



# AAVSO

**Annual Report**  
**2018–2019**







# The American Association of Variable Star Observers

## Annual Report 2018–19

### *Our mission:*

*“to enable anyone, anywhere, to participate in scientific discovery through variable star astronomy.”*

The American Association of Variable Star Observers  
49 Bay State Road  
Cambridge, MA 02138-1203  
United States

Telephone: (617) 354-0484  
Fax: (617) 354-0665

email: [aavso@aavso.org](mailto:aavso@aavso.org)  
website: [www.aavso.org](http://www.aavso.org)

Cover picture credit: Jared Heath Photography

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Stella Kafka, Ph.D.	CEO and Executive Director (2015–Present)
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### **Operations Team**

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Lindsay Ward	Communications Manager

### **Science Team**

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Sebastián Otero	External Consultant, VSX Team, Spanish Translations
Bert Pablo Ph. D.	Staff Astronomer
Michael Saladyga, Ph.D.	Technical Assistant and JAAVSO Production Editor
Elizabeth O. Waagen	Senior Technical Assistant, JAAVSO Associate Editor



*Photo Credit: AAVSO Ambassador Molly Wakeling, Astronomolly Images ©2019; M42 Orion Nebula*

## AAVSO in a nutshell

The American Association of Variable Star Observers (AAVSO) is an international scientific and educational 501(c)3 nonprofit organization of amateur and professional astronomers who are interested in stars that change in brightness—variable stars. Its mission is to enable anyone, anywhere, to participate in scientific discovery through variable star astronomy. The mission is pursued through enabling citizen and professional scientists to observe and analyze variable stars through education, collaboration, and software tools; collecting and archiving these observations in AAVSO-created databases that are accessible worldwide; forging collaborations between amateur and professional astronomers; and conducting scientific research and public outreach using variable star data.



*Photo: Stella Kafka at GIRLS Inc.*

The AAVSO's databases include its AAVSO International Database (AID) and International Variable Star Index (VSX). AID, comprised of over 39 million variable star brightness measurements going back over 100 years, is a valuable resource for scientists. Findings based on these data have been featured in more than 2,700 research papers worldwide, with AAVSO observers often co-authors of a paper. VSX is a continuously updated comprehensive list of all variables and the observations on each.



International Variable Star Index (VSX)

Due to much hard work and cooperation, AAVSO recently expanded its resource capacity to include spectroscopic data, in its new spectroscopic database, AVSpec. AVSpec observations complement AID contributions, enabling more comprehensive research and additional focuses for scientific discoveries.



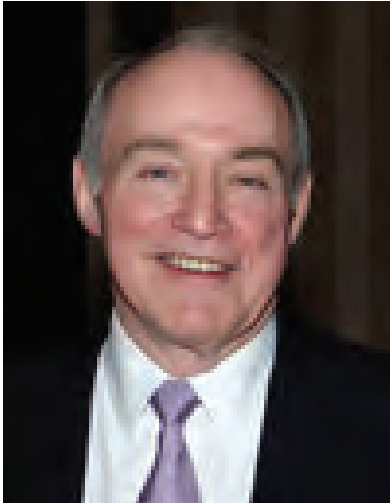
AAVSO partners internationally with individuals, organizations, and facilities to help make scientific discoveries and advance research. AAVSO promotes education in science, technology, engineering, and mathematics to show students how accessible and achievable a STEM career can be. Through its observing sections and *Journal of the AAVSO*, the organization furthers the distribution of data gathered by its observers, and research from the scientific community, respectively.

Through these endeavors, AAVSO built a worldwide network of skilled and dedicated astronomers who contribute to databases where their observations are verified. This partnership ensures AAVSO's reputation as a valuable resource for professional astronomers and astrophysicists.



*Photo Credit: AAVSO Ambassador Molly Wakeling, Astronomolly Images ©2019; Lunar Eclipse 2019*





## Message from the AAVSO President

It's almost incomprehensible how much scientific knowledge has grown since the founding of AAVSO in 1911.

