

Kai'aleleiaaka 🌌 THE MILKY WAY

Issue 6 🌌 10 August 2015

Wally Pacholka / AstroPics.com

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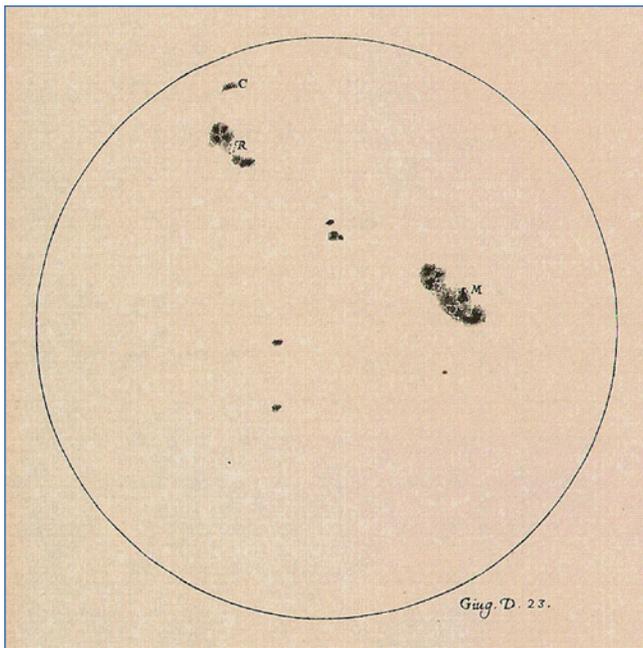
Revised Sunspot History Sets the Record Straight

There's no evidence of a correlation between solar activity and global climate change.

By LAURENCE A. MARSCHALL, *Kai'aleleika*

At a press conference held at the IAU General Assembly on Friday, 7 August, astronomers announced the results of an [important revision](#) to the historical record of solar activity.

The corrected version of the well-known solar-cycle graph brings homogeneity to the 400-year-long tally of sunspots, providing a trustworthy record to inform modern research on the Sun and on solar-terrestrial relations. It will provide an improved data set for ongoing studies of the solar dynamo, for predictions of space weather, and for models of climate change. Notably the revised sunspot record shows that there has been no upward



A drawing of the Sun made by Galileo Galilei on 23 June 1613. Galileo was one of the first to observe and document sunspots. [*The Galileo Project*, M. Kornmesser]

trend in solar activity since 1750 — a trend that had been suggested by previous versions of the count — which implies that there is no significant correlation between the level of solar activity and global temperature rise.

The corrected record, called [Sunspot Number Version](#)

[2.0](#), is the result of a project led by Frédéric Clette (World Data Centre [WDC]–Sunspot Index and Long-term Solar Observations [SILSO]), Ed Cliver (National Solar Observatory), and Leif Svalgaard (Stanford University, California).

A primary motivation for revisiting the old data was a discrepancy between two methods of charting solar activity. The first is the Wolf Sunspot Number (WSN), an index based on the number of individual sunspots and groups of sunspots. Because telescopes prior to the 1800s had poorer resolution than modern instruments, groups of sunspots could be more frequently mistaken for individual spots, and so, in 1998 a new index, the Group Sunspot Number (GSN), was adopted as a better representation of long-term solar activity. However, the WSN time series did not uniformly track the GSN, with discrepancies of as much as 40% at various epochs.

The sunspot record may be the longest-running scientific experiment in history, involving hundreds of thousands of reports, sketches, and photographs made by disparate amateur and professional observers over the past 400

Kai'aleleika 🌌 THE MILKY WAY

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Hawaii Convention Center, Room 302;

open Monday to Friday, 8 am to 6 pm

(closing at 2 pm on Friday, 14 August).

Email: newspaper@astronomy2015.org

Phone: +1 (808) 792-6638. Download PDFs at

<http://astronomy2015.org/newspaper>.

