January 2023 HAD Meeting: Seattle

HAD I: WGPAH Special Session

Sunday, January 8th. 3:00 – 5:00 pm   Room 614
Session 99
Session Chair: Jennifer Bartlett

99.01 Got Stuff? How We Deal with Possible Astronomical Heritage Material

3:00

Jennifer Bartlett[1], Virginia Trimble[2], R. Elizabeth Griffin[3], David DeVorkin[4], Wayne Osborn[5], Stephen McCluskey[6], Sara Schechner[7], James Lattis[8], Brenda Corbin[9], Thomas Hockey[10], Kenneth Kellermann[11], E. Krupp[12], Kevin Schindler[13], Patrick Seitzer[14]

[1]US Naval Academy, Annapolis, MD, [2]University of California, Irvine, Irvine, CA, [3]Herzberg Astronomy & Astrophysics Research Centre, Victoria, BC, Canada, [4]Smithsonian Institute (Emeritus), Kensington, MD, [5]Central Michigan University, Delavan, WI, [6]West Virginia Univ., Morgantown, WV, [7]Harvard University, Cambridge, MA, [8]University of Wisconsin-Madison, Madison, WI, [9]US Naval Observatory, retired, Washington, DC, [10]University of Northern Iowa, Cedar Falls, IA, [11]NRAO, Charlottesville, VA, [12]Griffith Observatory, Los Angeles, CA, [13]Lowell Observatory, Flagstaff, AZ, [14]University of Michigan, Ann Arbor, Ann Arbor, MI

According to the adage, “One person’s trash is another’s treasure.” When we finish a project, some resources will continue to be significant for our future research while others may no longer be relevant. How do we decide personally what is trash and what is treasure? What is our responsibility to those who might treasure our trash?

While cheap, digital storage is available, retaining the bits is easy to do. For our predecessors who recorded their observations on tapes, glass plates, or paper, storage was a greater challenge. Over time, many raw observations and working notes have been discarded. Once an observation is lost, we can never recapture that unique view of space and time. While we cannot know what questions future astronomers will ask, we can envision its reuse, along with its associated metadata and algorithms.

Neither raw observations nor scientific results exist without an entire ecosystem of instruments and institutions. For these, too, we must assess their status as trash or treasure and, for treasure, assign responsibility. What about instruments that have been superseded or observatory sites that have outlived their original mission? What retains scientific value? What can be re-purposed for education or outreach? What has continuing historic and cultural importance? Furthermore, we cannot and should not preserve everything; how, then, do we choose what to preserve and how best to conserve it?

The AAS charged its Working Group on the Preservation of Astronomical Heritage (WGPAH) with establishing criteria and priorities for identifying heritage material and with disseminating best practices for preserving heritage resources so that our scientific legacy remains available for research, teaching, and outreach. WGPAH can help you realistically sort through the trash and treasure of astronomical research. The choices we make reflect our values and reveal the stories we want to tell ourselves. Because our scientific heritage belongs to our whole community, we welcome your participation to ensure we preserve as many stories as we can.

99.02 Report from the Task Force on Historic Site Designation

3:10 Thomas Hockey[1]
[1]*University of Northern Iowa, Cedar Falls, IA*

In 2021, the Working Group for the Preservation of Astronomical Heritage (at its and the request of the Historical Astronomy Division) was asked by the AAS to investigate the feasibility and desirability of formal recognition of historical sites.

Jennifer Bartlett, Chair of WGPAH appointed me and the other Task Force members (Stephen McCluskey, Amy Oliver, Sarah Reynolds, Ken Rumstay, Sara Schechner, and Patrick Seitzer) to this investigation. There was the usual COVID-related delay; however, the Task Force now is ready to present its report to the AAS Executive Committee.

The Task Force report covers three aspects of the endeavor:

1. Assessment of the benefits of such a designation program for selected sites, as well as the value of promoting astronomical heritage in this manner for our Society and the profession.
2. Outline of a potential program based upon review of other historic-site designation programs.
3. Analysis of the costs of such an effort.

A program to recognize locations of astronomical importance provides opportunities to identify and promote astronomy's impact throughout history, as well as to highlight its connections to the history of a unique place. Ideally, the recognition involved in an AAS Historic Site Designation Program can be connected to other initiatives of the AAS and its divisions.

However, knowledge of a site might be culturally sensitive. Greater awareness of a site might increase the threat of human impact, theft, or vandalism. Consequently, working with site custodians and/or local communities in proposing, nominating, and recognizing sites is essential.

We consider sites worthy of potential designation to include:

● Observatories and instruments.

● Properties in which the design and/or landscape setting has significance in relation to celestial objects or events.

● Representations of the sky and/or astronomical objects or events.

● No-longer active field sites, even though they usually are physically separate from the sponsoring institution or researchers.

● Landmarks such as observational indicators or visual hierophanies.

We will propose that nominations be reviewed by a committee comprised of members of the AAS, HAD, and WGPAH. The committee will select 2-3 sites for recognition annually, recommending those sites to the WGPAH/HAD/AAS for approval.

Common components of a historical designation include an in situ commemorative plaque and/or brochure and a formal dedication. Plus, the AAS would need to maintain a website for each dedicated site. The costs should be evaluated with regards to how well they can integrate with and contribute to other AAS programs and initiatives.