Only three years earlier, Henrietta Leavitt discovered the period-luminosity relationship, providing a critical tool enabling us to measure the size of the universe.

Humankind was searching for an answer to the source of the Sun's immense energy. New Zealand's Ernest Rutherford was unraveling the atom with his discovery of the size of the nucleus. Understanding of nuclear fusion was a decade away.

The Milky Way was the entire universe. Hubble's discovery of the expanding universe and galaxies outside the Milky Way still lay in the future. Objects and ideas, such as black holes, gravity waves, exoplanets, and the Big Bang, were beyond human ken.

Into this backdrop of knowledge, AAVSO was founded. Its goal: to bring amateur astronomers into the quest to understand the universe.

AAVSO's 1918 document of incorporation states, "The Corporation is constituted for the purpose of the promotion of Variable Star Astronomy and kindred subjects." AAVSO's founders, aware of their limited understanding of why objects in the night sky vary in brightness, focused their attention on variable stars. But the words "kindred subjects" are interesting. Little could the founders predict the cacophony of night-sky objects amateurs would be observing a hundred years later, but they knew there were mysteries out there yet to be discovered. Observers concentrate on stellar objects whose brightness varies over an astonishing time range—from seconds to decades. And as for kindred objects? AAVSO exoplanet observations aid in the search for life elsewhere in the universe, and black hole observations increase understanding of these bizarre objects.

Over the past 108 years, AAVSO has contributed significantly to the explosion in scientific knowledge. At the same time, it has been the home for people enjoying a rewarding hobby.

Now, we look to the future. AAVSO's strategic planning efforts are focused on two key areas:

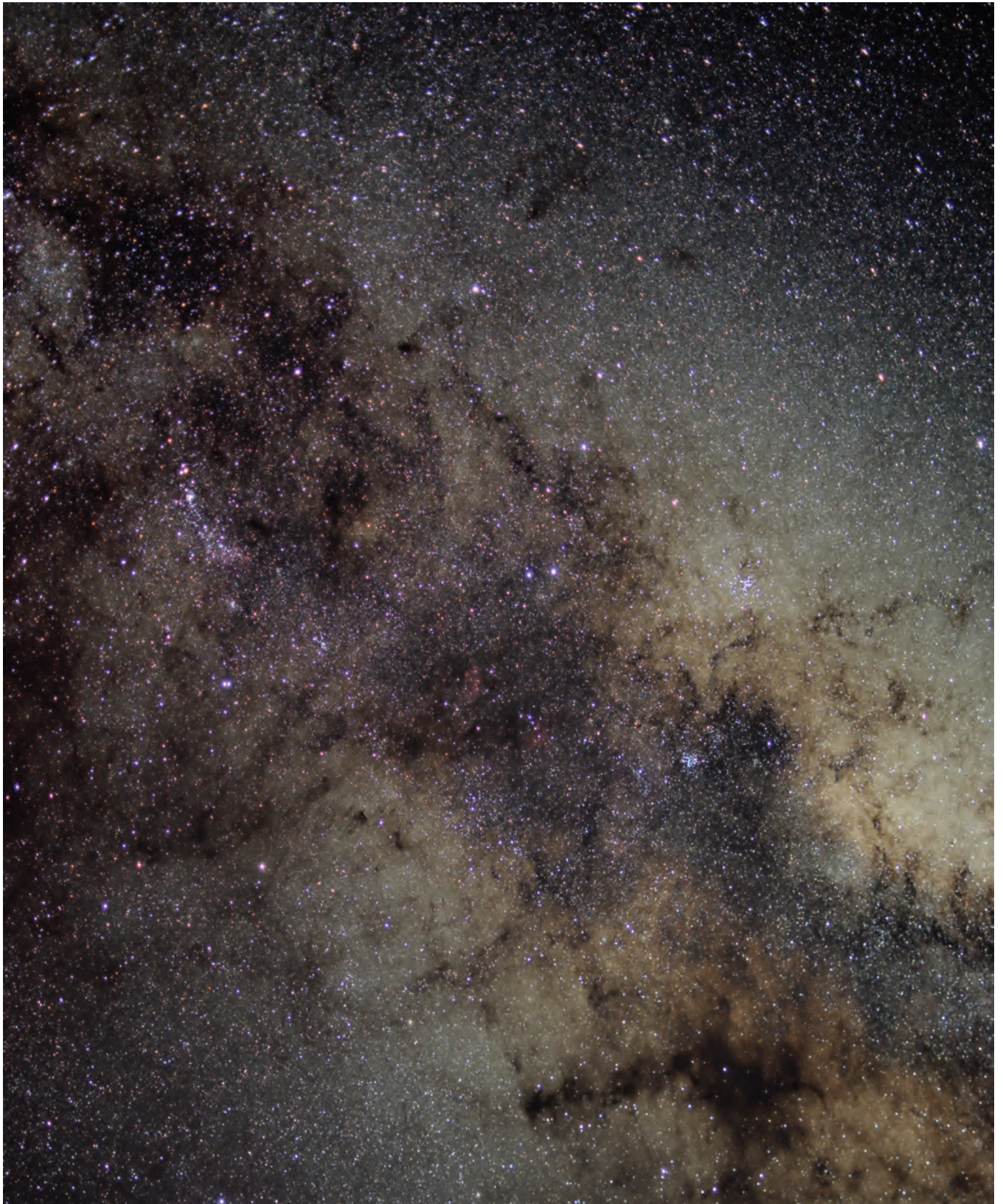
1. Its members—what they are most interested in, why they belong to AAVSO.
2. The future world of astronomy research—how amateurs can most effectively support the quest for knowledge.

