

H·A·D NEWS

*The Newsletter of the Historical Astronomy Division
of the American Astronomical Society*

Number 96 * December 2020

In This Issue

New HAD Officers	1
The 2021 Donald E. Osterbrock Prize	2
From the Chair	3
From the Vice-Chair	4
From the Past Chair	5
From the Secretary-Treasurer	5
National History Day Winners	6
Education in Cultural Astronomy	7
Black Lives in Astronomy	7
Yerkes Restoration Underway	8
Thirty Years of the Hubble Space Telescope:	9
Spacescapes and Landscapes	
New Books by HAD Members	10
Book Review: <i>Cosmology's Century</i>	12
Book Review: <i>Open Skies</i>	13
A Census of Newton's <i>Principia</i>	14
What's New in the <i>J.A.H.H.</i>	15

New HAD Officers

Ken Rumstay, Valdosta State University

By the time you read this, our country's 2020 presidential election will be history. Of course, as astronomers we take the long view: Whoever won on November 3rd, the Earth will still be consumed by the expanding giant Sun in seven billion years' time. I like a newsletter that starts on a cheerful note, don't you?

We have just wrapped up the election of new officers for the Historical Astronomy Division! Our newly-elected Vice Chair Terry Oswalt and the new At-Large Committee Members Samantha Thompson and Amy Oliver will assume office at the end of the virtual HAD Town Hall on January 11th. At that time our current Chair Alan Hirshfeld will (virtually) pass the gavel to Vice Chair Kevin Krisciunas, who will assume the duties of Chair.



HAD's new officers (from left to right): Terry Oswalt, Amy Oliver, and Samantha Thompson

Alan will then become Past Chair and also Chair of the HAD Prize Committee, which will select the recipient of the LeRoy E. Doggett Prize for Historical Astronomy next year and the Donald E. Osterbrock Book Prize in 2022. As Vice Chair, Terry will be in charge of soliciting and editing obituaries of all recently deceased AAS members. He will assume the Chair in January 2023.

Also on the ballot this year was a proposal to approve proposed revisions to the HAD Bylaws. These were approved by a vote of 163 to 1. The revised bylaws may be read on our website at <https://had.aas.org/sites/had.aas.org/files/2020HADBylaws.pdf>. I would like to thank everyone who voted in our Division election!

I would also like to thank Rebecca Charbonneau and Philip Nicholson, who have faithfully served on the HAD Executive Committee during the past two years. In addition, I would like to express gratitude to the members of the Nominating Subcommittee: Christina Reeves-Shull, Thomas English, and Chair David DeVorkin. Their efforts ensured a smooth election.

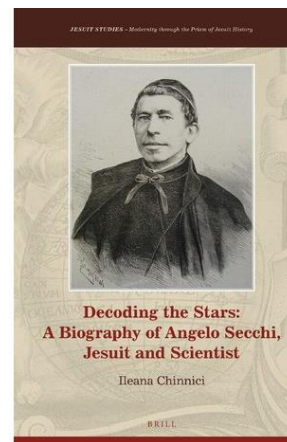
Finally, I would like to offer my special thanks to Patrick Seitzer, who will have completed six years of service as Vice Chair, as Chair, and as Past Chair. Thank you for all you've done for us, Pat!

The office of Secretary-Treasurer is not an elected one; that individual is appointed by the Executive Committee. As I near completion of my fifth year in that role, I would like to thank you all for your trust. I am grateful for having had the opportunity to serve our Division; it's been very rewarding!

hadsec@aad.org



The official HAD gavel will be passed on to Kevin Krisciunas when he assumes the Chair in January. On the handle are engraved the initials of all past Chairs, in chronological order: JE, OG, EK, DO, KB, JL, SD, WS, DD, VT, BW TW, DY, SS, TH, JH, JP, MR, PS, and AH.



The 2021 Osterbrock Prize

Pat Seitzer, Chair, HAD Prize Committee

The Historical Astronomy Division is pleased to present the 2021 Donald E. Osterbrock Book Prize for Historical Astronomy to Ileana Chinnici for her work *Decoding the Stars: A Biography of Angelo Secchi, Jesuit and Scientist* (Brill 2019).

This is the first full-length biography of Italian astronomer Angelo Secchi (1818-1878) in English and will become the definitive work on this important figure in the history of astrophysics. Secchi became well known as part of the transition from classical positional astronomy to astrophysics. He was a pioneer of spectroscopy and its application to stellar classification and solar physics. At the 25th anniversary of Secchi's death, George Ellery Hale praised his contributions "to the present widespread interest in Astro-physical research." Chinnici's book covers not only the research that Secchi is remembered for, but also the broader environment in which he worked. Based on extensive research in Italian and Vatican archives, it is richly illustrated with many color and black-and-white photographs.



Ileana Chinnici, winner of the 2021 Osterbrock Book Prize

Ileana Chinnici received a university degree in physics from the University of Palermo, Italy. Her dissertation was *Pietro Tacchini (1838-1905): A First Scientific Biography*, about another Italian astronomer who, like Secchi before him, served as director of the Osservatorio al Collegio Romano. Since 2004 she has been a research astronomer at the INAF/Osservatorio Astronomico di Palermo, in charge of museum activities and specializing in the history of astrophysics.

The Donald E. Osterbrock Book Prize is given in odd-numbered years. Books copyrighted in the two to five years before the award year are eligible. HAD originated the prize in 2009 and named it in memory of Don Osterbrock in 2010. Osterbrock was a longtime HAD member, a contributor to nearly every HAD meeting, HAD Chair from 1987 to 1989, and the recipient of HAD's highest honor, the LeRoy E. Doggett Prize for Historical Astronomy, in 2002.

The 2021 Osterbrock Book Prize will be presented to Dr. Chinnici at the virtual HAD Town Hall on 2021 January 11, when she will give a presentation about her book.

pseitzer@umich.edu



FIGURE 10.4 Portrait of Angelo Secchi. From *Tituli in supremis honoribus Angeli Secchi e Societate Jesu* (Rome: Tipografia delle Scienze Matematiche e Fisiche, 1876).

Portrait of Angelo Secchi (Figure 10.4 from *Decoding the Stars: A Biography of Angelo Secchi, Jesuit and Scientist*).



From the Chair

Alan Hirshfeld, U. Mass. at Dartmouth

Every year about this time, my intro astronomy class encounters the light-year, that awkwardly named unit of measurement over which some of my students inevitably stumble. The light-year would seem like an intuitive yardstick of cosmic distance, comprehensible to any STEM learner, were it not for the confounding reference to time. Since at least the 18th century, astronomers have expressed the vast scale of outer space in terms of light-travel time, having recognized that the astronomical unit (AU) was ill-suited to the outsize dimensions of the stellar and galactic realms. When Friedrich Wilhelm Bessel reported his breakthrough parallax determination of 61 Cygni to John Herschel in 1838, he expressed the resulting distance in AUs – but added that light takes 10.3 years to traverse this interval of space.

