comins (2001)