AAVSO's future is bright—stay tuned.

A handwritten signature in black ink that reads "Gordon". The signature is written in a cursive, flowing style.

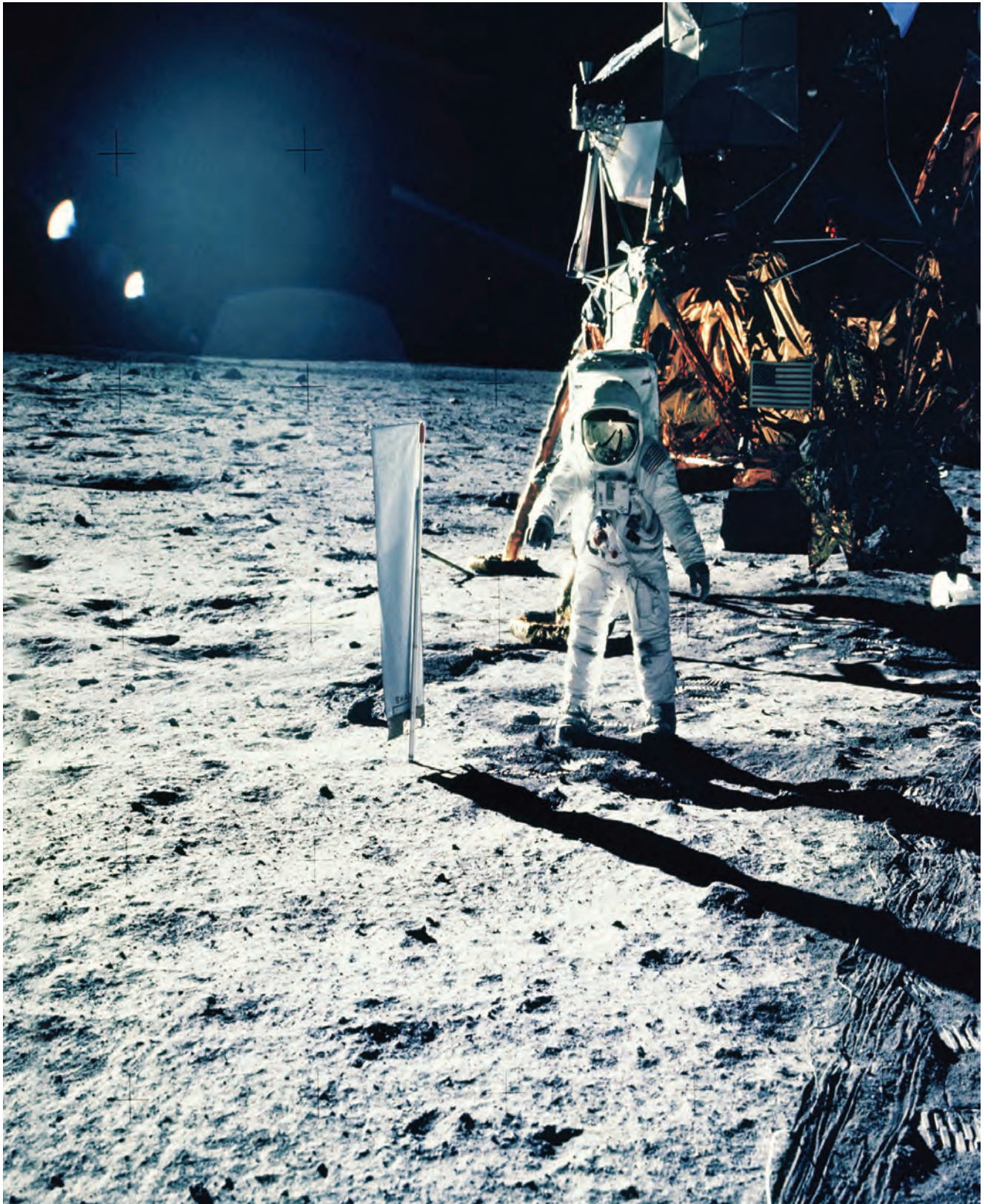
Gordon Myers, AAVSO President





*Photo Credit: AAVSO Ambassador Molly Wakeling, Astronomolly Images ©2019; The Milky Way*



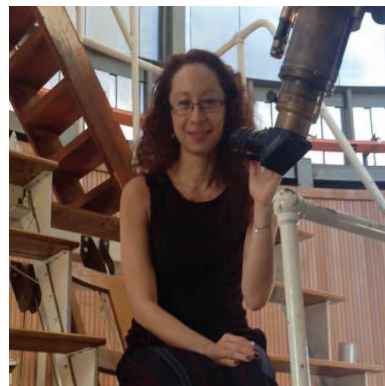


*Photo Credit: Neil Armstrong's reflection in Buzz Aldrin's visor is one of the few photos of Armstrong on the moon. NASA*



## Director's Review of the Year

Another year full of activities engaging our observers in a multitude of projects, training observers, increasing data quality control, and building stronger communities through our observing sections. We are making new connections and providing fresh opportunities. This report showcases some of our new accomplishments this year—milestones, avenues for data sharing, collaborations, scientific achievements, and innovative ideas.



Individuals in 62 different countries contributed over 2 million data points to the AAVSO International Database this past year. We saw a dramatic surge in the number of objects in the Variable Star Index, which surpassed 1.3 million stars, making it one of the largest databases of variable star information in the world. We participated in campaigns on a multitude of objects—from new unidentified transients to old favorites that are suddenly misbehaving (anyone know what is going on with Betelgeuse?). We have become indispensable to the TESS ground-based follow-up team, with increasing requests for exoplanet transit observations using small telescopes. We launched our spectroscopy database, which complements our photometric measurements and enhances the scientific value of the data. We also welcomed a new JAAVSO Editor-in-Chief, Prof. Nancy Morrison, and are looking forward to her ideas on our favorite journal.

The new decade finds the AAVSO at a crossroads. In 2019, we started a strategic planning process, engaging not only our board and our immediate community, but also a team of Harvard business school consultants. This team is helping us look at the AAVSO from the outside-in—challenging our existing biases about our work and our community, and providing new lenses through which we critically examine the work of the association. With continued deep respect for our long history and a focus on citizen science (and scientists), the outcome of this process will provide directions for the future of the AAVSO, highlighting flagship projects and resources for sustainable funding.

