The Spectrum

The Newsletter for the Buffalo Astronomical

May/June

Volume 17, Issue 3

Inside this issue:

The Website is Live! Have you visited?

Still haven't see the new website? Now is a great the time. With updates happening constantly, its very different from what we had before Check it out at BuffaloAstronomy.com and let us know what you think.

On a sad note: as many of you know, Cheri Harper passed away earlier this year. Cheri was the club's vice president as well as former editor of the Spectrum. I had a chance to work at length with Cheri when we were transiting the Spectrum. I found her very knowledgeable and delightful to work with. She was energetic, smart, and we discussed several projects she was interested in participating in. It was a true pleasure working with her

She will be missed.

BAA Schedule of Astronomy Fun for 2015

BAA Schedule of Astronomy Fun for 2015

2015 schedule of events:

May 8: BAA Meeting at 7:30pm at Buffalo State College

Jun 6: Public Night BMO

Jun 12: BAA Meeting/Elections at 7:30pm at Buffalo State College

July 4: Public Night BMO – I will need help as I have family obligations that day.

Jul 18: Club Star Party at BMO times TBA.

Aug 1: Public Night BMO

Aug 12: Meteor Shower –BMO anyone??

Sept 5: Public Night BMO

Sept 11: BAA Meeting at 7:30pm at Buffalo State College

Sept 11-13: Black Forest Star Party J

Oct 3: Public Night BMO

Oct 9: BAA Meeting at 7:30pm at Buffalo State College

Nov 13: BAA Meeting at 7:30pm at Buffalo State College

Dec 11: BAA Meeting at 7:30pm at Buffalo State College – Holliday Party!

See you at the Observatory

Daniel Marcus

Buffalo Astronomical Association

June General Meeting
and
2015-17 BAA Officer and Board of Directors
Election

Slate of Candidates

Vice-President:
(Completing the remaining 1 year of Cheri Harper's term ending in 2016)

Choose One (1) candidate:

□ Irene Ziarnowski

□ _____

Write-in Candidate

At- Large Directors:
Choose Three (3) candidates:

□ Dennis Bartkowiak

□ Neal Ginsberg (Incumbent)

□ Steve Smith (Incumbent)

□ _____

Write-in Candidate

Observatory Report

By Dan Marcus

Thanks to ADM telescope accessories we now have the C-14 mounted using rings for a more rigid attachment (Thanks Anthony!). Preliminary tests show we can guide with the ST-9 and the C-14 while imaging with the NP101 for about 5 minutes before flexure is an issue. The debate now will be if we want to eliminate the adjustable mount for the NP101 and bolt it directly to the rings. I will leave the setup the way it is for now and we will give it a good test run the way it is. The ST-9 seems to be able to guide on 13 mag stars using 3X3 binning and 10 sec exposures through the Blue filter (blue being the one that needs the most exposure to get an image, have not tried it through theO3 yet). The guiding seems to be excellent. During our Tuesday night sessions we will start taking some RGB images. We already have some of M97 using 10 minute Red and Green subs, and 20 min Blue subs. I need to get some darks for the longer exposures. Hopefully I can do that before public night Sat May 2. For public/member fun I do have to admit a one shot color camera is more convenient than RGB imaging. You may not get the advantages of narrow band filters, but you can more easily come home with color images with only one night of shooting. Imaging has never been sooooo much FUN, and you all know my opinion on fun.

Tuesday Night at the Observatory is in full swing. No pesky employment looming on the horizon so we should be at it all summer. One of the projects we are working on is Astro Tortilla a plate solving software that will figure out where the telescope is pointed, and then center what you are trying to locate. We shall see how that works. For now it is just as easy to put a Canon DSLR on the NP101 and use it as a finder to center things in the C-14 and ST-9. We currently go to an object, and if it is not in the frame, we then go to a bright nearby star, center it in the ST-9, recalibrate the mount and usually the object will be in the center of the field when we go to it again. Life is GOOD. Saturn should be creeping into the evening sky and we will be imaging it and its moons. Will be a piece of cake for this setup! The only issue will be the SHORT nights. They maybe warmer, but they are buggy and short. Comet 67P will also be a target as NASA is looking for people to image it, but it is more of a morning object.