The term “light-year” – specifically, “Lichtjahr” – seems to have made its first appearance in an 1851 article by German science writer Otto Ule titled “*Was wir in den Sternen lesen*” (“What we read in the stars”), here translated:

The measure by which we dare to measure the sky, that is, the light-year, is the space that light passes through in an Earth year, a space that covers 63,000 astronomical units, each of 20,680,000 [German] miles. That is our heavenly “hour’s walk.”

Ule’s readers would have understood the reference to “hour’s walk” (“Wegstunde”): the distance a traveler on foot might cover in an hour. Both “light-year” and “hour’s walk” include an explicit time element, yet indicate distance; perhaps that was Ule’s point in linking the two. (A German mile was approximately 7,500 meters, making Ule’s AU about 155 million kilometers.)

The light-year only gradually filtered into popular usage. In his *Popular Astronomy* book from 1855, François Arago lists stellar distances in AUs, miles, and years of light-travel time. My 1889 copy of Simon Newcomb's *Practical Astronomy* features "light-units," while Agnes Clerke's *System of the Stars* from 1905 adopts the "light-year," but also the more evocative "light-journey."

In the professional literature, the light-year gave way to the parsec, a term coined by Herbert Hall Turner in 1913. Indeed, the following year Arthur Eddington dismissed the light-year as an inconvenient and irrelevant unit, which had crept into technical investigations. But from a teacher's perspective, as problematic as the light-year might be, try explaining a parsec to a student!

This will be my final Chair's column before January when Kevin Krisciunas, our able Vice-Chair, takes up the position. Having started my term with considerable apprehension, I quickly grew to enjoy the experience, not least because of the many wonderful interactions, both virtual and face-to-face, I have had with fellow AAS members. My thanks to all of those who helped guide and inspire me along the way. See you virtually at our January meeting!

ahirshfeld@umassd.edu



From the Vice Chair

Kevin Krisciunas, Texas A&M University

The Vice Chair is in charge of soliciting, editing, and writing obituaries of astronomers associated with the American Astronomical Society. It is a never-ending task. Some unsolicited obituaries just appear in my email inbox and require minimal editing, such as multiple ones recently coauthored by Hugh Van Horn. Thank you, Hugh!







Recent obituaries published at <https://baas.aas.org/> include one for Jim Elliot (1943-2011), a colleague from my days working on the Kuiper Airborne Observatory. Jim was a co-discoverer of the rings of Uranus. In the second half of this year we have also published obituaries for Nat Carleton, J.-P. Macquart, John Littleton, Victor Slabinski, Guido Münch, Ron Allen, William A. Dent, Robert W. Hobbs, Irene Osterbrock, Carl J. Hansen, and George Coyne, who headed up the commission authorized by Pope John Paul II concerning the "Galileo affair".

The obituaries most difficult to finish involve astronomers who lived to be more than 90 years old, or who died many years ago. This summer we published an obituary of Carl A. Bauer, who died in 2019 at the age of 102 and 9 months. The last obituary finished at the time of this writing was for Raymond H. Wilson, Jr. (1911-1989). Wilson's first astronomy mentor was John A. Miller (1859-1946), a professor at Swarthmore College. Rarely do we deal with people who knew individuals born before the Civil War. This reminds me of a time when I was six, in 1959, when my father pointed out a man in our neighborhood in La Grange, Illinois, who was 100 years old and coincidentally named Miller.

There are roughly 100 deceased members of the AAS needing an obituary to be written. About thirty people have agreed to write one but have not finished it. My successor and I are likely to nag the people who agreed to write one. For the others needing an obituary, please volunteer!

krisciunas@physics.tamu.edu

Recent Additions

 <p>Raymond H. Wilson, Jr. (1911-1989) by Kirsten Marie Wilson Published: Oct 15, 2020</p> <p>Trained as an astronomer, Raymond H. Wilson, Jr., applied astronomical research methodologies to solve the innovations to move humankind into space. His research spanned over 50 years. https://doi.org/10.1002/ajasc.12001</p>	 <p>Nadine G. Barlow (1958-2020) by Bob Mondell, Robin Vilas, Lisa Press, and Lynn Hyman Published: Oct 20, 2020</p> <p>Barlow specialized in impact cratering processes, particularly on the planet Mars, and authored the textbook "Mars: An Introduction to its Interior, Surface, and Atmosphere". She spent much of her career at</p>
 <p>Sarah Lee Lippincott (1920-2019) by Kevin Krisciunas Published: Oct 20, 2020</p> <p>Lippincott spent her entire career working at Smith Observatory and Swarthmore College. Along with Peter van der Kamp, Lippincott sought to discover new small comets and to search stars, which are visible only during</p>	 <p>Stewart L. Sharpless (1926-2013) by Hugh M. Van Horn and Judith L. Riphthor Published: Oct 20, 2020</p> <p>Sharpless carried out fundamental investigations pertaining to the structure of the Milky Way Galaxy and established the C. E. Sarnath Visual Observatory of the University of Rochester as a center for astronomical</p>
 <p>Charles Stuart Bowyer (1934-2020) by Roman Moser, Jean Brodie, and James Overduin Published: Nov 11, 2020</p> <p>Bowyer was the driving force behind the Extreme Ultraviolet Explorer (EUVE) NASA mission and founded the Center for Extreme Ultraviolet Astrophysics in Berkeley. He received a number of awards for his work.</p>	 <p>Paul D. Shankland (1961-2020) by Geoffrey Cheshire Published: Nov 23, 2020</p> <p>Shankland received his astronomical training while serving in the United States Navy, where he rose to the rank of Commander. He became Director of the Naval Observatory Flagstaff Station, designing and building instruments and contributing to the GEMSS project.</p>

Recent additions to obituaries of former AAS members. The list appears on the website of the Bulletin of the American Astronomical Society (<https://baas.aas.org/obituaries>).



From the Past Chair

Patrick Seitzer, University of Michigan

This is my final column as HAD Past-Chair. Six years ago I began my participation in the HAD Leadership with my election as Vice-Chair. It has been an incredible six years. I learned so much and made so many contacts that it would be hard to single out any one as especially memorable.

I would like to strongly second what Alan (HAD Chair) stated when trying to encourage people to run for HAD Office. Please put your name forward or allow yourself to be nominated for the next election cycle. I can assure you that no matter what leadership role you are elected to, you will find it a very intellectually stimulating and rewarding experience.

pseitzer@umich.edu



From the Secretary-Treasurer

Ken Rumstay, Valdosta State University

Greetings to all HAD members! I hope this issue of HAD News finds you all in good health and good spirits. This has certainly been a difficult year; let's hope for improvement in 2021!

I would like to thank everyone who has helped our division to function smoothly this year, notably my fellow officers Alan and Kevin, and Executive Committee members Rebecca Charbonneau and

Philip Nicholson. Our Nominating Subcommittee, consisting of Christina Reeves-Shull, Thomas English, and Chair David DeVorkin, supervised a smooth and efficient election of new officers. The HAD Prize Committee, chaired by Pat Seitzer and consisting of Brenda Corbin, Liba Taub, Alan Hirshfeld and myself, spent many hours perusing some wonderful books before selecting the 2021 Osterbrock Prize winner. And finally, a special thanks to each of the hard-working members of the American Astronomical Society staff!

