

Rappahannock Astronomy Club

Minutes, April 8, 2009, Meeting

In attendance:

- Barton Billard
- Scott Busby
- Don Clark
- Leigh Gettier
- Tom Harmon
- Glenn Holliday
- Michael Masters
- Chris Reed
- Javier & Ruby Valverde

President Scott Busby opened the meeting at 7:05 p.m. with introductions around the room. Three visitors returned, along with a fourth who had recently joined the Club. Six other members were present.

Program

Scott Busby presented part 2 of his program, "Meteorites, Asteroids, and the Last Great Extinction Event." In this part, he discussed asteroids, covering their origins, descriptions, major impacts, and extinction events.

Asteroids are leftover material from the formation of the solar system. They range from dust-size to near planet-size pieces of material that never coalesced into planets and mostly exist in a belt between the orbits of Mars and Jupiter. The belt is very sparse. Spacecraft that have passed through have found that very large distances separate asteroids.

Information about asteroids comes from the occasional pieces that have fallen to Earth, from Earth-based observations, and since 1991, from spacecraft that have visited some of them. The first of these were *951 Gaspra* and *243 Ida*, visited by the Galileo spacecraft in 1991 and 1993, respectively. Another spacecraft that has visited asteroids is the Near Earth Asteroid Rendezvous (NEAR) spacecraft, launched in 1996. The NEAR spacecraft flew by the asteroid Mathilde in 1997 on the way to *433 Eros*. The first rendezvous with Eros in 1998 was turned into flyby data collection after an aborted orbit insertion attempt. The modified trajectory allowed the spacecraft to return to Eros in 2000. At the end of the planned mission, mission operators decided to add an attempt to land the spacecraft on the asteroid. The touchdown velocity was less than 2 meters per second, and the spacecraft survived the landing and was able to continue to signal using its omni-directional low-gain antenna.

Ceres is the largest and most massive asteroid. It is nearly spherical (975x909 kilometers) and constitutes approximately one-third the mass of all the asteroids in the solar system. The spherical shape is the result of the self-gravity overcoming rigid body forces that hold the irregular shapes of less massive bodies. Ceres is classified as a dwarf planet, in part because of this self-gravity. Other dwarf planets include Kuiper belt objects larger than Ceres. One is Eris, and another is Pluto after the International Astronomy Union decision in 2006 that reclassified it as a minor planet.

Gaspra has an irregular, elongated shape and lacks large craters, suggesting it is a relatively recent result of the breakup of a larger body within the last few hundred million years. Mathilde has an unusually long rotation period of 415 hours and is one of the darkest objects in the solar system. It reflects only 3 percent of the light that falls on it, making it about twice as dark as charcoal. Eros is elongated, approximately 33x13x13 kilometers, and heavily cratered.

Events and features on the Earth's surface attributed to major asteroid impacts include the Tunguska Event of 1908, the Barringer Crater, the Manicougan impact structure, Clearwater Lakes, and the Chicxulub crater. Tunguska occurred about 7:00 to 8:00 a.m. on June 30, 1908, in Siberia. It appears to have been an above-ground explosion of an asteroid or comet fragment about 20 meters in diameter that

released the equivalent energy of about 10 to 20 megatons of TNT. The explosion felled 60 million trees in an area of 2,150 square kilometers and produced a flash seen 50 kilometers away.

Barringer (or Meteor) Crater in Arizona is a 49,000 year-old impact crater nearly 1.2 kilometers in diameter. Scientists disputed the nature of the structure until the discovery by workers in the 1920s of fragments of the impactor within the crater. It is the first to be recognized as an impact crater.

The Manicougan impact structure and Clearwater Lakes are more than 200 million years old. Manicougan is one of the largest impact features still preserved, about 100 kilometers across. Clearwater Lakes are about 32 kilometers (west) and 22 kilometers (east) across.

Chicxulub appears to be the impact structure associated with the extinction of the Dinosaurs and about 40 percent of all species on Earth indicated by the fossil records around the Cretaceous/Tertiary (K-T) boundary. It is a structure about 170 kilometers across located off the Yucatan peninsula, and is approximately 64.98 million years old. The current estimate of the frequency of such impacts is about once in 100 million years.

We also have the example of impacts of pieces of the comet Shoemaker-Levy 9 (SL9) on Jupiter in 1994. SL9 was originally discovered the year before. Estimates put the rate of impacts on Jupiter at 2,000 to 8,000 times higher than the rate on Earth because of the giant planet's size and gravity. The presence of Jupiter probably greatly decreases the probability of impacts on Earth and other inner Solar System planets. The prediction of the SL9 impacts in 1993 allowed the event to be studied in detail. Impressive "scars" in Jupiter's cloud system caused by the impacts persisted for some time.