The Buffalo Astronomical Association proudly pre-

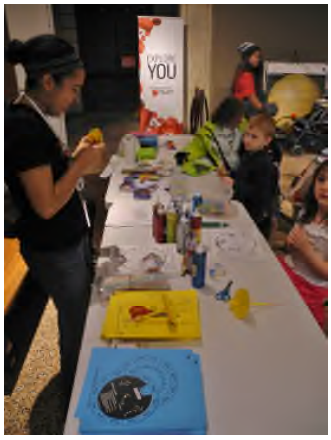
Astronomy Day 2015

At the

Buffalo Museum of Science 2015

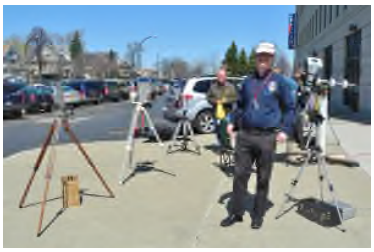
- Over 1,100 visitors to the museum!
- Over 40 BAA members in attendance
- All day crafts and face painting always had a crowd.
- Outstanding solar viewing (see Dan's article on the solar photography).

A special "Thank You" to everyone who participated and helped make Astronomy Day a resounding Success!

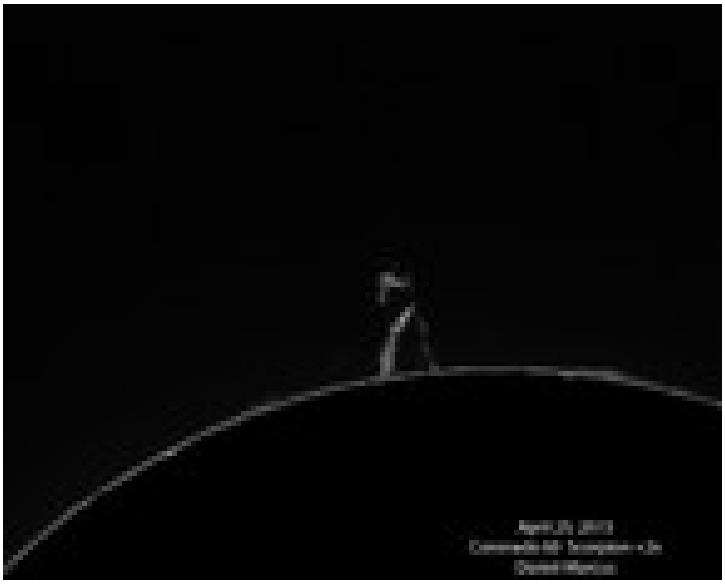


PICTURES SPEAK A THOUSAND WORDS


ARTIFACTS



For all of you who were stuck inside during Astronomy Day and missed out on the CME that occurred, here is and image, and one taken 3 days later that I happened to catch just in the nick of time. It was AWSOME to watch the prominence grow in size and drift away from the Sun in a matter of 1 to 2 hours. Think of sending something to the Moon from the earth in less than 2 hours. The prominences were highly Doppler shifted. Actually the wider band width filters like the PST allowed better viewing. Those of us with .5 angstrom filters had to adjust the filters while viewing just to see the whole prominence. Hopefully by the next meeting I will have some other images of them as they blew up and faded away. The one on Tues April 28 stretched out much farther than the one on Saturday the 25. Have a video of it where I run the filter up and down the spectrum so you can see the whole prominence- will bring it to the May meeting. If I remember correctly both were about the same location on the Suns edge, but don't hold me to that observation. I need to start making sure I have camera consistently positioned, not so easy when you have the diagonal and camera orientations to worry about. Be much easier if it was a straight through system.



Dan M.

Elias Loomis: *Elements of Astronomy*

I read an astronomy book (well, not all of it) that was published in 1871. Its author was Elias Loomis, LL.D. (an honorary degree conferred by NYU in 1854), who was professor of natural philosophy and astronomy at Yale. I thought the term *natural philosophy* went out of fashion a century of so earlier, but there it was. The title page said the book was designed for academies and high schools. I decided I might be able to handle it.