3:20 Discussion of Task Force Report

99.03 **Recognizing, Rescuing and Researching Astronomy's Irreplaceable Legacy of Heritage Data**

3:30 Elizabeth Griffin[1]
[1]HAA - DAO, Victoria, BC, BC, Canada

In its earliest years, the newly-formed science of astrophysics was supported by large volumes of photographic observations. Photography was the only workhorse detector in those pre-electronic years. Many decades later, the world has largely forgotten (or sometimes deliberately ignored) the existence of those data. Yet for some important types of time-domain science, access to the information in those photographic plates is critical. Long-period binaries cannot be measured at all precisely without radial-velocity data that span more than one orbit, and frequently it is the aggregation of all available data, however ragged, that can ultimately confirm (or deny) an improved period. That is largely how the period of the 2-mag binary γ Per was refined, and its total eclipses discovered only recently. The orbits of near-Earth objects can be refined (and alerts disarmed) by measuring their observed positions on old images. Astrometric orbits have periods that stretch into centuries, so the older the data the better for helping to confirm what newer (if more precise) measurements indicate. The concentration of the Earth's ozone before humans sent pollutants into the upper atmosphere can be investigated uniquely from astronomical spectra 80 to 100 years old. These are all critical science, and astronomers must rescue these ageing data before disaster (e.g., breakages, tossing through ignorance, loss of essential equipment, loss of historical memories) overtakes and these jewels are gone for good.

3:50 Questions

99.04 **International Glass Plates Group and Getting Started with a Collection**

3:55 Morgan Black[1]
[1]United States Naval Observatory, Washington, DC

The United States Naval Observatory (USNO) Library has begun an effort to obtain intellectual and physical control over the Observatory’s glass plate collections. While the majority of our glass plates are at the Pisgah Astronomical Research Institute (PARI), our collections still on site include both pictorial and data plates. As part of the International Glass Plates Working Group, we are working towards this goal in tandem with other institutions across the world. This self-selected group of astronomers, librarians, archivists, historians, computer scientists and others meet monthly to discuss standards and norms, historical and scientific value, and other topics of value to those with or interested in glass plate collections. This talk will showcase how the USNO Library is currently planning on tackling our collections, from physical preservation to metadata and digitization standards, and some lessons learned from participating in the International Glass Plates Working Group.

4:10 Questions

99.05 NOIRLab Legacy Mosaic Data Rescue Project

4:15 Nicholas Foo[1], Julie Steffen[2]
[1]AAS-NOIRLab, Tucson, AZ, [2]American Astronomical Society (AAS), Tucson, AZ

The American Astronomical Society (AAS) is collaborating with NSF's NOIRLab (National Optical-Infrared Astronomy Research Laboratory) to conduct a rescue project on the legacy mosaic data archived by the National Optical Astronomy Observatory (NOAO; National Optical Astronomy Observatories pre-FY2000). In the mid-1990s, telescopes at Kitt Peak National Observatory (KPNO) and Cerro Tololo Inter-American Observatory (CTIO) made the significant transition to archiving digital observational data stored on magnetic exabyte tapes. From 1993 until 2004 5+ million raw data files on 9000+ unique data magnetic tapes were collected in the NOAO Science Archive. In the present day the 8mm tape format is obsolete, where the data has been offline for the past 20–30 years despite numerous possibilities for archival research. Eventually, they will not be recoverable because the tapes will degrade overtime and the hardware that is required will no longer be available. Using a bank of 8mm tape readers, the recovery project team has managed to extract and catalog the data. So far, nearly all Mosaic-1 wide-field-images have been recovered. Currently, existing pipeline software is being developed to perform calibration and basic analysis to produce science-ready images. All observations recovered from the project will be publicly accessible via the Astro Data Archive ingest. Hopefully, the unveiling of previously dark data will initiate and inspire numerous archival research investigations in the future.

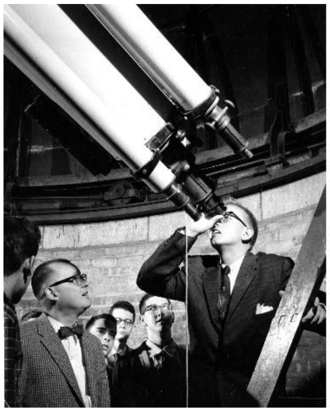
4:30 Questions

99.06 Preserving Large, Historic Observatory Class Telescopes: Three Case Studies Highlighting Three Completely Different Approaches

4:35 Bart Fried[1]
[1]Antique Telescope Society, Forest Hills, NY

In the 19th century in the United States, any college or university worth its salt had to have an observatory in order to compete for students. Not just useful for teaching astronomy or for research, the telescopes were icons on the campus, perched on a high point or on top of a prominent building, a beacon for all to see how science held a prominent position in the institution. And the bigger the telescope and dome, the better. But in many cases, encroaching light pollution, high rise buildings, demand for space and the advancement of "big" astronomy done with huge telescopes or, later, space based telescopes caused a cataclysmic downfall for many of these telescopes. This forced institutions to make serious decisions, sometimes fatal for the telescopes and domes.

Lately and fortunately, there is a reverse trend underway due to recognition that these telescopes can serve additional functions of outreach, inspiration and once again, research and education. Three such telescopes will be presented. The 12-inch Clark-Selew refractor, formerly at Rutherfurd Observatory in New York City; the 12-inch Brashear-Warner & Swasey refractor formerly at Dudley Observatory, and the 12.5-inch Brashear-Warner & Swasey refractor formerly at Ohio State University. These three are selected since they are all approximately the same vintage and the same size. How and what became of them highlights differences in approach which can lead to success for the telescope … or not.