In our last issue, I promised that our Division would indeed meet in 2021! The Historical Astronomy Division will meet virtually in January, in conjunction with the 237th meeting (also virtual) of the AAS. At the time of writing, the schedule of HAD sessions is as follows:

Monday, January 11th

12:00 – 1:30 PM EST	HAD I (Invited Talks)
1:40 – 2:40 PM EST	HAD Town Hall

Tuesday, January 12th

12:00 – 1:30 PM EST	HAD II (Oral Session)
4:10 – 5:40 PM EST	HAD III (Special session)

Wednesday, January 13th

12:00 – 1:30 PM EST	HAD IV (iPoster session)
---------------------	--------------------------

Monday's Town Hall is HAD's annual business meeting; it will feature the presentation of the 2021 Donald E. Osterbrock Book Prize, and an acceptance speech by recipient Ileana Chinnici.

The special session on Tuesday afternoon, organized by Jay Pasachoff, will highlight the Golden Record which the Voyager spacecraft are carrying into interstellar space. One of the speakers will be Emer Reynolds, Writer/Director of "The Farthest," a feature film celebrating the Voyager missions. That film will be available for viewing throughout the meeting. This session was a highlight of the October virtual meeting of the AAS Division of Planetary Sciences.

Please note that the HAD two-day meeting registration fee will cover the entire three days of the virtual meeting. I, along with all the HAD officers, regret that we will not be able to meet in person with you in 2021!

Finally, as we approach the end of another calendar year I would remind you to please renew your HAD membership, and to consider making a donation to the Doggett or Osterbrock Prize Funds. We rely on your contributions!

hadsec@aas.org

HAD Recognizes National History Day Award Winners

Ken Rumstay, Valdosta State University

National History Day, a non-profit organization based in College Park, Maryland, operates an annual project-based contest for students in grades 6-12. It has affiliates in all fifty states and in Washington, D.C., Puerto Rico, Guam, American Samoa, South Korea, China, South Asia, and Central America. In 2020 the competition theme was "Breaking Barriers in History".

Former HAD Chair Marc Rothenberg brought to our attention the fact that the history of astronomy was particularly well-represented in this year's competition, with three young women receiving prizes for projects based on famous women in astronomy. Marc suggested that HAD might want to recognize these students in some way. After some discussion, we decided to present each of the students with a certificate and an honorary junior membership in HAD. A Zoom award ceremony was arranged for 1:00 pm EDT on July 31st.

The three students who were recognized were:

Isabella Hardy, of Gryphon Academy in Crossnore, NC. She won first place in the Junior Individual Performance category for a dramatic work titled "Williamina Fleming: Breaking Barriers with a Universe of Glass."

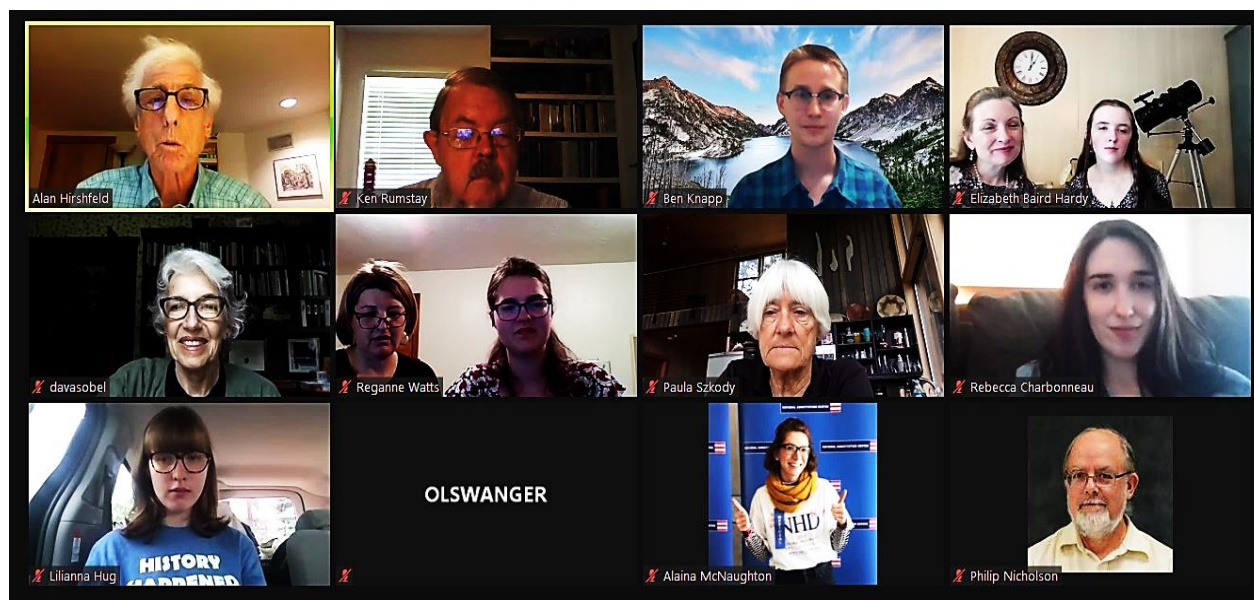
Lilianna Hug (Salamander Meadows Homeschool, in California, PA), won second place in the Senior Individual Performance category for "The Story of Starlight: Women Who Changed Our Understanding of the Universe."

Reganne Watts (Boise High School, Boise, ID) received a Special Award in the History of the Physical Sciences and Technology for the website "Maria Mitchell: Breaking Barriers to Prove the Sky is Not the Limit for Women" which she created. This prize was awarded by the American Institute of Physics.

These young women were clearly inspired by the legion of female staff members who performed calculations and analyzed photographic plates at the Harvard College Observatory more than a century ago. HAD Chair Alan Hirshfeld invited Dava Sobel (author of *The Glass Universe: How the Ladies of the Harvard Observatory Took the Measure of the Stars*, Viking, 2016) to participate in the Zoom award ceremony. To our delight she accepted the invitation, and during the session expressed delight at the level of sophistication exhibited by the award winning projects.

Special thanks to Dava Sobel, and to everyone who participated in this event. We are honored to have had an opportunity to encourage the study of astronomical history in this way!

hadsec@aaas.org



Screen shot of the virtual ceremony honoring the National History Day award winners.



Education in Cultural Astronomy

Steven Gullberg, University of Oklahoma

I am pleased to announce that the University of Oklahoma has launched a formal graduate program of study in Archaeoastronomy and Astronomy in Culture. The courses in the program are primarily online so that anyone, anywhere can take them. The College of Professional and Continuing Studies at the University of Oklahoma is renowned for creating very high-quality online courses and programs. Of the over 350 academic institutions annually assessed by *U.S. News & World Reports* for their online delivery, we consistently rank in the top ten.

