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**Beaver Meadow Observatory Report**

Did you manage to get out and view the Regulus occultation?? Joe Sullivan and I tried to find a clear spot in the clouds. We left early on the 19 and headed to Syracuse on the I-90. At Syracuse we determined that our chances were slim to none. The best choices were to go North to my sister’s a 30 minute drive, or South to NYC a 4 hour drive. After consulting the Moon Gods, and the weather maps we decided to go North to cheap lodging and a warm place to stay with internet and see if we could catch a gap in the clouds. I got up at 1:30am and could not even locate where the Moon was in the sky. Checked the trusty internet and ALL sites were clouded out, from the Bahamas to Upper Canada. Oh well, got clouded out for the Lunar Eclipse as well.

Looks like the next adventure will be the Comet Linear Meteor Shower the morning of May 24 from around 2 to 5am. It seems we may be in for a real treat. The predictions give us a possibility of seeing 60-100 per hour or more. They expect the material to be made up mostly of dust, but they are predicting a fair number of fireballs. The Moon rises at 3am so it will be low in the sky. With the Moon up, you will not have to travel to really dark skies as there will not be any, just need to get out of the city. If clear around here, I will be at the Observatory, if cloudy, I will be traveling (up to 12 hours) to get to clear skies. If you want to join in on the adventure please let me know!

Since I have not been able to work myself out of a job yet, (trust me, I’m working as fast as I can) Tuesday night at the Observatory will be canceled for now until I can work my way out of a job again. With luck I should be able to start them back up by the beginning of June??, one can only hope, at least it is good for the bank account.

Observatory users be warned that the dew heaters for the C-14 and NP101is are not working properly, I will get out there soon and change out the controller for a straight through power supply to see if it cures the problem, if not we will have to order extra dew heaters for the C-14 and NP101. Stay tuned to Egroups for further updates.

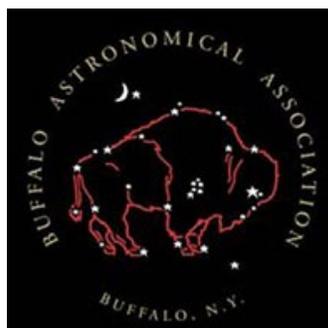
See you at the Observatory!  
Daniel Marcus



## BAA Schedule of Astronomy Fun for 2014



May 9	BAA Meeting at Buffalo State 7:30pm
May 10	Wilson Star Search - begins at dusk, Krueger Park, Wilson NY
June 7	Public Night BMO – Theme – Luna and lovers of Astronomy
June 13	BAA Meeting at Buffalo State 7:30pm – elections and pizza party
June 14	Wilson Star Search - begins at dusk, Krueger Park, Wilson NY
June 21	Star Lights—Buffalo Museum of Science, volunteers needed to bring telescopes
July 5	Public Night BMO
July 12	Wilson Star Search - begins at dusk, Krueger Park, Wilson NY
July 26	BAA Club Star Party
Aug 2	Public Night BMO
Aug 9	Wilson Star Search - begins at dusk, Krueger Park, Wilson NY
Aug 22-24	Black Forest Star Party
Sep 6	Public Night BMO
Sep 12	BAA Meeting at Buffalo State 7:30pm
Sep 13	Beaver Meadow Fall Festival 11am to 5pm Solar viewing
Sep 13	Wilson Star Search - begins at dusk, Krueger Park, Wilson NY
Oct 4	Public Night BMO – last one for the season
Oct 7/8	Total Lunar Eclipse
Oct 10	BAA Meeting at Buffalo State 7:30pm
Oct 11	Wilson Star Search - begins at dusk, Krueger Park, Wilson NY
Oct 23	Very partial Solar Eclipse at sunset
Nov 14?15?	BAA Meeting - location and time TBA
Dec 12	BAA Meeting at Buffalo State 7:30pm – Holiday Party



## May 9, 2014 Meeting

7:30 pm

### Buffalo State College

Presentation by BAA member and Organizer of the "Wilson Star Search"

**Steve Smith**

### "Art of the Public Star Party"



**And BAA Member's**

### "Astronomy Gear Show and Tell"



All members are invited to bring their favorite observing gear and aids—eyepieces, star charts, books / references, lasers, red lights, finder scopes, filters, apps, programs etc...