4:50 Questions

4:55 Closing remarks (Jennifer Bartlett)

WGPAH Annual Meeting (Splinter Session)

Sunday, January 8th. 5:30 – 6:30 pm Room 305
Chair: Jennifer Bartlett

HAD II: Oral Presentations I (Pre-20th century)

Monday, January 9th. 10:00 – 11:30 am Room 614
Session 121
Session Chair: Kevin Krisciunas

121.01 From Diving Eagle to Alighting Vulture: The Origin of Vega in Arabian Astronomy

10:00

Danielle Adams[1]
[1]Lowell Observatory, Flagstaff, AZ

The bright star Vega has a name that is well-known around the world, but whose meaning continues to be misunderstood. Typically presented as the "Diving Eagle", the original Arabic name for Vega—*an-nasr al-wāqiʿ*—is best interpreted as the "Alighting Vulture". Together with its partner, Altair—the Flying Vulture—these two stars were well-known to Arabian astronomy as the Two Vultures, a star name that was in use by the early 6th century CE.

Drawing from 6th century CE pre-Islamic Arabic poetry and 9th and 10th century CE Arabic texts by Quṭrub (d. 821 CE), Ibn Qutayba (d. 889 CE), and aṣ-Ṣūfī (d. 986 CE), this talk traces the origins and significance of the Two Vultures in indigenous Arabian astronomy and reveals the time of night and season of the year during which they were intended to be observed. This original research demonstrates the benefit of fully understanding the cultural contexts out of which even the most prominent of our modern star names have come.

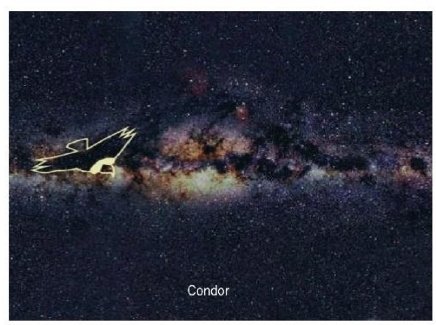
121.02 Archeoastronomy of the Incas: Constellations of Cosmo-Cultural Design

10:10

D. Kala Perkins[1]
[1]InfinitiEd/ AUSN, Woodside, CA

The Muyuqmarka
Photo: Servicio Aerofotográfico Nacional (SAN)

The foundation of Muyuqmarka



The Andean Condor

The Inca astronomers guided the culture's design and architecture of a unique ancient city based inextricably on the universal dynamics of its geolocation. The solstice, equinoxes and various bright star movements and locations were built into their buildings and complex agricultural designs. In their central city, all was structured and designed to reflect the patterns and rhythms of the universe above. They sometimes used water mirrors, to reflect the stars and sun, gaging weather patterns and other calendrical dynamics by their clarity and reflection pattens. Earth, Panchamama, humans and the universe were understood, as in most all Indigenous cultures, as inextricably intertwined and interdependent. Human culture, civilization and the bio geography and geology, were appreciated as reflections and harmonics of the cosmic dynamics. The Pleiades, and air currents as they observed the stars, assisted in their forecasting weather for the growing season.

Visiting this unique and profoundly historical Peruvian city, one may now venture an evening outing to Cusco Planetarium, run by enthusiastic local amateur astronomers, in the folds of the Andean city summits, just near one of the many sun temples and ancient observatories. Here we learn of the unique dark constellations in the plane of the galaxy, created by the contemplative imaginings of only three known Southern cultures, - the Incas, the Australian Aboriginals and a few tribes of Africa. In this presentation we explore the unique Ancient Incan Astronomy, with its calendar and related agricultural designs. We dip into the pool of stars with the Big Black Llama, the Water Serpent and other dark constellations emerging from the dance of the Incan musings with the Milky Way.

121.03 Two Letters, the Cosmos: From Plato's Timaeus to Kepler and Galileo

10:20

George Latura[1]
[1]*independent researcher, Trumbull, CT*
(Remote presentation)

In Raphael's fresco 'School of Athens' (Vatican, 1511), Plato holds his book *Timaeus* in one hand while, with his other hand, he points to the heavens. This cosmological work survived for millennia because it contains Plato's mathematical and geometric account of Creation.

In this cosmogony, the Demiurge – the cosmic geometer – generates two geometric constructs that would relay astronomical ideas through the ages, to the Renaissance and beyond.

In the first construct, the Demiurge takes various portions from an elemental mixture of Same, Different, and Being. These portions give seven numbers: 1, 2, 3, 4, 9, 8, 27, that progress the numbers 2 and 3 through squares (2x2, 3x3) and cubes (2x2x2, 3x3x3).

For the second geometric edifice, the Demiurge fashions two celestial circles that intersect each other at an angle resembling an X.

These two cosmic constructs came to be associated with the shapes of two Greek letters: *Lambda* and *Chi*.

LAMBDA: Plato's seven numbers (*Timaeus* 35b-c) were arranged by the Academy scholarch Crantor in the shape of the letter Lambda, drawing attention to the squares and cubes that Plato connects, through the Circle of the Different (36d), to the Wanderers in the sky (38c).

Planetary power proportions traveled from Plato to Crantor, to Plutarch, to Theon of Smyrna, to Macrobius, to Proclus, and to Kepler, who used Plato's planetary proportions to illustrate his Third Law of Planetary Motion (Latura, 2022) in *Harmonices Mundi*:

'Let the periodic times of two planets be 27 and 8... Hence the semidiameters of the orbits will be as 9 to 4. For the cube root of 27 is 3; that of 8 is 2; and the squares of these roots are 9 and 4.' (tr. Aiton et al., 1997: 413).

Plato's planetary power proportions led to Kepler's Third Law (Latura, AAS 2022 presentation).