There are sixteen chapters, but the first six are devoted to the Earth and its environs. They cover the topics important for that time period like: the shape and dimensions of Earth, seasons, refraction, twilight, and aberration of starlight. Astronomical instruments are covered here, including mural circles, the astronomical clock, and the sextant. Mathematics is avoided, but there are plenty of geometric proofs with elaborately drawn figures having copious letters to identify each part. The complicated (at least to me) explanations such as: the line from Bg bisects the plane defined by ACFH, etc. This was a typical approach in the era of this publication. I always find it tedious and obscure. I wonder if high school students of 1871 felt likewise.

Later, there were chapters on the moon, the planets, meteors and comets. Finally, there was a single chapter that covered stars and nebulae. This paucity of material on stars and deep space reflects the sparse information known about these subjects a century and a half ago. An elementary astronomy text today would overflow with information on these subjects. I decided to find out what the author had to say about stars.

He first noted how many stars there were of each magnitude, and concluded there were 5905 stars visible to the naked eye or, in other words, there were 5905 stars as bright or brighter than 6th magnitude. He then explained that the ratio of magnitudes was in the brightness sequence 100, 25, 12, 6, 2, 1. While this maintains the current brightness ratio of 100 to one for a five magnitude difference, it certainly doesn't follow the approximately 2.5 brightness ratio between magnitudes in vogue today. His explanation: "It is probable that these varieties of brightness are chiefly caused by difference of distance rather than by difference in intrinsic splendor" is sound to a point, but we now recognize that most of the brightest stars visible without optical aid are those that have expanded in their old age and have become truly intrinsically brilliant.

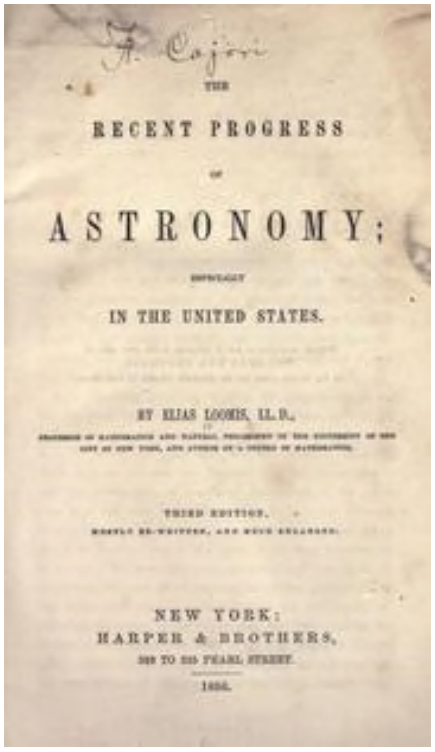
Following three pages that cover constellations, the author then deals with "temporary stars;" however he does not differentiate between supernovae and ordinary or recurrent novae. Supernovae were unheard of in his day. Loomis also addresses "periodic stars," citing Mira and Algol as eponymous examples. He suggested that "temporary stars do not differ from the periodic stars except in the length of their periods." He offered theories to explain these phenomena, a couple of which are plausible today; others are fantastic. Among the former are that a dark opaque body revolves around the star and intercepts some of its light (Algol), or a "nebulous body of great extent" revolves around the star and obscures it (Mira, probably, although he didn't say so). On the fantastic side is his idea that some stars may be flat discs that, when they rotate, periodically present their dim slender edge to us and at other times present their bright flat side. Since later he notes that stars are equivalent bodies to our sun, it seems Loomis has taken a departure from not only observational evidence, but also the laws of physics

He next describes using parallax to determine the distance to stars, pointing out that until recently

such measurements were impossible because no star has a parallax greater than one second of arc. In explaining how parallax is measured, he gives the parallax of two stars: Alpha Centauri at 0.92", and 61 Cygni at 0.45". Modern values are more like 0.75" and 0.29", respectively, making them more distant than was thought in Loomis's time. He also noted that stellar spectra reveal that stars are made up of the same substances that appear here on Earth and in the sun. He cites sodium, magnesium, iron and hydrogen as "widely diffused" among the stars.