The two courses which we offered this past spring were “Archaeoastronomy and Methods” and “Archaeoastronomy of Chaco Canyon and Cahokia.” Currently, in the fall of 2020 we are offering “Latin American Archaeoastronomy” and “Archaeoastronomy Beyond the Americas.” In 2021 we will offer these four courses again and plan to add a course called “Cultural and Ethno-astronomy” as well as a course for “Indigenous Astronomy in the United States and Canada.”

The program’s sole onsite course, a five-day class called “Field Research in Archaeoastronomy,” will be held in both Farmington and Chaco Canyon in New Mexico at the time of the solstice in June of 2021. Students will practice data collection, analysis, and placing what is found into a cultural context.

Our undergraduate archaeoastronomy program is scheduled to launch in August of 2021 and will include such courses as:

History of Astronomy in Culture

Positives and False Positives: Identifying

Pseudoscience in Archaeoastronomy

Astronomy in Culture: Insights and Applications

Contemporary Cultural Astronomy

Calendars, Culture, and the Cosmos

Courses can be taken with degree programs, certificate programs, or as individual classes. The program’s webpages can be viewed at:

<https://pacs.ou.edu/certificates/archaeoastronomy/>

Take a look and see what we have to offer. Please help me spread the word! Formal education in archaeoastronomy education is relatively new, and many people are unaware that it is available. You may know someone who will be excited by this opportunity. If you have any questions, please ask. And thank you!

srgullberg@ou.edu



Black Lives in Astronomy

Andrew Fraknoi, Fromm Institute at the University of San Francisco

“Black Lives in Astronomy,” a new eight-page resource guide, includes written and video resources about and by 25 black astronomers, as well as general materials to examine the history and issues facing black members of the astronomical community. Both older, established scientists and people early in their careers are covered. It is aimed at the introductory college and amateur astronomer level, and thus does not include any technical materials. It is designed to give instructors and students examples of authentic black voices that can be shown in class or used in assignments. You can find it free of charge at:

<http://bit.ly/blackastro>

fraknoiandrew@fhda.edu



Neil deGrasse Tyson



Dara Norman



Aomawa Shields



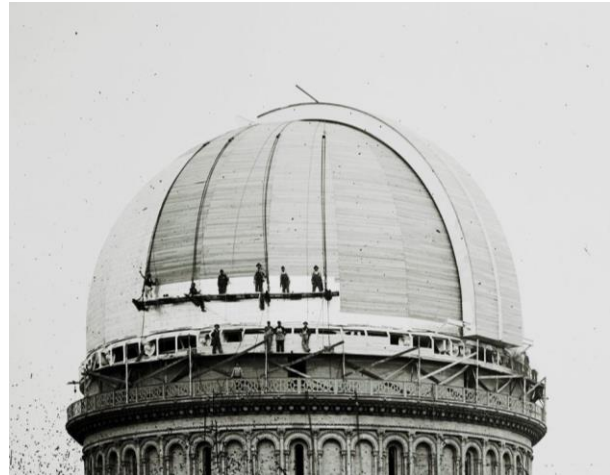
Yerkes Restoration Underway

Jennifer Lynn Bartlett, Chair, WGAH

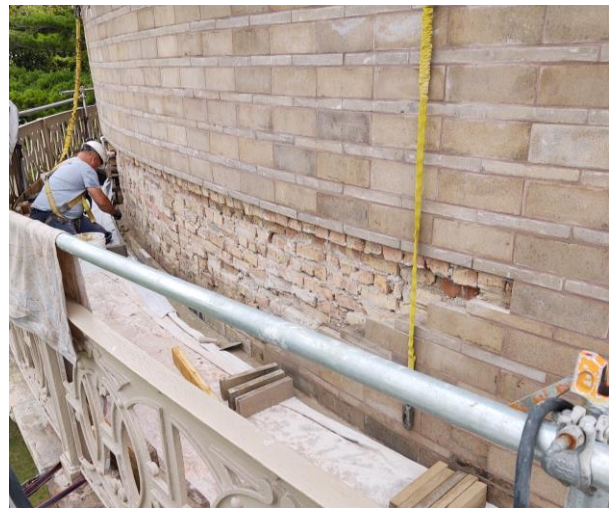
The Yerkes Future Foundation (YFF) has begun a massive effort to restore the historic Yerkes Observatory building. Specialist crews are investigating and repairing the structure brick by brick. They are replacing deteriorated mortar with lime putty. They are seeking appropriate materials to restore or replace damaged bricks. The various sculptures around the building are made of a terracotta clay and require a different restoration. YFF anticipates that the exterior brickwork project will take more than a year. Work will continue while the weather permits and then resume in the spring. Next, YFF plans to restore the dome housing the 40-inch refractor, which has some leaks allowing water into the structure. YFF also plans to upgrade the electrical systems, remodel some interior spaces, and improve the Olmsted landscaping throughout the grounds. YFF would like to be ready to welcome the public back to the Observatory by summer 2021.

Former staff engineer John W. Briggs visited Yerkes for several days in September to advise on the possibility of refurbishing the Bruce astrograph. He reports that the restoration is likely but is not sure when work will begin. Catherine Wolf Bruce (1816–1900) donated the 10-inch photographic telescope, which was originally installed in 1904. Photographs taken with this telescope were among those used by E. E. Barnard (1857–1923) to characterize the “small star with large proper-motion” that now bears his name (Barnard 1916). Frank Ross (1874–1960) was another pioneer of wide-angle photography who used this instrument.

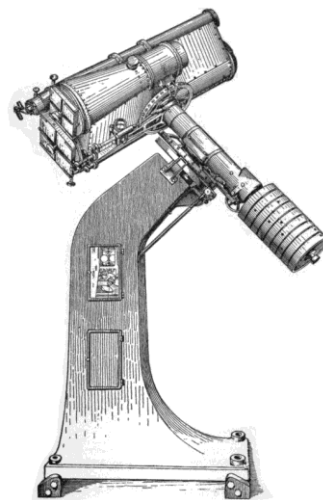
In addition, YFF is in the process of hiring an Executive Director; the position is described on their website. For more information about Yerkes Observatory, please contact YFF at



Sheathing and tinning of the Yerkes Observatory great dome in October 1896.



Restoration of the exterior brickwork at Yerkes Observatory, October 2020.



Sketch of the 10-inch Bruce astrograph at Yerkes Observatory (from 1911, “Telescope,” Encyclopædia Britannica, vol. 26)

epic scenes in the American West. Popularized by the Hudson River School in the 19th century American art movement, the breath-taking style was embodied by a group of landscape painters whose aesthetic vision was influenced by romanticism and professionally inspired by members of the Duesseldorf School of painting in Germany and other European countries. The paintings typically depict the Hudson River Valley and surrounding area, including the Catskill, Adirondack, and White Mountains.

Hudson River School paintings reflect three themes of 19th-century America: discovery, exploration, and settlement. These landscapes images are characterized by their realistic, detailed, and sometimes idealized portrayal of nature. In general, Hudson River School artists believed that nature in the form of the American landscape was a reflection of God, although they themselves varied in their depth of religious conviction.