CHI: The second geometric structure in Plato's *Timaeus* is the intersection of two heavenly circles (36b-c) that meet at an angle 'like an X' (tr. Zeyl, 1997: 1240).

Antiquity saw these two circles as the Ecliptic (path of Wanderers) and the Milky Way (Latura, 2019, 2018, 2014).

Medieval Europe held that the Milky Way was a sublunary phenomenon (according to Aristotle's Meteorologica), until Galileo's spyglass showed it was all stars (*Sidereus Nuncius*, 1610):

'What we observed... is the essence... of the Milky Way, which can be seen so clearly with the aid of the telescope... For the Galaxy is nothing else but a collection of innumerable stars... In whatever part of the Milky Way you point the spyglass, a vast crowd of stars immediately present themselves.' (tr. Shea, 2009: 73).

Plato's geometric constructs – *Lambda* and *Chi* – transmitted astronomical ideas to Kepler and Galileo.

121.04 The Oriental Guest Star of 1181 AD was a Supernova Whose Remnant is Pa 30

10:30 Bradley Schaefer[1]
[1]Louisiana State University, Baton Rouge, Baton Rouge, LA

In 1181 AD, Chinese and Japanese observers reported a bright Guest Star in the constellation Chuanshe (in northern Cassiopeia), unmoving and visible for 185 days. This is the fifth confidently known historical supernova (along with only SN 1006 in Lupus, the Crab SN 1054, Tycho's SN 1572, and Kepler's SN 1604), and as such would be greatly valuable for modern astrophysics, if only a supernova remnant (SNR) can be confidently identified. Since 1971, the SNR identification has been the remnant 3C 58, as the only plausible SNR in the area, despite the remnant's age certainly being much too old, as known since 2002. In 2013, amateur astronomer D. Patchick discovered a unique nebula surrounding a unique star, with two groups attributing this structure, named Pa 30, to be the SNR of the Type Iax SN 1181. Here, I provide a wide range of new historical evidences and analyses to test this idea: First, a detailed analysis of the original Chinese and Japanese reports places the Guest Star of 1181 into a small region with the only interesting source being Pa 30. Second, I present strong proofs that the Guest Star was a supernova. Third, I prove that Pa 30 is a SNR. Fourth, I conclusively connect SN 1181 with the SNR Pa 30. Fifth, the ancient records confidently place the peak magnitude as 0.0 to -1.4 mag, and hence peak absolute magnitude of -14.5 to -16.0 mag. Sixth, the Pa 30 central star is fading fast from B=14.90 in 1917, to B=16.20 in 1950, to B=16.34 in 2011/2012, to B=16.58 in 2022. In the end, I have used the historical records to demonstrate that the Oriental Guest Star of 1181 AD was a supernova whose remnant is Pa 30. This makes SN 1181 as the fifth case where we can connect the SN type to the SNR morphology, know the exact age of the remnant, all while the remnant is nearby allowing very detailed measures. Indeed, in a companion paper for this AAS meeting, I work forward from the historical evidence to demonstrate that the explosion mechanism is specifically an in-spiral merger between a CO white dwarf and a ONe white dwarf.

121.05 William Herschel's papers presented to the Bath Philosophical Society

10:40

Woodruff Sullivan[1]
[1]University of Washington, Seattle, Seattle, WA

Over a short period in 1780-81, William Herschel (1738-1822) presented about 20 short papers to the newly formed Bath Philosophical Society (BPS), a group of ~30 men interested in scientific and philosophical investigations and arguments. By this time Herschel had already been occupied for several years metamorphosing from a successful full-time musician in Bath into a telescope maker and natural philosopher. But he was uncertain as to which areas he should mainly pursue.

The BPS papers, which never were formally published, are remarkable in their breadth and reveal many aspects of Herschel's thinking at this critical point in his life. Their topics include electricity, optics, types of forces in nature ("central powers"), metaphysics, growth of coral measured with a microscope (!), as well as astronomical topics such as the heights of lunar mountains, timings of the lunar occultation of a star, observations of the variable star Mira, and an "Account of a comet" [bonus points to those who can identify the historical ultra-significance of this paper]. In this talk I will discuss several of these papers and some insights gathered about the man who would soon become a full-time astronomer and move to near Windsor Castle.

121.06 William Herschel's Unpublished Music Treatise

10:50

Sarah Waltz[1]
[1]U. of the Pacific, Stockton, CA

Before the 1767 arrival of William Herschel (1738-1822) in Bath, where he began dividing his time between his professional music career and his telescope hobby, Herschel had begun drafting a music theory treatise which was never published. Although the treatise proper was probably drafted between 1763 and 1766, Herschel had also speculated on music theory in his 1761-3 letters to his brother Jacob, which he kept for the purpose of the treatise. The treatise draft contains six sections with fully itemized tables of contents, although only one chapter is written out. Fortunately, however, that is the chapter on which Herschel expounds on his unusual “Gravitational” theory of musical relationships. Furthermore, it appears that many other sections of the treatise can be filled in from his letters to Jacob, including the “Gravitational” theory under different terminology and another place in which he speaks of related keys as “Satellites.”

This use of vocabulary from the natural sciences suggests that Herschel’s astronomical reading may predate Bath, which was heretofore unknown. This paper will attempt to explain Herschel’s musical concepts in lay terms in order to fix the importance of his “Gravitational” theory to his music theory, to speculate on early clues in his reading concerning his shift to astronomy, and to examine the type of thinker revealed by Herschel’s music-theoretical writing.