Looking back, 2019 was another successful year. We are excited to have embarked on this journey, one that would not be possible without you. I want to take this opportunity to thank you—our members, our volunteers, our observers, our donors. Your continuous support, dedication, encouragement, and generous donations are highly valued, make our work possible, and enhance this wonderful community of individuals who collectively explore the variable night sky.



Best wishes - clear skies  
Stella Kafka, AAVSO Director





## Journal of the AAVSO

On October 1, 2019, Nancy Morrison assumed the editorship of the JAAVSO. She thanks the previous editor, John Percy, for excellent service. She also thanks the AAVSO for the opportunity to serve and for the high quality of the journal and its staff.

The JAAVSO advances the mission of the AAVSO by: enabling variable star researchers to submit their results to peer review with the goal of publication, and providing beginning astronomers with an accessible introduction to variable star research. We publish research articles on any topic related to variable stars, including instrumentation and research methods, as well as articles on historical and educational topics and the occasional invited review article. Compilations of data are also welcome. The journal also includes abstracts of presentations at meetings sponsored or cosponsored by the AAVSO. Authors include student, professional, and amateur astronomers.

Because of a vote by the AAVSO Board of Directors at its meeting in October 2019 in Las Cruces, NM, the Journal of the AAVSO is now fully open access. Formerly, articles were accessible only to AAVSO members during the first year after publication. Now, anyone can download them as soon as they are published.

The time frame of this report covers Volume 46, number 2, and Volume 47, number 1. Together, they include 23 refereed articles, 8 data reports, and 39 meeting abstracts, for a total of 140 and 116 pages of content, respectively.

Upcoming issue 2 of Volume 47: it includes 15 refereed articles, three data reports, and 37 meeting abstracts at the time of writing. Three more refereed articles are in production and three are in review. Thus, this incomplete volume already contains more articles than either of its two predecessors individually, thus ending John Percy's term as editor on a high note.

In the future, the editor will be holding discussions with staff about future enhancements to its on-line presentation, within the limits of available resources. She will also be holding discussions about other future developments with the Board, its Publications Committee, and the JAAVSO Board of Editors. Suggestions from readers about what form those developments might take are invited.

## International Variable Star Index (VSX)

VSX is a continuously evolving database that includes most variable star catalogues and stars published in variable star listings, journals, and alert pages (such as ASAS-SN, ATel, Gaia, and TNS), along with new discoveries submitted by individual researchers. The VSX Team, led by Sebastián Otero, keeps it as current and accurate as possible.

The number of users and submissions remain high and stable, even in this multi-survey era, which speaks volumes to the observers and how they adapt to change.



Throughout the year, Patrick Wils implemented upgrades and corrections to make the VSX experience more friendly:

- There is now no need to give a URL anymore if there is a bibcode available. New ADS-style URLs are implemented automatically.
- Non-standard characters can now be written in all VSX form fields.
- The period field now supports 15 decimal places instead of 10 (we received submissions justifying the implementation of such precision).
- A link to the Data Download page was added to the AUID field.

Klaus Bernhard helped us with new lists for upload, and Patrick Schmeer revised and implemented additions from alert pages.

The VSX team reached a huge milestone—the total upload of one million objects—on September 23, 2019. The number of records grew from nearly 600,000 to 1,391,000 in just one year. Most of the objects came from the OGLE catalogue of variable stars, with contributions from ASAS-SN, WISE, Pan-STARRS1, K2, BESTII, CzeV, CoRoT, and Evrscope surveys.

We also implemented the Novice Discovery option for beginners, made the VSX Manual available online, updated the FAQ page, and added the UGZ/IW, CWB(B), and CWBS variability types to our online documentation.

We thank all the people who contribute to VSX, the VSX Team, and AAVSO staff, for the excellent work they have been performing.