## College of Fellows Report

**Rowland Rupp**

Steve Smith received the College of Fellows Award at the annual dinner meeting "for establishing the Wilson Star Search and sharing his love of astronomy with the public." Steve has held observing sessions in Wilson during summer months for several years and has been an advocate of astronomy there and at other venues.

Mike Anzalone was inducted into the college for his contributions to many projects and programs of the BAA, and for having achieved recognition in teaching astronomy to organizations and observing groups. He joins the following other members of the college: Marilou Bebak, Larry Carlino, Alan Friedman, Janice Gardner, Bob Hughes, Steve Kramer, Jack Mack, Dan Marcus, Beverly Orzechowski, Joe Orzechowski, Rowland Rupp, Bill Smith, and Bob Titran.

The meeting was held on April 12<sup>th</sup> at Risotto Restaurant where Gary E. Carver, PhD was our guest speaker. Dr. Carver is the Director of Research and Development at Omega Optical. His talk was anecdotal, instructive and, at times, personal when he spoke of people and projects he encountered during his extensive career. He was particularly skilled and detailed in answering questions that, at times, were complex.

## Election of Officers

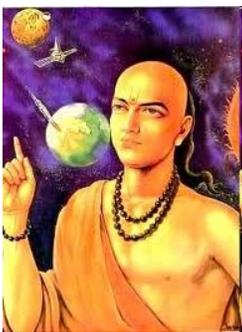
ALL nominations for the June election are due by the May meeting. If you are interested in running or know someone you would like to nominate for President, Vice-president, Secretary, or Treasurer please do so at the May 9th meeting. Elections will be held at our June 13th meeting, and pizza will be served!



## The Indian Astronomer Aryabhata

By Randy Boswell

India, a land of one of the oldest civilizations and comprised of many religions, customs and diverse peoples, it has captured the western imagination for centuries. However, what is less apparent is India's contribution to the sciences. Regarding this, India has produced a number of early astronomers whose achievements pre-dated their Western counterparts.



The greatest of these was Aryabhata (476-550 A.D.). Born in Kerala, South India, Aryabhata was the first in a line of astronomer-mathematicians during the classical age of India. [1] His major work was a treatise known as the *Aryabhatiya* (499 A.D.) and contained profound astronomical and mathematical insights for his day. This short, pamphlet-length work was written in Sanskrit and in the style of poetic verse, necessitating the use of commentaries to aid in its understanding. Accordingly, these include twelve notable commentaries that were written between 525 A.D. through 1900. [2] Among the most notable of these were those written by the Indian astronomer-mathematicians, Bhaskara and Brahmagupta. The *Aryabhatiya* consisted of 108 verses in the text and 13 introductory verses. These were divided into three major sections: *Ganita* ("Mathematics"), *Kala-kriya* ("Time Calculations"), and *Gola* ("Sphere"). [3]

In *Ganita* Aryabhata offers a number of significant mathematical insights. The most famous of these insights is Aryabhata's determination of the value of pi,  $\pi$ . Aryabhata's calculations yielded a value of 3.1416 – a figure that is accurate to four rounded-off decimal places and which its determination pre-

dated that of the Greek mathematicians. [1,2]. Aryabhata's other mathematical innovations included formulas for determining square and cube roots, working out methods for calculating compound interest, providing formulas for finding the sums of arithmetic progressions, and the construction of a table of sines, which has been much commented upon in the historical writings.