He discuses the "proper motion" of stars which, even for the fastest moving stars, is only a couple of seconds of arc annually. Two reasons are given for this motion: part may be that the star has a *real* (italics his) motion through space, and also partly that the solar system is moving through space as well. Loomis notes that Sir William Herschel determined that the solar system is moving toward the constellation Hercules, and that Struve (the author didn't say which one of this family of astronomers) estimated that we are traveling about 150 million miles per year. Loomis deduces that since the sun is moving toward Hercules, it must be revolving around a center of gravity located in the plane of the Milky Way ninety degrees from its direction of travel, that is, in the constellation Perseus. Today we know the sun revolves around the center of the galaxy located in Sagittarius, far from Perseus. One can't really fault astronomers of this time, they deduced these directions and motions by observing the relative motions of nearby stars that all share our motion around the galactic center, which was yet to be discovered

Loomis makes a case for most of the 6000 double stars then known to be true binaries revolving around their common center of gravity, and not merely stars distant from one another that happen to lie in the same line of sight. He noted that a random distribution of stars could never produce so many pairs appearing close together unless they were gravitationally bound. Loomis commented that Herschel was the first to investigate the orbits of binary stars and had found that their motion was around each other. Herschel had expected this procedure would allow him to measure the annual parallax caused by Earth's orbital motion about the sun (as it would if the apparent pairs of stars were really located at vastly different distances from us), but found instead this much more interesting phenomenon. These orbits were found to be elliptical, often with high eccentricity. By finding the distance from Earth to some of the nearer binaries, Loomis points out, we can determine their true distance from each other from which, if we also know their orbital period, we can calculate their masses. Thus we find stars are not only made of the same elements as the sun, but they have comparable masses. While Loomis didn't claim it, this might be one of the first steps toward astrophysics.


THE

RECENT PROGRESS

OF

ASTRONOMY;

IN THE UNITED STATES.

BY ELIAS LOOMIS, LL.D.,

THIRD EDITION.

NEW YORK:
HARPER & BROTHERS,

1856.

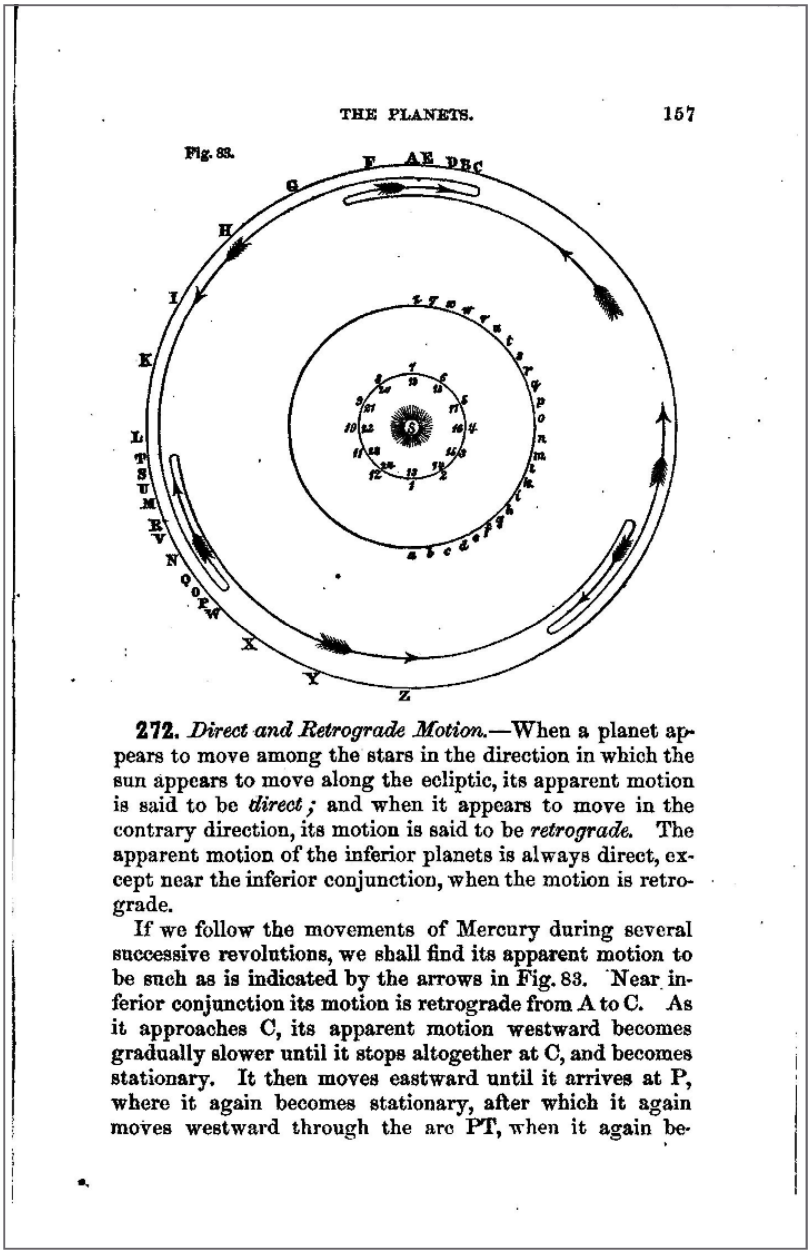
One can't fault the author for the limitations of astronomical knowledge available in the middle of the nineteenth century, although the idea of flat stars grates on me somewhat and seems out of keeping with his background and achievements. Loomis was, after all, a professor at Yale College - a not too shabby institution.