## Astronomers Corner



Hello and welcome everyone, to a foray into the world of observing sections! You may be asking yourself, “What is an observing section?” It can actually be whatever YOU want it to be. It’s AAVSO’s way of building communities that enable you to easily communicate with like-minded people who share your passion for a certain type of star or research, or your love of building. These communities are designed to address the various interests and needs

of members and observers.

AAVSO is implementing big plans this year to make these sections more engaging, like giving you the ability to subscribe to sections that interest you. This will provide you with access to upcoming section-specific bulletins, alerts, or projects, and is a new way to interact with fellow enthusiasts. New projects, content, and possibly even a new observing section are also on the horizon. The section leaders are eager to introduce their own visions to you as well.

So, how do you become involved? The best way is through AAVSO’s forums. There is one forum set up for each observing section to ask questions and help one another. If you want to be more heavily involved with a particular section, simply contact one of the observing section leaders directly by going to <https://aavso.org/observers#sections>, clicking on the appropriate section, and clicking the contact button by the section leader’s name.

AAVSO looks forward to seeing you in these sections, and hopes that you enjoy the journey!

Bert Pablo, Staff Astronomer



## AAVSO Special Awards presented in 2019



### 2019 AAVSO Directors Award

**Kristine M. Larsen**

"With this Director's award, AAVSO HQ and volunteers want to express our deepest gratitude for her tireless work and dedication."

### AAVSO 50<sup>th</sup> Merit Award

**David Benn**

"has contributed thousands of hours to AAVSO," primarily by developing and implementing VStar, a program used to analyze light curves, and through teaching and furthering CHOICE Courses."



### AAVSO 51<sup>st</sup> Merit Award

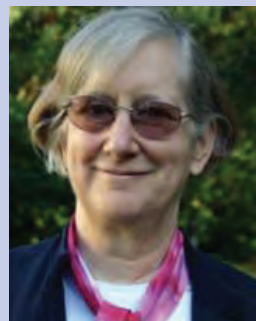
**Patrick Wils**

"volunteers countless hours to AAVSO's International Variable Star Index (VSX), and we would not have reached the star data milestones achieved this year without him. In addition to this service, he is also a valued mentor and AAVSO software programmer."

### AAVSO 16<sup>th</sup> William Tyler Olcott Distinguished Service Award

**Lee Anne M. Willson**

"for her support and leadership of the AAVSO, her seminal research into the nature and evolution of Mira and semiregular variable stars, her service as an ambassador between the professional and amateur astronomy communities, her inspiring education of students, and her outreach activities with the general public."





*Sloan Digital Sky Survey Plate Workshop Las Cruces, NM*



*Apache Point Observatory Tour, October 2019*



*Apache Point Observatory Tour, October 2019*



*Attendees of the AAVSO 109th Annual Meeting, Las Cruces, New Mexico, USA*

## 108th Annual Meeting Review

Attendees at AAVSO's 108th Annual Meeting at Hotel Encanto in Las Cruces, New Mexico saw many new components being tried for success. Of particular note were the separate workshops for beginners and experienced observers, a how-to hour, and the Sloan Digital Sky Survey Plates for Education workshop for Las Cruces teachers, which was also attended by those AAVSO members and their guests who are educators.

Newcomers to the meeting this year included AAVSO's Ambassadors, who are astronomy and astrophysics undergraduate and graduate student volunteers who promote AAVSO and variable star research in university and community events.

Field trip participation capacity to Sunspot Solar Observatory and Apache Point Observatory maxed out, and the trip was enjoyed by all its participants, even those local to the area, since Apache Point Observatory does not generally conduct tours.



Enjoyable as always were the keynote speakers, poster presenters, fundraising raffle, and presentations by members keeping us all up to date on their personal projects and research.

The observing section breakout session provided time for connecting, organizing, brainstorming, and increasing section accessibility and involvement. Many ideas sprang from this breakout, including implementing regular bulletins and various ways to refresh the content and scope of the observing sections.