121.07 One of the United States' Most Prominent Solar Eclipses Also Was A Scientific Success

11:00

Thomas Hockey[1]
[1]*University of Northern Iowa, Cedar Falls, IA*

"The observatories must have been left undirected; the mathematical chairs of colleges must have been emptied," mused Maria Mitchell about the number of astronomers who flocked to observe the 7 August 1869 total eclipse of the Sun.[i] This solar eclipse, with totality spanning the North American continent, nonetheless is often overlooked by history. Still, it produced significant solar science.

Afterward, astronomers unquestionably distinguished between the photosphere and chromosphere. Spectroscopists had time (just barely) to make observations of the chromosphere and prominences, confirming the presence of hydrogen in them. This had been ascertained just the year before, during the first application of spectroscopy to a total eclipse of the Sun. However, the weather in 1868 had made results from that year's eclipse expeditions suspect.

If 1868 was the total solar eclipse at which astronomers focused on the chromosphere/prominences, 1869 was the total solar eclipse at which they targeted the corona. Indeed, 1869 solar-eclipse observers in the United States were spared spending more time with the prominences because of investigations made from India in 1868.

Observers in 1869 expected the corona to be a simple aureole. The radially asymmetric streamers of the faint, outer corona were so dramatic and complex that astronomers in totality's path felt that they had been misled by their predecessors at past eclipses!

The days during which the corona was thought to be a lunar atmosphere had passed. Into the resulting vacuum appeared the idea that it was a terrestrial atmospheric effect. In 1869, this theory died a quick death.

Charles Young and William Harkness produced the initial, high-resolution spectroscopy of the corona. It showed the presence of emission lines. At least partly, the corona was a rarefied, gaseous atmosphere of the Sun (though today we might not use those terms to describe it).

In the words of Simon Newcomb, the corona's temperature is "many times 100,000°."[ii] We now know this number to be ironically low. Why was the corona hotter than the photosphere? Eclipse observations of 1869 led to what has been referred to as "the single most outstanding problem in astrophysics for fifty years."[iii]

[i] Mitchell, M. "The Total Eclipse of 1869." Hours at Home. P. 556. (October 1869)

[ii] Newcomb, S. "Report of Professor Simon Newcomb, U. S. N." p. 5. In Sands, B. F. Reports of Observations of the Total Eclipse of the Sun, August 7, 1869. Washington: United States Government Printing Office. (1869)

[iii] Golub, L. & Pasachoff, J. M. The Solar Corona. Cambridge (England): Cambridge University Press. (1997)

HAD Town Hall

Monday, January 9th. 12:45 – 1:45 pm Room 614
Session Chair: Ken Rumstay

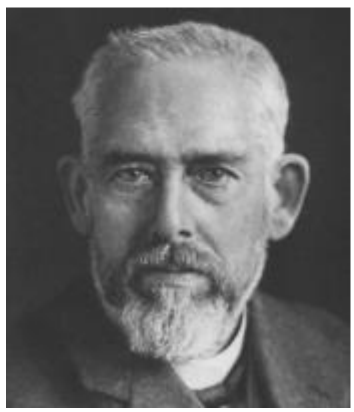
Welcome
Report of the Chair
Report of the Vice-Chair
Report of the Secretary-Treasurer
Report from the WGPAH Historic Sites Task Force
Installation of new HAD officers

HAD III: Oral Presentations II (The 20th Century and Beyond)

Monday, January 9th. 2:00 – 3:30 pm Room 614
Session 147
Session Chair: Terry Oswalt

147.01 What's In a Name: Why Trojan Asteroids are Trojan

2:00 Martin Connors[1]
[1]Athabasca University, Edmonton, AB, Canada



Perhaps the most elegant single result from the post-Newtonian golden age of celestial mechanics was Lagrange's discovery that small bodies, now generically known as Trojan asteroids, can stably orbit in the path of an associated planet, if they remain near one of two triangular points 60º ahead of or behind it. (Another three semi-stable points are colinear and their discovery can be credited to Euler). Thousands of Trojans, including those first discovered, are now known associated with Jupiter. They may be fossil remnants Solar System formation, so several are targets of the "Lucy" spacecraft. Some are also known associated with Mars, Neptune, Uranus, and Earth, but not Saturn. The German astronomer Max Wolf's remarkably productive early application of techniques of astrophotography allowed Heidelberg's Königstuhl Observatory to lead the world in asteroid discovery a century ago. World War I severely impacted astronomy in Germany, even as it was ascendant elsewhere, and Wolf is known today mostly through his discovery in February 1906 of the prototype of the Trojan asteroids, 588 Achilles. Its slow motion, immediately apparent to him, implied a much larger distance from the Sun than for his prior discoveries. Yet, despite an extensive training in celestial mechanics techniques, Wolf was slow to realize, or accept, that Achilles was the first example of a real body corresponding to Lagrange's 1772 solution of the three-body problem. That this was the case was already suggested in May 1906 by the Swedish astronomer Charlier, who also encouraged searches at the alternate Lagrange point. Despite the second Trojan being found there in October 1906, there is no evidence that Wolf attributed much significance to the result associated with his name in most modern textbooks. By June 1907, Wolf's correspondent and visual follow-up co-observer Johann Palisa de facto realized that a new class of objects had been found. He suggested the Trojan War names Achilles, Patroclus, and Hector (later changed to Hektor) for the three "consorting" objects then known. Seeing a pre-existing elegant theory paradoxically ignored leads to an examination of the interplay of observation and theory in early photographic astronomy. It becomes clear that the success of discovery techniques led to intense time pressures on observational astronomers specializing in asteroids, with celestial mechanics mainly used to assure reliable future observations. In this sense, Wolf and his Heidelberg colleagues ensured a successful future for asteroidal observational astronomy, while denying themselves the luxury of interpreting their results.