However, it was in the field of astronomy that Aryabhata was light-years ahead of the West. The remaining sections of the *Aryabhatiya*, *Kala-kriya* and *Gola*, deal with this subject. For example, Aryabhata was one of the earliest persons to suggest that the Earth was a sphere and rotated on its axis. Regarding this, Aryabhata said that this accounted for the apparent westward motion of the stars and likened it to the illusion of a stationary object moving as viewed from a moving boat. Thus, according to Aryabhata: "*In the same way that someone in a boat going forward sees an unmoving [object] going backward, so [someone] on the equator sees the unmoving stars going uniformly westward. The cause of rising and setting [is that] the sphere of the stars together with the planets [apparently?] turns due west at the equator, constantly pushed by the cosmic wind.*" [4]

Also, in connection with this, Aryabhata calculated the sidereal rotation of the Earth by using the fixed stars as reference points, which resulted in a value of 23 hours, 56 minutes and 4.1 seconds; the modern value being 23:56:4.091. [5] He also fixed the sidereal year as being 365 days, 6 hours, 12 minutes, and 30 seconds – an error of 3 minutes, 20 seconds over the length of a year. [5] Although the notion of sidereal time was known in his day, Aryabhata's calculations were considered the most accurate at the time. This was highly insightful given the fact that Europe was wedded at the time and for many centuries afterwards to a hidebound

cosmology, which held that the heavenly bodies were embedded in concentric transparent spheres that rotated around a stationary Earth.

Regarding the solar system, Aryabahata posited a geocentric model whereby the Sun, Moon and the planets revolved around the Earth in epicycles, thus to account for the apparent retrograde motions of the heavenly bodies and echoing the first century Ptolemaic Greek astronomy. However, Aryabahata added a unique twist to this by proposing the notion of gravitation, which held the solar system together. [5,6] This was significant in that Aryabahata's idea pre-dated that of Newton by more than a millennium.

Aryabhata also offered a modern explanation for solar and lunar eclipses. According to Aryabhata, eclipses were the result of shadows produced when the Earth-Moon orbital plane intersected the Earth-Sun orbital plane, at points called lunar nodes. [4] This insight was given at a time when it was generally thought in India that eclipses were the work of the Hindu demons Rahu and Ketu and in Europe where they were associated with ominous superstitions. Moreover, Aryabahata was also able to predict the eclipses of the Sun and Moon long before European astronomers.

He also offered the idea that the light of the Moon and planets were due to the reflection from the light of the Sun.

In summation, Aryabahata was ahead of his time. His writings had a profound influence on the development of Islamic astronomy and were later translated into Latin in the 13<sup>th</sup> century, where it had an important influence on European astronomers and mathematicians. Although Newton, Copernicus and Galileo are associated with modern astronomical concepts, much of the same ideas were due to the earlier work of Aryabahata, which preceded them by more than ten centuries. India

honored him by naming its first commercial satellite, launched in 1975, Aryabahata. End.

## Notes

1. *StudyHelpline.net*, "Aryabhata Scientist Biography," 2011, <http://www.studyhelpline.net/Biography/Aryabhata-Scientists-biography.aspx> (accessed 2 November 2013).
2. William J. Gongol, "The Aryabhata: Foundations of Indian Mathematics," 14 December 2003, <http://www.gongol.com/research/math/aryabhata/> (accessed 4 November 2013).
3. Takao Hayashi, "Aryabhata I," *Encyclopedia Britannica*, <http://www.britannica.com/Ebchecked/topic/37461/Aryabhata-I> (accessed 11 November 2013).
4. *Wikipedia*, "Aryabhata," 1 November 2013, <http://en.wikipedia.org/wiki/Aryabhata> (accessed 9 November 2013).
5. *Sankalp India Foundation*, "Astronomy," <http://www.sankalpindia.net/drupal/astronomy> (accessed 16 November 2013).
6. *Hindunet.com*, "The Things India Knew First," 8 August 2003, <http://www.vnn.org/world/WD0308/WD08-8270.html> (accessed 24 November 2013).

## BAA Officers and General Information

President: Mike Anzalone  
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Treasurer: Jeff Gardner

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 Derek Bill

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Star Parties: Dan Marcus

BAA Yahoo E Group: Dennis Hohman

BAA Website Webmaster: Chris Elliott  
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BAA voice mail box: (716) 629-3098

Location / Time of Meetings: BAA meetings are held on the 2nd Friday of the month from September to June starting at 7:30pm. Our meetings are held in room C122 of the Classroom Building at the Buffalo State Campus. See map below, building 35.