His accomplishments extended far beyond that. Born in Connecticut, Loomis graduated from Yale at age nineteen in 1830. He went on to teach mathematics at Western Reserve, where he supervised the construction of their observatory, only the third at a college campus in this country, and at the University of the City of New York (NYU now). He wrote books on algebra, analytic geometry, trigonometry and calculus.

Later, he received his appointment to Yale where he also taught Latin. He did research in meteorology, electricity, telegraphy, Earth's magnetic field, and made observations of meteors (determining their altitudes) and comets. He and a colleague were the first Americans to observe the return of Halley's comet in 1835. In the *Smithsonian Annual Report* for 1865 he noted a relationship between auroras and sunspot activity.

All in all, Loomis was a very accomplished scientist and mathematician. Living a century and a half ago accounts for his limitations of astronomy, especially of deep space. I suppose someone reading our texts a century, or maybe only decades, from now will draw the same conclusions about us.

Rowland A. Rupp



THE PLANETS. 157

Fig. 83.

272. *Direct and Retrograde Motion.*—When a planet appears to move among the stars in the direction in which the sun appears to move along the ecliptic, its apparent motion is said to be *direct;* and when it appears to move in the contrary direction, its motion is said to be *retrograde.* The apparent motion of the inferior planets is always direct, except near the inferior conjunction, when the motion is retrograde.

If we follow the movements of Mercury during several successive revolutions, we shall find its apparent motion to be such as is indicated by the arrows in Fig. 83. Near inferior conjunction its motion is retrograde from A to C. As it approaches C, its apparent motion westward becomes gradually slower until it stops altogether at C, and becomes stationary. It then moves eastward until it arrives at P, where it again becomes stationary, after which it again moves westward through the arc PT, when it again be-

Here is an example from the book. This is page 157 where Loomis describes Direct and Retrograde motion.

The complete book is available to read here:

http://www.unz.org/Pub/LoomisElias-1870

Quintessence

A New Look At An Old Idea

By

Randy Boswell

The early part of the twentieth century witnessed the discovery that the universe is expanding. This inexorably led to the profound conclusion that the universe had a beginning in time from a point source, now known as the big bang. Then, at the end of the twentieth century astronomers made an equally profound discovery. Two independent teams of researchers studying the Doppler or red shifts of distant Type 1a supernovae came to the conclusion that the universe is expanding at an accelerated rate. Astronomers dubbed the driving force behind this expansion, dark energy.

Researchers- notably Robert R. Caldwell, Rahul Dave and Paul Steinhardt of the University of Pennsylvania - later named this repulsive force, quintessence. The name is derived from an ancient idea of Aristotle. In Aristotle's time the universe was believed to be composed of earth, air, fire and water, plus an invisible "fifth element or essence," which Aristotle invoked for the celestial sphere of the stars and planets and known in ancient times as the ether. According to Aristotle, this fifth element prevented the moon and planets from falling to the center of the celestial sphere. Translated into Latin, this "fifth essence" became known as *quinta essentia*. Quintessence, therefore, is a modern re-interpretation of Aristotle's old idea. It is a theoretical model of where dark energy comes from. The term refers to a dynamical quantum field, not unlike an electrical or magnetic field that gravitationally repels [Ostriker and Steinhardt, 2001].