147.02 Clyde Tombaugh's Extraordinary 9-Inch Telescope

2:10 Kevin Schindler[1]
[1]Lowell Observatory, Flagstaff, AZ

In 1928, Clyde Tombaugh completed construction of his third telescope, a 9-inch reflector. By far his best to date, this one was also noteworthy because of the array of materials from the family farm that he used to build it. The mounting includes parts from a cream separator, automobile axle, and fly wheel from some other piece of equipment, and the tube appears to be a segment of grain auger. The telescope is also an important piece of astronomy history because it was drawings Tombaugh made with this instrument that he sent to Lowell Observatory. Unbeknownst to Tombaugh, his timing was perfect because observatory Director Vesto Slipher was just then looking for an assistant to help with the revived search for a ninth planet that observatory founder Percival Lowell had begun in 1905. Slipher liked the 23-year-old and his work and hired him. Within a year, Tombaugh discovered Pluto. Years later, when Tombaugh relocated to New Mexico, he took the 9-inch with him and continued using it for the rest of his life. In June 2022, Tombaugh's descendants put the telescope up for auction. The philanthropy department at Lowell Observatory put out call to supporters and collected enough pledges to win the auction. The telescope arrived at Lowell Observatory in July and is now on permanent display in the observatory's Rotunda Museum.

Staff will also occasionally take it outside at night and use it for viewing, much as Tombaugh did on his Kansas farm nearly a century ago.

147.03 Canada and the Hubble Space Telescope

2:20

Christopher Gainor[1]
[1]*Quest: The History of Spaceflight Quarterly, Victoria, BC, Canada*

Although Canada is not a partner in the Hubble Space Telescope (HST) like NASA and the European Space Agency, Canada has played a notable part in the evolution of HST. Canadian astronomers took part in HST almost from the beginning as observers and as part of the scientific team for HST. In order to facilitate the work of its astronomers, the Canadian government created the Canadian Astronomy Data Centre (CADC). Along with experts at the Space Telescope Science Institute in Baltimore, Maryland, and the Space Telescope European Coordinating Facility in Germany, the staff of the CADC advanced the work of archiving and distributing data from HST and other observatories to scientists around the world via the internet, which was coming into wide use at the time HST was launched. While Canadian astronomers have been involved in many space astronomy programs and even promoted their own programs, HST has played an important part of Canada's progress in this field. Today the Canadian Space Agency is a partner in the James Webb Space Telescope along with NASA and ESA. This presentation will discuss how both HST and Canadian astronomy benefitted from each other.

147.04 The Shape of Things to Come: SETI Astronomer's Visions of the Future of Humanity

2:30

Rebecca Charbonneau[1]
[1]*The National Radio Astronomy Observatory, Charlottesville, VA*

In New Mexico, 2,000 feet below the ground, a series of tunnels store some of the United States' most deadly nuclear waste. The waste will remain dangerous for hundreds of thousands of years, longer than our species has existed. The site, called the Waste Isolation Pilot Project (WIPP), has a warning which reads: "This place is not a place of honor. No highly esteemed dead is commemorated here… nothing valued is here. What is here was dangerous and repulsive to us." The message is an example of a "long-term nuclear waste warning message", a type of messaging that is intended to communicate danger to future individuals who may come across the site after it has been forgotten by history. But how do we begin to communicate across time, civilization, and even species? How might a human (or post-human species) understand an English message? Since the 1980s, the Department of Energy (DOE) has invited various scholars, including astronomers, to develop ideas for warnings messages. Many suggested creative ways to convey the risk, including enveloping the site in a field of spikes, creating warning myths about the site (akin to the Bermuda triangle), or even developing an atomic priesthood designed to protect the site for millennia.

In trying to communicate with future humans, with unknown languages and cultures, the DOE inadvertently stumbled upon the same problem SETI scientists face: how do you communicate with unknown intelligences? How do you signal (or interpret) hostility or peaceful intent? How can you predict what human civilization will evolve into? This talk, based off a chapter in my forthcoming book on Cold War cooperation between Soviet and American radio astronomers, explores the various Soviet and American attempts to create messages that signal meaning across time and species. In doing so, we see how the attempt to

communicate with the Other inevitably reflected how Soviet and American astronomers viewed themselves and their own futures.

147.05 NASA's Universe of Learning's Audio Series: Exploring the People and History Behind the Science

2:40

Rutuparna Das[1], Kathleen Lestition[1], Elizabeth Gutierrez[2], Isabella Srikhirisawan[3], Kimberly Arcand[1], Timothy Rhue[4], Varoujan Gorjian[5], Colleen Manning[6], April Jubett[1], Denise Smith[7], Emma Marcucci[8], Gordon Squires[9], Anya Biferno[10]

[1]Center for Astrophysics | Harvard & Smithsonian, CAMBRIDGE, MA, [2]Discover Financial Services, Chicago, IL, [3]West Virginia University, Morgantown, WV, [4]Space Telescope Science Institute, BALTIMORE, MD, [5]Jet Propulsion Laboratory, Pasadena, CA, [6]Goodman Research Group, Inc., Cambridge, MA, [7]STScI, Crofton, MD, [8]Space Telescope Science Institute, Baltimore, MD, [9]Caltech/IPAC, Pasadena, CA, [10]Jet Propulsion Laboratory, Pasadena, CA

(In-person presentation)

The NASA's Universe of Learning (NASA's UoL) project creates and delivers science-driven, audience-driven resources and experiences designed to engage learners of all ages and backgrounds in exploring the universe for themselves. The competitively-selected project represents a unique partnership between the Space Telescope Science Institute, Caltech/IPAC, NASA Jet Propulsion Laboratory, and the Smithsonian Astrophysical Observatory, and is part of the NASA Science Mission Directorate Science Activation program. Project objectives include increasing learners' understanding of the process of science, increasing the role of NASA subject matter experts as partners, and increasing the diversity of participants reached through intentional, inclusive programming.