The unique entertainment at the banquet was heart fully delivered by Randy Granger, Native American musician and storyteller, performing both songs he wrote himself and a couple of oldies but goodies, on instruments he made himself.

We hope to see you all at the 109th Annual Meeting at The Row Hotel, Somerville, Massachusetts from November 6th through 9th, 2020, and at the pre-meeting spectroscopy workshop by Ken Hudson on November 4th and 5th.



Michael Cook 109th Annual Meeting Las Cruces, NM. 2019



AAVSO 108th Annual Meeting Las Cruces, New Mexico. 2019



Randy Granger, 108th Annual Meeting banquet entertainment



Poster session 108th Annual meeting Las Cruces, NM



Discussing Astronomy 108th Annual Meeting Las Cruces, NM



## The Argelander Society



Named for Friedrich Argelander, who is considered to be "the father of variable star astronomy," **The Argelander Society** offers membership benefits to those individuals who have given substantial financial support to the AAVSO over many years. Once a benefactor has donated a cumulative total of \$35,000.00 to the AAVSO, they are eligible for a lifetime membership in the organization, free registration to annual meetings, invitations to special events, special awards, and tokens of the association's appreciation.

*Picture : Friedrich Wilhelm August Argelander (1799–1875)  
Photograph courtesy of the Mary Lea Shane Archives of the  
Lick Observatory, University of California-Santa Cruz*

The AAVSO gratefully acknowledges the benefactor members of

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Alessio Caradossi  
Ms. Kim Hay

## Treasurer's Report October 1, 2018 to September 30, 2019

Robert Stephens, Treasurer, AAVSO, 49 Bay State Road, Cambridge, MA 02138

### American Association of Variable Star Observers Statement of Financial Position September 30, 2019

#### Assets

##### Current Assets

Cash and cash equivalents	\$486,964
Prepaid expenses	9,424
Investments	<u>12,903,636</u>

**Total Current Assets** 13,400,024

**Property and Equipment, Net of Accumulated Depreciation** 1,222,959

**Total Assets** \$14,622,983

#### Liabilities and Net Assets

##### Current Liabilities

Accounts payable and accrued expenses	\$34,858
Prepaid membership dues and meetings	<u>41,841</u>
Total Current Liabilities	<u>76,699</u>

##### Net Assets

Without donor restrictions	11,005,306
With donor restrictions	<u>3,540,978</u>

**Total Net Assets** 14,546,284

**Total Liabilities and Net Assets** \$14,622,983

**American Association of Variable Star Observers  
Statement of Activities and Changes in Net Assets  
For the Year Ended September 30, 2019**

**Changes in Net Assets Without Donor Restrictions**

**Unrestricted Revenues, Gains and Other Support**

Contributions and grants	\$185,822
Membership dues and fees	97,665
Sales of publications and related material	7,377
Meeting fees	30,005
Annex rent	20,832
Investment income	268,026
Unrealized gain (loss) on investments	553,202
Gain (loss) on sale of investments	<u>(496,125)</u>
	666,804
Net assets released from purpose restrictions	<u>35,361</u>
Total Unrestricted Revenues, Gains and Other Support	<u>702,165</u>

**Expenses**

Program Services – research, data collection, publication and meetings	632,945
General and administrative	334,401
Fundraising	<u>25,973</u>
<b>Total Expenses</b>	<u>993,319</u>
<b>Increase in Unrestricted Net Assets</b>	<u>(291,154)</u>

**Changes in Net Assets With Donor Restrictions**

Contributions and grants	1,300
Investment income	4,834
Unrealized gain (loss) on investments	9,977
Gain (loss) on sale of investments	(8,948)
Assets released from program restrictions	<u>(35,361)</u>
Decrease in Temporarily Restricted Net Assets	<u>(28,198)</u>

**Increase (Decrease) in Net Assets** (319,352)

**Net Assets – Beginning of Year** 14,865,636

**Net Assets – End of Year** \$14,546,284