The concept is based on the notion that energy is inherent in the fabric of space. I.e., a purely empty volume of space is said to exert energy or force, which is otherwise known as vacuum energy. But whereas vacuum energy maintains the same value, the dynamics of quintessence is said to change over time and vary with location [Tate, 2009].

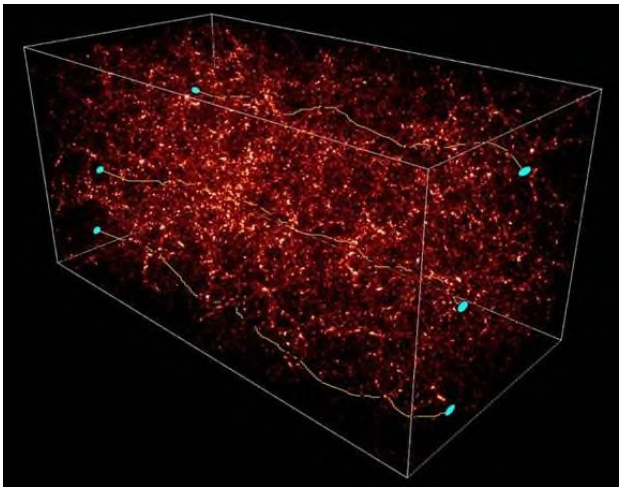
It is theorized that quintessence became the dominating force in the universe about 10 billion years ago. Specifically, it is said that dark energy was created when the universe was 10^-35 second old, but did not cause the universe to accelerate for another half-dozen or so billion years [Wanjek, n.d.]. It is suggested that quintessence turned on during the transition from a radiation to matter-dominated universe , when it was cool enough for atoms and eventually stars to form [Wanjek, n.d.].

This is significant because quintessence seams to answer what cosmologists call the problem of fine-tuning or coincidence. The basic idea behind this is that if the universe had expanded too rapidly from what is observed today, space would have blown apart to such a degree to preclude chunks of matter from forming into stars and planets. If, on the other hand, the expansion of the universe was not sufficient enough, the mutual attraction of

matter, then present, would have caused the universe to collapse in on itself.

More specifically, vacuum energy cannot account for the fine-tuned expansion rate. This is because in the nascent universe the vacuum energy could not have been very significant [Siegfried, 2004]. This is in accord with the idea that the matter density (i.e., matter density exerts what physicists call a positive force or gravitational attraction, whereas vacuum energy exerts what is a called a negative or repulsive force) exerted a greater positive force than the negative force of vacuum energy. Therefore, if the vacuum energy was greater than the matter density the universe would have expanded too rapidly for matter to condense into celestial bodies. This is supported by the fact that according to calculations empty space should produce an amount of vacuum energy that is larger than what is actually observed by a factor of 10 to the 120th power [Siegfried, 2004]. What accounts for the lessening of much of the vacuum energy? And what accounts for the idea that quintessence turned on during the transition from a radiation to matter-dominated universe? Cosmologists have termed this the Nancy Kerrigan Problem - named after the figure skater by that name who was injured in the knee shortly before the 1994 Winter Olympics, which prompted her to plaintively ask Why me? Why now?

Regarding this, cosmologists have suggested that quintessence is a tracker field. According to physicists a tracker field is a field which "tracks" or takes on the properties of its surrounding environment. According to this scenario, quintessence as a tracker field adjusted its value or energy density (i.e., the factor that determines the degree of force, be it positive or negative that is exerted) to the predominating form of energy then present. Or, more specifically, it locks into a track on which its energy density remains a nearly constant fraction of the density of radiation and matter [Ostriker and Steinhardt, 2001]. According to the Standard Model, the nascent universe first consisted mainly of radiation. Then, as the universe cooled the energy content of radiation decreased more rapidly than that of matter. Finally, matter took over and the energy balance shifted in favor of matter. Accordingly, it has been suggested that quintessence was an insignificant factor while it tracked the radiation energy, but when matter became dominant quintessence underwent a change and exerted a negative value or pressure and which eventually led to the cosmic acceleration of today.



In conclusion, quintessence is a hypothetical and mysterious field about which scores of papers have been produced in the scientific community. In this connection it is interesting to note that Einstein's general relativity field theory was initially thought to be hypothetical until it was validated many decades later. Similarly, the theory of quintessence remains yet to be validated as researchers learn more about the universe in the years ahead. End.