In pursuant of these objectives, NASA's UoL is creating a series of audio resources, telling the stories of discovery linked with various UoL content themes and NASA missions and initiatives. Each installment explores a particular discovery, showcasing both the science and the scientists behind the discovery, and interviews a contemporary scientist working in the same field. The project pays special attention to the lived experiences of the scientists, and to the process of science followed throughout. Each installment also invites learners to interact with the science themselves, and encouragers development of their identities as science learners.

When choosing whom to highlight, this project intentionally showcases the stories and voices of scientists from a variety of backgrounds – particularly women and underrepresented minorities – in an effort to encourage a diverse group of learners to "see themselves" reflected in the world of science. Projects currently in development showcase, among others, Cecilia Payne-Gaposchkin and the discovery of the composition of stars, Margaret Burbidge and the understanding of stellar nucleosynthesis, and Fritz Zwicky and Vera Rubin and our discovery and understanding of dark matter.

Formative user testing has been conducted with a variety of audiences, and has documented participant gains in interest, knowledge, and personal connections to science and scientists. Participants were particularly fascinated in the connections between the historical world of astronomy and what it is today. Feedback from this testing has also highlighted possible ways of better engaging particular underrepresented groups.

This presentation is based on work performed as part of the NASA's Universe of Learning project and is supported by NASA under cooperative agreement award number NNX16AC65A.

147.06 Dismantling the James Webb Disinformation Campaign: When Disordered Activism Met Rigor

2:50

Hakeem Oluseyi[1]
[1]*George Mason University, Fairfax, VA*

"The wrong way," he declared, "is to smear everybody's reputation; to make charges on the basis that, if one is not right, you try to find another you hope will stick." This is a 1950 quote from then Secretary of State Dean Acheson in response to congressional attacks from McCarthyites on the federal agency he led. This statement could just as well be applied to the approach of a group of astronomy activists who have implemented an aggressive disinformation campaign designed to implicate James Webb, Dean Acheson's deputy, in the discriminatory federal policy against "sex perverts" that lasted for nearly 50 years from 1947 to 1995 and resulted in the unjust removal of thousands of people from federal service. This talk will cover: 1) the evolving allegations against Webb; 2) the full historical story of the discriminatory federal policy, including its initiation and enforcement; and 3) Webb's roles as a federal administrator across three agencies.

147.07 Osterbrock Prize Lecture: Meet the Neighbours: J.S. Plaskett and Other Canucks

3:00

R. Peter Broughton

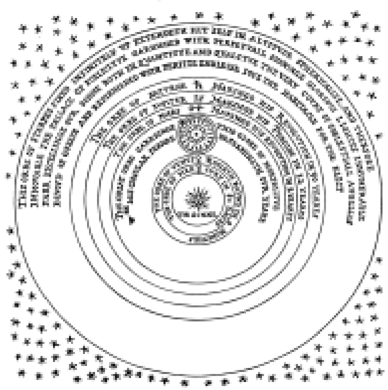
Canadian Prime Minister Pierre Trudeau, speaking to the American press corps in 1969, compared life for Canadians to that of a mouse sleeping with an elephant. It is still an apt comparison, and I will examine what that means for Canadians. The situation was somewhat different in the early twentieth century as I will attempt to show in the exemplary life of Canadian astronomer, John Stanley Plaskett (1865-1941).

HAD IV: iPoster Presentations

Monday, January 9th. 5:30 – 6:00 pm   Exhibit Hall 4AB
Session 158

158.01 ON A SIXTEENTH-CENTURY EMPIRICAL DISPROOF OF PTOLEMAIC GEOCENTRISM

Peter D Usher[1]
[1]*Pennsylvania State University, University Park, PA*



The significance of the book *Alae seu Scalae Mathematicae* (Mathematical Wings or Ladders) published by Thomas Digges in 1573, has long been under-estimated. The book reports on an empirical disproof of Aristotelian–Ptolemaic geocentrism based on diurnal parallaxes measured and derived by a “new and unheard-of method.” Digges' mathematical theorems on data measurement and reduction comprise the bulk of *Alae seu* and replace the method of Regiomontanus which needed accurate time intervals between observations that existing clocks could not supply. Evidence suggests that Digges obtained planetary parallaxes of sufficient accuracy to assert that planets do not circle the Earth at a constant distance but have some other center or centers. His well-known cartoon of an infinite universe of stars containing a planetary system centered on the Sun appears to be an inductive adoption of the Copernican system justified by his planetary parallax determinations. He claims that this was accomplished by use of "a new kind of instrument" which he promised to discuss in a book entitled "Commentaries upon the Revolutions of Copernicus," provided his work met with approval, but the book never appeared. In 1579, Digges explains the reasons, among which are the quality of his home life, his isolation, and law suits. This year is a good time to celebrate the 450th anniversary of the publication of *Alae Seu*.