One day, perhaps, far into the future, neutrino space telescopes will survey the sky to produce views of the Universe equally inspirational as those of today's photon space telescopes and the soaring landscapes of 19th century artists.

hans@neutrino.aquaphoenix.com

References

- Brown, D., 2009. In *Reading Genesis After Darwin*, S.C. Barton and D. Wilkinson (Eds.), NY: Oxford University Press.
- Brush, S. G., 1978. *The Temperature of History: Phases of Science and Culture in the Nineteenth Century*, New York: Burt Franklin & Co.
- Carus, C.G., 1927. *Neun Briefe ueber Landschaftsmalerei*, Dresden: Wolfgang Jess.
- Kessler, E. A., 2012. *Picturing the Cosmos: Hubble Space Images and the Astronomical Sublime*, Minneapolis: University of Minnesota Press.

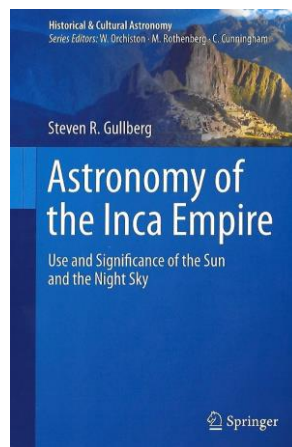


A Storm in the Rocky Mountains, Mt. Rosalie, by German-American painter Albert Bierstadt (1866).

New Books by HAD Members

Ken Rumstay, Valdosta State University

One of the joys of editing the *HAD News* is the opportunity to inform our members of new publications of interest. I am pleased to report the recent publication of three new books by members of our division.



Astronomy of the Inca Empire: Use and Significance of the Sun and the Night Sky, by Steven R. Gullberg (Springer, 2020, ISBN 13: 978-3030483654).

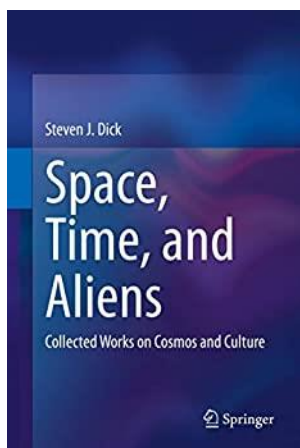
HAD member Ed Krupp contributed the foreword for Steve's new book. The description from the back cover reads:

Astronomy in the Inca Empire was a robust and fundamental practice. The subsequent Spanish conquest of the Andes region disrupted much of this indigenous culture and resulted in a significant loss of information about its rich history. Through modern archaeoastronomy, this book helps recover and interpret some of these elements of Inca civilization.

Astronomy was intricately woven into the very fabric of Andean existence and daily life. Accordingly, the text takes a holistic approach to its research, considering first and foremost the cultural context of each astronomy-related site. The chapters necessarily start with a history of the Incas from the beginning of their empire through the completion of the conquest by Spain before diving into an astronomical and cultural analysis of many of the huacas found in the heart of the Inca Empire.

Over 300 images—with more than 260 in color—are included throughout the book. They feature original artwork and photos captured during the

author's extensive field research in Machu Picchu, the Sacred Valley, Cusco, and elsewhere, adding visual insight to a rigorous examination of Inca astronomical sites and history.



Space, Time, and Aliens: Collected Works on Cosmos and Culture, by Steven J. Dick (Springer, 2020, ISBN 13: 978-3030416133).

Author Steven Dick has provided a description of his new publication:

This 800-page volume covers forty years of my articles ranging from astrobiology and space exploration to astrometry and its institutions, discovery and classification in astronomy, and philosophy of astronomy. The whole is designed to be greater than the sum of its parts, unified by the theme of "Cosmos and Culture." Some of the chapters, such as those on philosophy of astronomy, appear here for the first time and are based on updated papers given at places like the Notre Dame History of Astronomy workshops. Others, like "The Consolations of Astronomy" were written for this volume; that chapter is a take-off of Boethius's title The Consolation of Philosophy.

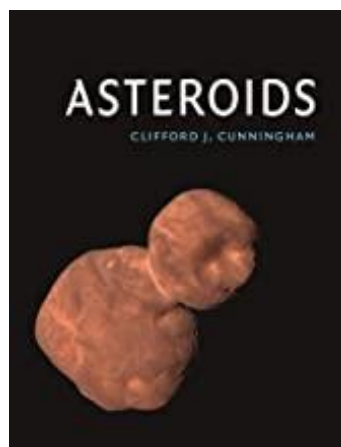
Each chapter ends with a "Commentary 2020" section, where the material is brought up to date, the context of the meetings is given, etc. Serendipitously there are forty-two chapters, and those of you who are science fiction fans will know the significance of the number 42!

[https://en.wikipedia.org/wiki/Phrases_from_The_Hitchhiker%27s_Guide_to_the_Galaxy#Answer_to_the_Ultimate_Question_of_Life,_the_Universe,_and_Everything_\(42\)](https://en.wikipedia.org/wiki/Phrases_from_The_Hitchhiker%27s_Guide_to_the_Galaxy#Answer_to_the_Ultimate_Question_of_Life,_the_Universe,_and_Everything_(42))

You can preview abstracts and the first two pages of each chapter (but not the General Introduction and Part Introductions, for some reason) at

<https://www.springer.com/gp/book/9783030416133> You can see a bit more of the text and a much more complete Table of Contents at <https://books.google.com/books?id=RmfjDwAAQB&newbks=0&printsec=frontcover#v=onepage&q&f=false>.

*The book has more than 100 illustrations, many in color, so the price is high, but maybe you can recommend it for your institutional libraries. I have found Springer to be very good in both their editorial and production departments, even in these difficult times. In my experience with two books, they allow the author to do what he or she wants, and charge accordingly. And if you do a trade volume like *Classifying the Cosmos*, somehow you get the illustrations and a good price!*



Asteroids, by Clifford J. Cunningham (Reaktion Books, 2021, ISBN-13: 978-1789143584)

From the publisher's website:

Grounded in historical studies of asteroids from the nineteenth century, Asteroids is a fully up-to-date view of these remarkable objects. Without resorting to any technical diagrams or mathematics, Clifford J. Cunningham shows that asteroids are not just rocks in space, but key to understanding the life and death on Earth of both animals and humans. From space missions to the asteroids' starring role in literature and film, Cunningham precisely and entertainingly looks at the place asteroids have in our solar system and how they affect our daily lives.

Cliff also mentioned that he is one of a hundred experts who have contributed to the recently published *Britannica All New Kids' Encyclopedia: What We Know & What We Don't!*

hadsec@aas.org



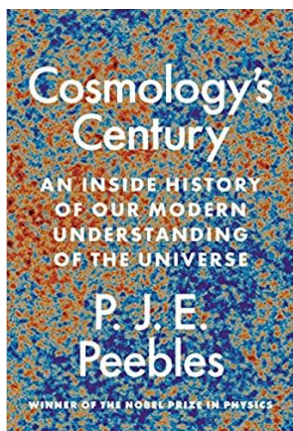
Book Review

Virginia Trimble, UC Irvine

Cosmology's Century: An Inside History of Our Modern Understanding of the Universe, by P.J.E. Peebles (Princeton University Press, 2020, ISBN-13: 978-0691196022).