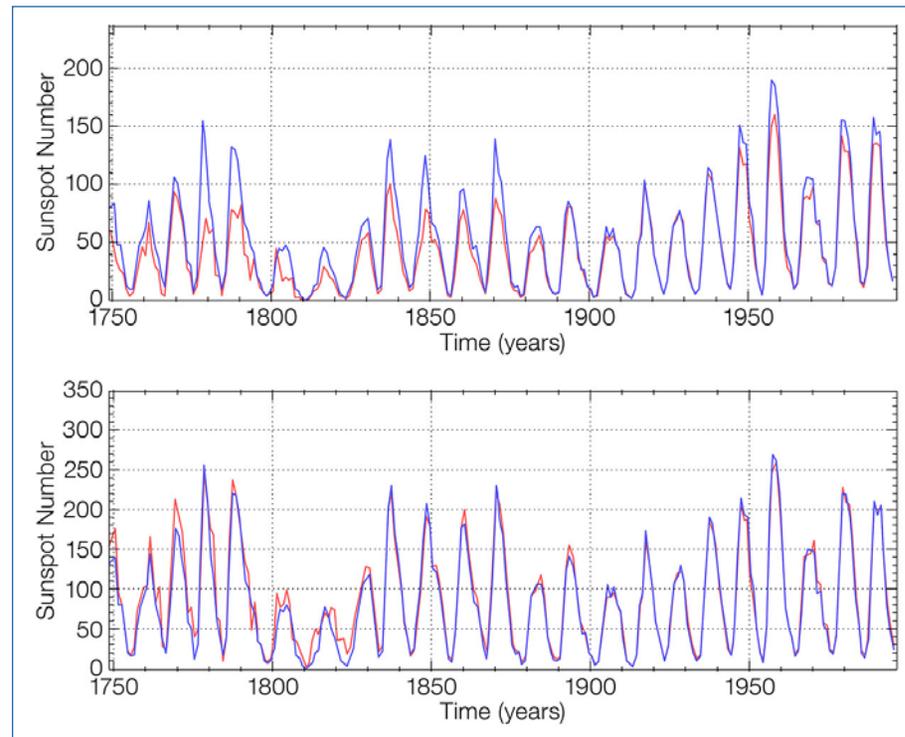


Kai'aleleika (The Milky Way) is the official newspaper of the XXIX General Assembly of the International Astronomical Union, 3-14 August 2015, Honolulu, Hawai'i. It is published for the IAU by the American Astronomical Society, which thanks the following organizations for providing staff to work on the newspaper: Astronomical Society of the Pacific, Stratospheric Observatory for Infrared Astronomy, and Universe Awareness at Leiden University. © 2015 AAS, all rights reserved.

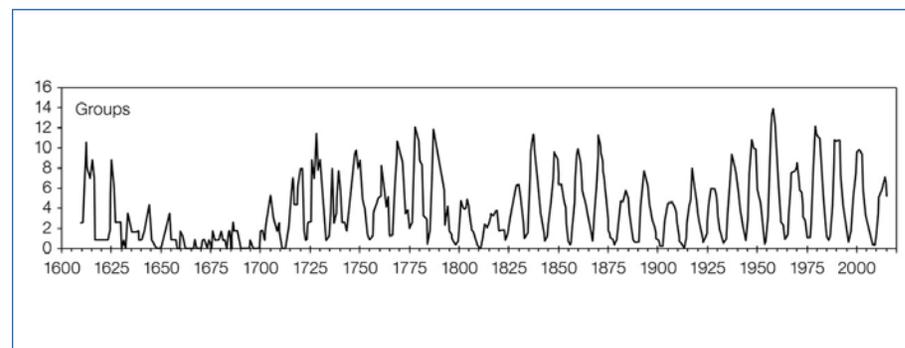
years. The creation of Sunspot Number Version 2.0 involved more than 40 astronomers examining these original sources over the past four years, unearthing additional reports and images that had not been included in the original tallies by Wolf and others, and then applying corrections to produce a homogenous data set. The WSN and GSN graphs are now in good agreement, with no significant systematic differences. This, noted Clette, “is a strong final confirmation of the validity of the corrections,” which were done independently by various members of the team. The data and analysis are now a matter of public record, and an upcoming topical issue of the journal [Solar Physics](#) will be devoted to the revised sunspot count.

A link between solar activity and climate had been suggested because a prolonged near-absence of sunspots, the Maunder Minimum, coincided with a period of cool summers and harsh winters in Europe from 1645 to 1750. Prior to Sunspot Number Version 2.0, the time series of GSN data indicated a notable increase in sunspot activity at solar maximum from 1750 to the present, which some called the Modern Grand Maximum, and which a number of skeptics had identified as evidence that natural trends on the Sun, rather than human-caused greenhouse emissions, are the principal driver of global climate change. Sunspot Number Version 2.0 shows no trend of any significance, upward or downward, in solar activity since 1750, and thus provides no evidence that solar activity plays a significant role in global temperature rise since the industrial revolution.