158.02 Wilsons: Leaving a Large Imprint in the History of Astronomy (For No Obvious Reason)

Thomas Hockey[1]
[1]*University of Northern Iowa, Cedar Falls, IA*

Do you want to become a famous American astronomer? Try having the family name Wilson. Just in the history of American astronomy, there is, or has been: Herbert Wilson (1858-1940 | Carleton College), who helped create and edited two famous astronomical journals, *Popular Astronomy* and *Astronomy & Astro-Physics*; Latimer Wilson (1878-1948 | Chattanooga Observatory), who, during four decades of making planetary sketches and photographs, observed specular reflections from the icecaps of Mars; Ralph Wilson (1886-1960 | Dudley Observatory), who cataloged stellar radial velocities and realized that the Magellanic Clouds are external to the Milky Way Galaxy; Olin Wilson (1909-1994 | Mount Wilson Observatory), who detected sunspot-like cycles in other stars and recognized the Wilson-Bappu Effect; Albert Wilson (1918-2012 | Rand Corporation), who supervised the *Palomar Sky Survey* and held the first-ever Astrobiology seminar; and Robert Wilson (1936- | Harvard-Smithsonian Center for Astrophysics), who co-discovered the Three-Degree Cosmic Background Radiation, for which he earned the 1978 Nobel Prize in Physics. Moreover, as fame is subjective; likely there are other Wilsons who are not considered famous—yet.

While certain families come to dominate the profession (e. g., Cassini, Herschel, Kirch, and Struve), these Wilsons were mostly unrelated, as far as I am able to ascertain.[*] (Ralph and Mary Wilson had four children; their one son was Herbert.)

Of course, there is the fact that Wilson is the tenth most-common surname in the United States. Yet the most common name by far—Smith—has left a much smaller mark in American astronomy to date: Sinclair Smith (1899-1938 | Mount Wilson Observatory Physics Laboratory) measured the mass of the Virgo Cluster, but primarily is known as an instrument maker extraordinaire.

On the other hand, only about one-hundred Americans of any trade, service, or profession currently share the last name of Thaddeus Basnachiewicz[**] (1882-1954 | Jagiellonian University), who came up with a new way to determine parabolic and elliptical orbits and, in 1930, calculated the orbit for Pluto. However, this particular Basnachiewicz of astronomical fame was, in fact, not American but Polish.

The author would like to know: Is your name Wilson?

Biographies are excerpted from Hockey, Thomas; Trimble, Virginia; and Williams, Thomas; et al. (Editors). Biographical Encyclopedia of Astronomers, Second Edition. New York (New York): Springer. 2014. Statistics are provided by the United States Census Bureau.

[*] Cultural bias cannot be ignored, though.

[**] Spellings vary.

158.03 AstroGen Is Ten Years Old. Here Are Ten Ways You Can Use It.

Joseph Tenn[1]

[1]Sonoma State Univ., Rohnert Park, CA

The Astronomy Genealogy Project (https://astrogen.aas.org) was approved as a project of the Historical Astronomy Division at the January 2013 AAS meeting in Long Beach. Ten years later, the database contains information about some 41,000 individuals, including at least 35,000 who have earned doctorates with astronomy-related theses. Others are included because they supervised such theses. Here are some ways you can use AstroGen:

1. Compile a list of your university’s astronomy graduates.
2. Find the theses based on observations made at your observatory.
3. Compare the production of astronomy-related doctorates by university.
4. Compare the production of astronomy-related doctorates by country.
5. Compare the careers of graduates of different universities.
6. Trace the growth and decline of different fields of astronomy.

7. Trace changes in the language used for writing theses.
8. See how the progeny of prize-winning astronomers fare.
9. Find academic descendants of an astronomer.
10. Find academic ancestors of an astronomer.

158.04 The Roots of Astronomy & Astrophysics at Penn State University

Christopher Palma[1], Richard Wade[2]
[1]Pennsylvania State University, State College, PA, [2]Pennsylvania State University, University Park, PA

The Department of Astronomy & Astrophysics at Pennsylvania State University exists today, separate from the Department of Physics. The earliest Bulletins of the AAS and internal Penn State records show that the separate Department was created in 1965. The first Department Head was Dr. John Hagen, who brought together four faculty and several staff to build an undergraduate major, graduate program, and a research program.

The roots of this department, however, began with the work of Dr. Henry Yeagley Sr., who began teaching a course in telescope-making in the 1930s from within the Department of Physics. Dr. Yeagley was a physicist with many research interests, but his teaching interests included building telescopes and teaching the night sky using early planetarium technology and public observatories. He was not a research astronomer, however, and he wrote that he quickly exceeded the limits of his knowledge in the astronomy courses he was teaching. At the urging of Penn State students who wanted to progress into astrophysics, Dr. Yeagley pressed Penn State to hire a PhD astronomer, and so Dr. Carl Bauer was hired (on the recommendation of Harlow Shapley) in 1953.

In this poster, we trace the origins of Astronomy & Astrophysics at Penn State to its roots in public outreach programs designed by Henry Yeagley, documented in records in the Special Collections Library at Penn State and in the student newspaper. We discuss Dr. Bauer's role in building the foundations of the undergraduate program, and we very briefly touch on the growth of the program from there, through the Hagen era to the large program that exists today.

We exhibit sources that document the first small telescopes and observatories built at Penn State in the 1930s and the history of the Black Moshannon Observatory, built in the 1970s. Because these observatories are now closed, we seek to share knowledge of their existence as they become less known to the current astronomers at our institution and others.

HAD Dinner

Monay, January 9th. 7:00 – 9:00 PM Elephant & Castle Pub and Restaurant

40+E and Friends Reception

Tuesday, January 10th. 6:30 – 7:30 PM Seattle Convention Center Room 201