When does history start, and when does it end? Author Peebles's *Century* begins with Einstein's 1917 paper "*Kosmologische Betrachtungen zur allgemeinen Relativitätstheorie*". His forty pages of references include no earlier entries except a 1901 paper by the 76 year old William Thomson, by then more than halfway from his 1892 investiture as Baron Kelvin (a small river that flows into the Clyde) of Largs to his death in 1907*. He is alphabetized in the references as Kelvin, L. (presumably for Lord).

Peebles's *Century* largely ends in 1998-2003 in what he calls a revolution, resulting in our current "best buy" standard model, Λ CDM (for Lambda-Cold-Dark-Matter), beginning with inflation and leading to the formation of galaxies and large-scale structure, which have grown from initially very subtle density perturbations, visible in the 2.7 K microwave background radiation.



*A 1903 book by Michelson (*Light Waves and Their Uses*) is also cited, but the Kelvin item is the only pre-Einstein paper.

The structure of most of the book follows six more-or-less simultaneous threads. These are:

Chapter 2 - Homogeneity (which Peebles treats as initially just an assumption by Hubble and others, though now observationally established on large scales); Chapter 3 - Cosmological Models (and especially the rise and fall of the Steady State); Chapter 4 - Fossils (the radiation and light elements); Chapter 5 - The Growth of Cosmic Structure; Chapter 6 - Subluminal Mass (now called dark matter); and Chapter 8 - Non-baryonic Dark Matter (both hot and cold).

Chapter 9 presents biased, tilted, mixed, and other variations on the dark matter theme. That chapter also describes the 1998-2003 revolution, including the "redshift-magnitude" test for supernovae and the gradually emerging anisotropy of the CMB, with a look towards the future.

In some ways, the most interesting chapter is the very short Chapter 10: The Ways of Research. It includes the importance of new technology (beginning with red-sensitive plates), human behavior, roads not taken, and the social construction of science. Here we meet briefly a history in which Einstein became a musician, and another in which George Gamow was still thinking about his work on the early universe when Joe Weber asked him if he had any interesting thesis projects for a microwave spectroscopist (and got the answer "no").

Jim's last words in Chapter 10 declare that there are clouds over Λ CDM. He means this as an analogy to the Kelvin paper "Nineteenth-century Clouds over the Dynamical Theory of Heat and Light". Cloud I for Kelvin was Michelson-Morley, which was part of the lead-up to special relativity. And Cloud II was the phenomenology of heat capacities, which required a good deal of quantum mechanics for its removal. Peebles's clouds for 21st century cosmology are (I) the very early universe and (II) "the enigmatic simplicity of the dark sector." He mentions the current discrepancy between values of the Hubble constant found from distance ladders and from details of the moments of the CMB anisotropies, but thinks it likely that the cause is some problem with the observations or their extrapolation from long ago and far away to here and now, rather than the need for "new Physics".

Very many interesting details line these several paths. The lead-up to the discovery of the CMB, the measurements of the spectrum and anisotropies

are treated in fine detail. One of Peebles's heroes is Herbert Gush, then of the University of British Columbia, who coordinated a rocket-borne Fourier transform interferometer. If it had worked on its first flight it would actually have established the thermal spectral shape of the CMB just before the FIRAS experiment (coordinated by John Mather), flying on the COBE satellite, found this result. Gush et al. published a bit later, and did not share in the 2006 Nobel Prize for physics.

Other topics appear drawn with broader brushes, particularly the gradual accumulation of data suggesting, and later requiring, a good deal of "missing mass" (Ivan King's phrase at a 1977 conference in a talk referring to a cloudy day!), or subluminal mass (Peebles's phrase), or "*Dunkle materie*", which appears first in a 1930 paper by Knut Lundmark referring to half a dozen individual galaxies in which he has found that the "*dunkle materie*" outweighed the "*leuchtende materie*". Yes, this is before the now much-cited Zwicky paper. One of the author's "fun figures" is a plot of citations per year to Zwicky 1937 (the English-language version of the 1933 analysis of the velocity dispersion in the Coma cluster). The same page has three different versions of a plot of M or M/L vs. L or size of cosmic structure: 1966 from Karachetsev (publishing in the Armenian journal *Astrofizika*, and I didn't know about this one before), 1974 from Ostriker, Peebles, and Yali, and 1995 from Neta A. Bahcall and friends. The 1974 version from Jaan Einasto, Kaasik, and Saar, which appeared a smidgeon ahead of Ostriker et al. and perhaps made clearer that the stuff they were talking about had to be something new, is relegated to a line of text for "presenting similar arguments."

Among many other gold nuggets in the volume is a September 26, 1947 letter from Einstein to Georges Lemaître in which he acknowledges there is a time-scale problem that arises from comparing the reciprocal of the Hubble constant (about 2 Gyr then) and the oldest Earth rocks, and "It is true that the introduction of the λ term (now Λ) offers a possibility; it may even be the right one. He had, of course, firmly relinquished the cosmological constant in the early 1930s. If it was "his biggest blunder" he made it twice (just as Newton bought into the South Sea Bubble twice!).

Almost lost in the frenzy of cheers for the redshift-magnitude plots for distant supernovae, but recovered here, is the very first paper from one of

the two (Physics Nobel 2011) teams. Saul Perlmutter et al. (1997 *Astrophys.J.* **483**, 565: "Measurements of the Cosmological Parameters Ω and Λ from the First Seven Supernovae at $z = 0.35$ ") reported a positive value for q_0 , that is, a decelerating universe. I've always thought it interesting and important that these studies finally ruled out a tired-light interpretation of extragalactic redshifts because they show time dilation of the SN light curves. In fact an earlier paper, with just one SN at $z = 0.3$ (Nørgaard-Nielsen et al.) using ESO data, had made that point already.

Two last thoughts. The book is dedicated "To Alison, my best friend for six decades." And the author is a skilled craftsman of Canadian-American English. Consider, from p. 331 "observations of galaxies at high redshift that look different from — and younger than — nearby galaxies." Indeed an observation that would have been a death blow to the Steady State Theory, if various radio observations hadn't already knocked it out, but also a gentle admonition to anyone who might have written "different than" or "different to."

vtrimble@uci.edu



Book Review

Rebecca Charbonneau, University of Cambridge

Open Skies: The National Radio Astronomy Observatory and Its Impact on US Radio Astronomy, by Kenneth I. Kellermann, Ellen N. Bouton, and Sierra S. Brandt (Springer, 2020, ISBN-13: 978-3030323448).