Spaceweather.com has a list of predicted near-Earth encounters in terms of "miss distance," the distance of closest approach. These encounters involve a class of asteroids in orbits that cross the Earth's called "Near-Earth Asteroids." Ones that are predicted to pass close to the Earth are called "Potentially Hazardous Asteroids." The asteroid Apophis, 210 to 330 meters in diameter, is one that will approach in 2013, 2029, and 2036. It is said to have an outside chance of impacting in 2036. One uncertainty is what the Earth's tidal force will do to Apophis when it approaches to about 5.6 Earth radii (29,470 kilometers) of the center of the Earth in 2029 (on Friday, April 13).

Suggested reading includes books by Phil Plait, *Death from the Skies!*, and John S. Lewis, *Rain of Iron and Ice*. *The Great Comet Crash*, edited by John R. Spencer and Jacqueline Mitton, has an impressive collection of photos of the impact of comet Shoemaker-Levy 9 on Jupiter. Scott also recommended a video simulation available on YouTube (search the site for "asteroid impact").

Business Meeting

The Star Party events coming up are Westmoreland State Park on April 18 (7:48 p.m. sunset), Barnesfield solar observing, and Caledon on April 25 (7:55 p.m. sunset). Later, Scott added that he also has an astronomy event planned for Aquia Harbor on the 25th.

Treasurer Tim Plunkett was absent and had not sent a Treasurer's report this month.

Mike gave a Star Party report on the Messier Marathon event at Caledon. He attended with James Bingham, Bart Billard, Joe Francis, Scott Busby, and Myron Wasiuta. The sky was cloudy until about 10 p.m., and the Moon interfered toward dawn, but Scott and Mike stayed until Moonrise and saw nearly 100 Messier objects with their go-to telescopes. The clouds and Moon caused them to miss 6 or 7 objects each at the beginning and end. Bart described the Borders event on April 3. He arrived before 8 p.m. and met Mike in the store while waiting for it to get a little darker. They began setting up shortly after 8:00. About 50 visitors enjoyed views of the Moon and Saturn. It took a while to get over disorientation because of the location and the glare of the lights in the parking lot before they realized Saturn was up enough to observe.

Old Business

Club mailbox—The question whether the Club needs to continue renting a mailbox was deferred to allow Tim Plunkett's participation.

Gallileoscope purchase—The Club decided to ask Tim at the next meeting to order 8, including members' additional offers to purchase on a show of hands.

Universe DVD series—Prices were obtained for purchase from the History Channel or Amazon. The more favorable price is Amazon at \$128.96 including shipping, available after May 26. The Club has authorized the purchase, and we are waiting for the release of the DVD on "The Planets," which completes the set.

Beginner's book list—Mike suggested updating the Club library with more up-to-date books suitable for beginners. Leigh provided a list starting from his discussion in his program on "getting started in astronomy" at the January meeting. We plan to decide on which books to buy for the library at the next Club meeting.

Alternative dark sky sites—Glen reported on Camp High Road Church camp. Rental would be involved, but he has not yet discussed the amount. He is still looking for State Park-like deals. Scott is checking into Bealeton Aerodrome and Fort A.P. Hill. Glenn said that most Fort A.P. Hill campsites have lights and he is not sure about whom to see about turning them off. The campsites are available for local use. He has experience from scouting events there. Tom Harmon said Curtis Park in Stafford is available for \$25/night rental. Darkness is not great because it is near Fredericksburg. Mike recommended that the Club should consider giving up trying to have events at Big Meadows to which we invite other Clubs' participation, i.e., make them Club-only events.

Development of Boy Scout merit badge course—Glenn has a Word file plus files on his section of the Club website.

Change from Yahoo to Google for RAC_GROUP— The topic was deferred again because Scott has not been able to talk to Mark about his recommendations.

Plan for field trip to Green Bank in WV—Mark DeVito was absent, so the topic was deferred.

Plan for RAC attendance at regional star parties—Joe Francis circulated his survey. Results should be available soon.

Meeting room alternatives—We concluded that the ability to go later than 9:00 p.m. is an important consideration. It is inconvenient to be pushed to pack up 10 or 15 minutes before 9:00, and some members would like the opportunity to stay and talk after the meeting. Chris Reed reports that Fredericksburg Academy has a suitable room. The list that has circulated needs updating to eliminate Gander Mountain and Salem Church (9:00 closing) and include the new possibilities. Scott would like to try to take a vote on a new location at the next meeting.

Tom Harmon asked whether the Club has its own liability insurance.

Club meeting and star party announcements in local media—Mike was concerned about having Mark's friend Amber present before we are confident we will have good attendance. For the May meeting announcement, the topic is Scott's "Basic Webcam Astrophotography" presentation (due for a repeat).

Status of Club loaner assets—Glenn has tried to call Vernice Gilkey and has been unable to get an answer on the telephone. He said he could ask Tim for the address so he could drive by to check on her.

Next Meeting

The next meeting is scheduled for May 13, 2009, 7:00 p.m., at Central Rappahannock Regional Library Headquarters, Fredericksburg, Virginia.

Submitted by Bart Billard, Secretary