References

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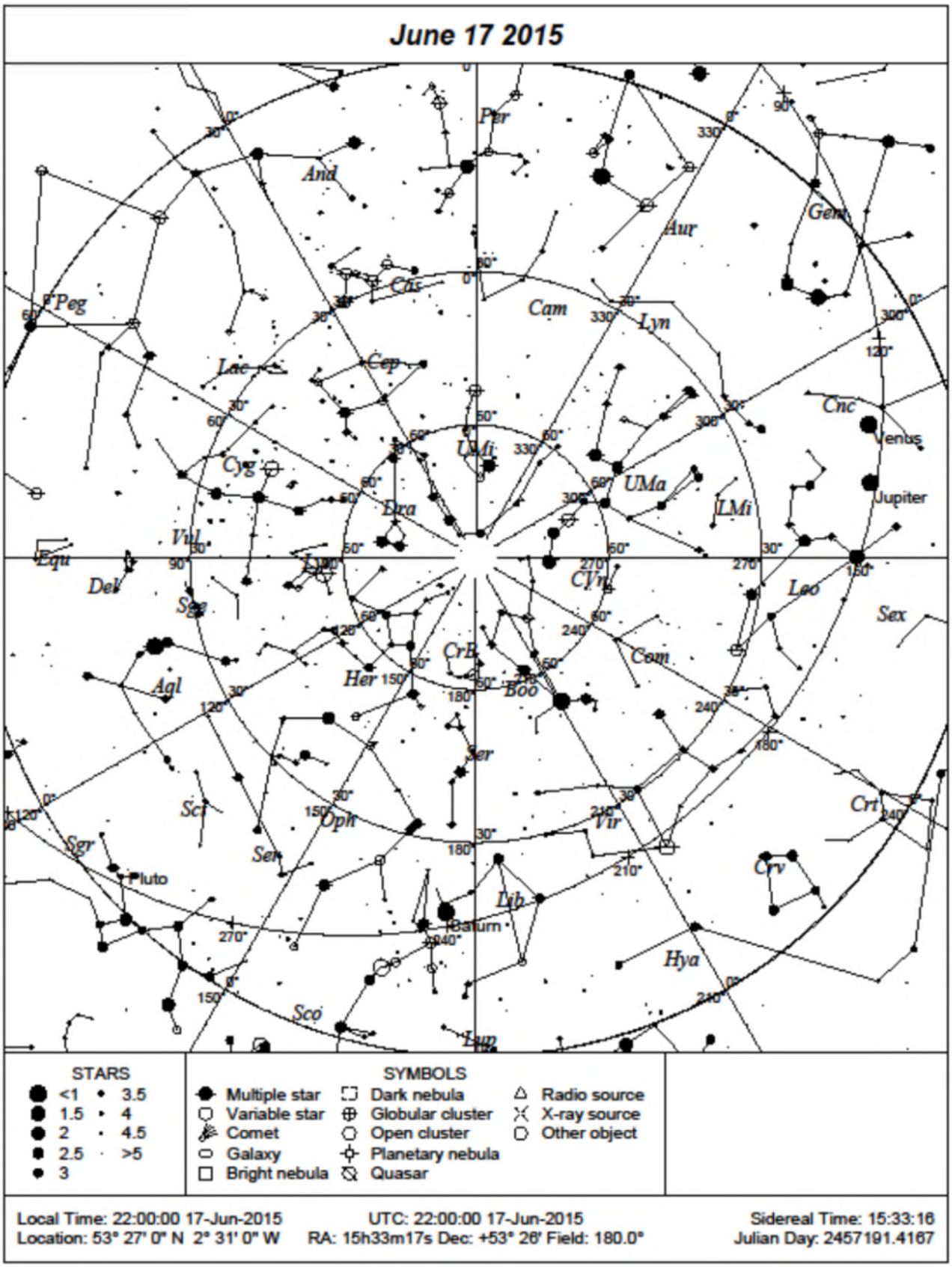
June 17 2015
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Local Time: 22:00:00 17-Jun-2015
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UTC: 22:00:00 17-Jun-2015
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Location / Time of Meetings: BAA meetings are held on the 2nd Friday of 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.