Radio astronomy developed from instruments of warfare—wartime radio technicians in Europe, the United States, Soviet Union, and Australia successfully transitioned from soldiers to scientists by repurposing radar and instruments towards scientific pursuits. Yet it was not until about a decade after the end of the war, as tensions between the US and USSR heated up, that the

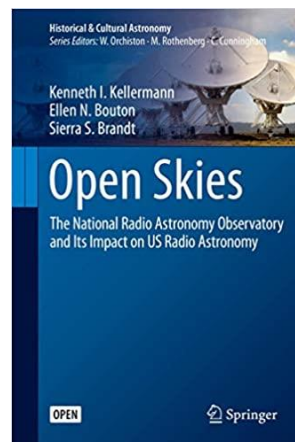
United States government began to invest in radio astronomy. After a brief foray into the very early days of radio astronomy, *Open Skies: The National Radio Astronomy Observatory and Its Impact on US Radio Astronomy* begins with the acknowledgement that “in the US, support for radio astronomy was largely driven by Cold War defense concerns” and situates the National Radio Astronomy Observatory as a major player in the larger historiography of mid-20th century science.

The book charts the successes of NRAO from its early days to its future, yet it is not an uncritical or whiggish hagiography of the institution. Rather, it paints a vivid picture of the complexities, dramas, successes, and failures of US radio astronomy through a focus on NRAO and its relationship with the US and international scientific community. The book has a loosely chronological framing, beginning with the postwar “explosion” in radio astronomy—which led to the sense that the US was “falling behind” and needed to invest in a government-funded flagship facility—moving on to cover major developments such as the creation of the Very Large Array (VLA) and development of Very Long Baseline Interferometry, before concluding closer to the present day, with the rise of large international projects like the Atacama Large Millimeter Array (ALMA) and the Square Kilometre Array (SKA), as well as the planning for the Next Generation Very Large Array (ngVLA). *Open Skies* does not simply recount events in NRAO’s history, but successfully places them within the larger political, scientific, and economic environment.

Open Skies is a rare kind of book, being both expansive—covering a wide range of dates and subjects—and incredibly detailed, carefully documented and verified by a combination of thorough archival research and oral history testimony. This level of detail was made possible because of NRAO’s investment in the creation and maintenance of a national archive for radio astronomy, housed in their Charlottesville headquarters, and because two of the authors, Ken Kellermann and Ellen Bouton, helped to establish those archives. Bouton is the chief archivist who established the archive and has worked at the Observatory since the 1970s and Kellermann is the retired former Chief Scientist, who has worked at the Observatory since the 1960s. Their involvement in NRAO and its history allows for an “insider’s” perspective on the institution, though one conscientiously empirical.

The history of radio astronomy is a relatively new field, and there is much work to be done in subsequent research and publications. As a survey and analysis of a giant of the discipline, *Open Skies* will no doubt serve as both an invaluable reference and foundation to future researchers, as well as an informative and engaging resource for astronomers who wish to understand the roots of their discipline.

rac214@cam.ac.uk



A Census of Newton’s Principia

Jay Pasachoff, Williams College

Prof Mordechai Feingold of Caltech, together with Andrej Svorencík of the University of Mannheim in Germany, have published "A preliminary census of copies of the first edition of Newton’s *Principia* (1687)" in *Annals of Science*, 2020, vol 77, no 3, pp. 253-348. In Taylor & Francis Online, it is <https://www.tandfonline.com/doi/full/10.1080/00033790.2020.1808700>.

They have identified 387 copies, which implies that the print run was larger than had been assumed and which therefore implies that the book was more widely read than had been thought. "The new empirical evidence presented in our census enables a reassessment of the early diffusion of the *Principia* in Europe which, in turn, would necessitate a major refinement of our understanding of the contribution of Newtonianism to Enlightenment science."

Prof. Feingold (feingold@hss.caltech.edu), of Caltech’s Division of the Humanities and Social Sciences, writes that they would be grateful for information regarding additional copies, as well as corrections and comments.

jmp@williams.edu

What's New in the Journal of Astronomical History and Heritage

JOURNAL OF ASTRONOMICAL HISTORY AND HERITAGE	
ISSN 1440-2807	
VOLUME 23 NUMBER 1	APRIL 2020

CONTENTS

	Page
Papers	
"Foundling of Percival Lowell": The saga of naming Pluto <i>Thomas Hockey</i>	2
Australian eclipse expeditions: James Short and the eclipses of 1908, 1910 and 1911 <i>Nick Lomb</i>	26
Astronomical dating of seven Classical Greek eclipses <i>F.R. Stephenson, L.V. Morrison, and C.Y. Hohenkerk</i>	47
Seeking an inconstant constant: the quest to discover the variability of the Sun from William Herschel to Andrew Ellicott Douglass <i>William Sheehan and G. Wesley Lockwood</i>	63
Solstice and solar position observations in Australian Aboriginal and Torres Strait Islander traditions <i>Duane W. Hamacher, Robert S. Fuller, Trevor M. Leaman, and David Bosun</i>	89
Sustained cartographic innovations in nascent French Canada: the life and times of Jean Deshayes <i>Richard de Grijs</i>	100
Herschel's spurious moons of Uranus: their impact on satellite orbital theory, celestial cartography and literature <i>Clifford J. Cunningham</i>	119
Understanding <i>śrngonnati</i> : elevation of the Moon's cusp (with examples) <i>B.S. Shubha, B.S. Shylaja and P. Vinay</i>	163
Cook's third voyage to the Pacific and early scientific astronomy on the north-western coast of America: the sojourn at Nootka Sound in April 1778 <i>Wayne Orchiston and William Wells</i>	174
Obituary	
Dr Yukio Ōhashi (1955–2019) <i>Wayne Orchiston and Tsuko Nakamura</i>	209
Book Reviews	
<i>Cosmic Discovery: The Search, Scope, and Heritage of Astronomy</i> , by Martin Harwit <i>Samantha Thompson</i>	218
<i>Unifying Heaven and Earth: Essays in the History of Early Modern Cosmology</i> , edited by Patrick Boner and Dario Tessicini <i>Clifford J. Cunningham</i>	219
<i>Scandalous Error. Calendar Reform and Calendrical Astronomy in Medieval Europe</i> , by C. Philipp E. Nothaft <i>Cecelia Pantì</i>	220
<i>Simon Marius and His Research</i> , edited by Hans Gaab and Pierre Leich <i>Clifford J. Cunningham</i>	223
<i>The Wayward Comet: A Descriptive History of Cometary Orbits, Kepler's Problem and the Cometarium</i> , by Martin Beech <i>Pedro M.P. Raposo</i>	224
<i>Franz Xaver von Zach und die Astronomie seiner Zeit</i> , edited by Wolfgang R. Dick and Oliver Schwarz <i>Endre Zsoldos</i>	226
<i>Decoding the Stars: A Biography of Angelo Secchi, Jesuit and Scientist</i> , by Ileana Chinnici <i>Wayne Orchiston</i>	227



Published by the National Astronomical Research Institute of Thailand, 260 Moo 4,
T. Donkaew, A. Maerim, Chiang Mai 50180, Thailand.

JOURNAL OF ASTRONOMICAL HISTORY AND HERITAGE ISSN 1440-2807	
VOLUME 23 NUMBER 2	AUGUST 2020

CONTENTS

	Page
Papers	
'Dark stars' and a new interpretation of the ancient Greek stellar magnitude system <i>Clifford J. Cunningham</i>	231
Medieval astronomical clocks in the Baltic region and the mysterious golden numbers in Gdansk <i>Lars Gislén</i>	257
Alexander Bruce: Scotland's accidental 'scientific revolutionary' <i>Richard de Grijs</i>	267
The time balls of Mauritius <i>Roger Kinns</i>	281
Geodetic arcs, pendulums and the shape of the Earth <i>James Lequeux</i>	297
The eclipse of 21 June 1629 in Beijing in the context of the reform of the Chinese calendar <i>Sperello di Serego Alighieri and Elisabetta Corsi</i>	327
Henrique Morize and the eclipse of 1919 eclipse: the National Observatory of Brazil, the solar corona, and pure science <i>Antonio A.P. Vidiera</i>	335
Comet tales from India: the Great September Comet of 1882 (C/1882 R1) <i>Ramesh Kapoor</i>	353
Native American traditions of Meteor Crater, Arizona: fact, fiction or appropriation? <i>Duane W. Hamacher</i>	375
A cultural comparison of the 'dark constellations' in the Milky Way <i>Stephen R. Gullberg, Duane W. Hamacher, Alejandro Martin-Lopez, Javier Mejuto, Andrew M. Munro and Wayne Orchiston</i>	390
Book Reviews	
<i>No Shadow of a Doubt: The 1919 Eclipse That Confirmed Einstein's Theory of Relativity</i> , by Daniel Kennefick <i>Clifford Cunningham</i>	405
<i>Gravity's Century: From Einstein's Eclipse to Images of Black Holes</i> , by Ron Cowen <i>Clifford Cunningham</i>	405
<i>Proving Einstein Right: The Daring Expeditions That Changed How We Look at The Universe</i> , by S. James Gates Jr. and Cathie Pelletier <i>Clifford Cunningham</i>	405
<i>Zwicky: The Outcast Genius Who Unmasked the Universe</i> , by John Johnson Jr <i>Clifford Cunningham</i>	407
<i>History of the Observatory at the University of Trnava 1756 – 1785</i> , by Alžbeta Hološová and Henrieta Žažová <i>Paul Gabor</i>	408
<i>Hellenistic Astronomy: The Science in its Contexts</i> , edited by Alan C. Bowen and Francesca Rochberg <i>Clifford Cunningham</i>	410

Contents	
<i>As the World Turns: The History of Proving the Earth Rotates</i> , by Peter Kosso William Tobin	411
<i>In Memoriam Hilmar Duerbeck</i> , edited by Wolfgang R. Dick and Christiaan Sterken Clifford Cunningham	413
<i>Mathematical Disquisitions: The Booklet of Theses Immortalized by Galileo</i> , by Christopher M. Graney Clifford Cunningham	414
<i>News From Mars: Mass Media and the Forging of a New Astronomy, 1860-1910</i> , by Joshua Nall Clifford Cunningham	416
<i>Saturn</i> , by William Sheehan. Clifford Cunningham	417
<i>Jean-Charles Houzeau's Escape from Texas. A Belgian Astronomer Caught in the American Civil War</i> , by C. Sterken and A.A. King Emile Biémont	418
<i>History of the Plurality of Worlds: The Myths of Extraterrestrials Throughout the Ages</i> , by Pierre Connes, edited by James Lequeux Steven J. Dick	419
<i>The Moon: A Translation of Der Mond by Johann Friedrich Julius Schmidt</i> , translated by Stephen Harvey Bill Leatherbarrow	421
Corrigendum: The Obituary for Dr Yukio Ôhashi	423

The *Journal of Astronomical History and Heritage*, founded in 1998 by Wayne Orchiston and John Perdrix, is an online open-access journal published in April, August, and December of each year. All issues are available at <https://www.jahh.org/>.

The first two issues for 2020 (volume 23) are now available; as a service to our members the Tables of Contents are reproduced here.

A number of HAD members are involved in the production of this fine journal, as editors (see the list at right), authors, and reviewers! If you would like to contribute in any capacity, please contact Wayne Orchiston at jahh.editor@gmail.com.

Chief Editor

Wayne ORCHISTON (Thailand)

Associate Editors

Clifford CUNNINGHAM (Canada)

Duane HAMACHER (Australia)

James LEQUEUX (France)

Peter ROBERTSON (Australia)

Editorial Board

Alan BATTEN (Canada)

Suzanne DÉBARBAT (France)

Steven DICK (USA)

Priscila FAULHABER (Brazil)

Ian GLASS (South Africa)

Bambang HIDAYAT (Indonesia)

Ioannis LIRITZIS (Greece)

Nick LOMB (Australia)

Tsuko NAKAMURA (Japan)

Il-Seong NHA (South Korea)

Ray NORRIS (Australia)

Yukio ÔHASHI (Japan)

F. Richard STEPHENSON (England)

Xiaochun SUN (China)

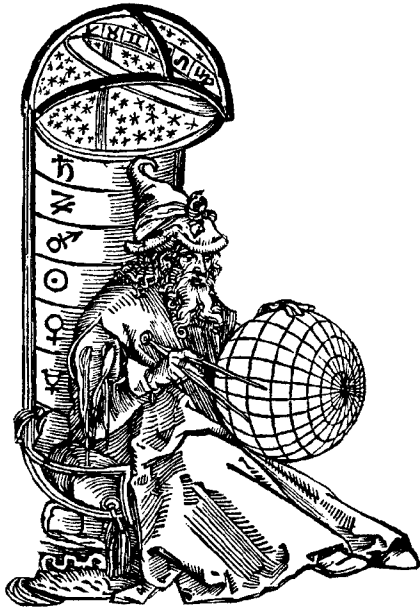
Joseph S. TENN (USA)

Virginia TRIMBLE (USA)

Mayank VAHIA (India)

Brian WARNER (South Africa)

Gudrun WOLFSCHMIDT (Germany)



Historical Astronomy Division of the American Astronomical Society

HAD News #96, December 2020, edited by Ken Rumstay. Please send contributions for the next issue, comments, etc. to hadsec@aaas.org.

A complete version of this newsletter, with color photographs and active links, may be found at <https://had.aas.org/sites/had.aas.org/files/HADN96.pdf>.

Photo credits: p.1: Terry Oswalt, Amy Oliver, Samantha Thompson; p.2: Alan Hirshfeld, Brill Publishers, Ileana Chinnici; p.3: Brill Publishers, Alan Hirshfeld; p.4: Kevin Krisciunas; *Bulletin of the American Astronomical Society*; p.5: Patrick Seitzer, Ken Rumstay; p.6: Ken Rumstay; p.7: Steven Gullberg, Andrew Fraknoi; p.8: Jennifer Bartlett. Ed Struble, University of Chicago Photographic Archive, Encyclopedia Britannica; p.9: European Space Agency, Hans Haubold; p.10: Wikimedia Commons, Springer; p.11: Springer, Reaktion Books; p.12: Virginia Trimble, Princeton University Press; p.13: Rebecca Charbonneau; p.14: Springer; pp.25,16,17: *Journal of Astronomical History and Heritage*.

HAD News
c/o K.S. Rumstay
Department of Physics, Astronomy, and Geosciences
Valdosta State University
Valdosta, GA 31698