That said, the new sunspot numbers will be the go-to data set for modern climate models, even if solar activity continues to be considered a minor factor in driving current climate change. More important for the astronomical community, the revised data will provide a more reliable basis for modeling the hydrodynamics of the Sun. “The holy grail of theoretical solar physics is to be able to predict future solar activity,” notes Svalgaard, “and this revision, by giving us a more reliable record of the past, will enable us to better test our models of the future.” 🌸



The top graph shows the level of disagreement between the old Wolf Sunspot Number (blue) and the old Group Sunspot Number (red). The lower graph demonstrates the increase in similarity between the two after being recalibrated. [WDC-SILSO]



A graph showing the GSN as measured over the past 400 years, following the new calibration. The Maunder Minimum, between 1645 and 1715, when sunspots were scarce and the winters harsh, is clearly visible. The modulation of the 11-year solar cycle is clearly seen, as is the 70- to 100-year Gleissberg cycle. [WDC-SILSO]

Names for Features on Pluto and Its Satellites

Ignoring the IAU's naming themes could lead to public confusion and disappointment.

By LOUISE GOOD & LARS LINDBERG CHRISTENSEN

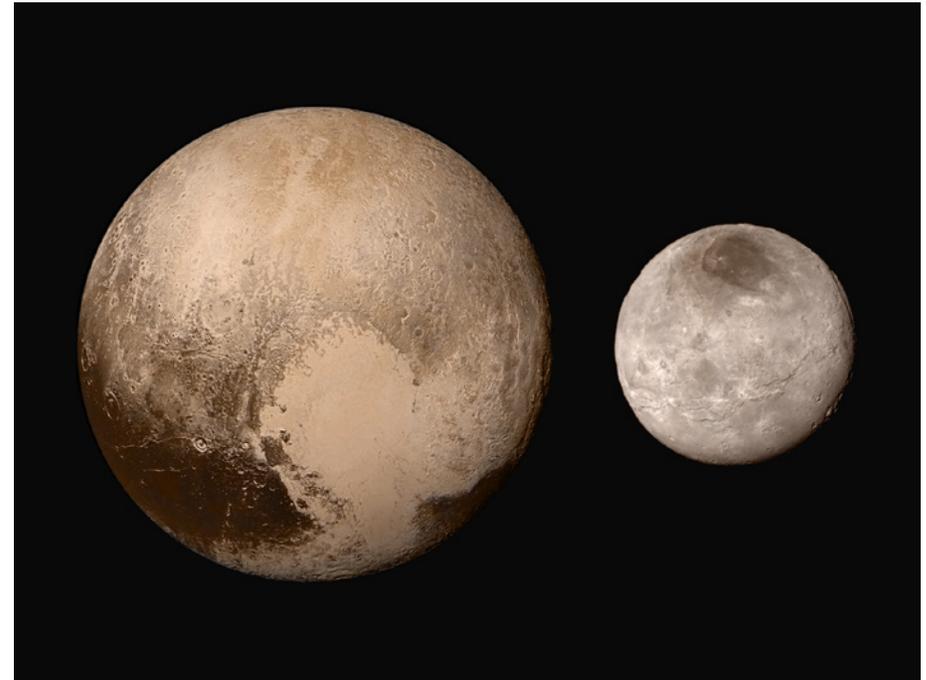
The recent spectacular success of NASA's [New Horizons](#) mission to Pluto and its moons has lifted the curtain on a fascinating and complex world on the outskirts of our planetary system.

Scientists working on space missions sometimes give informal names to newly discovered features on celestial objects. Such is the case with many of the amazing features found on Pluto and Charon.

The [informal names](#) chosen by the New Horizons team have excited many members of the public, who are not aware that

these names may be only temporary. Unfortunately, some of the names used for features on Pluto and Charon fall outside the [naming themes](#) accepted by the IAU. "If such use persists, it can lead to confusion and disappointment when the informal names are eventually superseded by the permanent names assigned by the IAU," explains Rita Schulz (European Space Agency), Chair of the IAU's [Working Group for Planetary System Nomenclature \(WGPSN\)](#).

[The IAU has an elaborate naming system for astro-](#)



Images from the New Horizons spacecraft's Long Range Reconnaissance Imager (LORRI) were combined with color data from the Ralph instrument to create these global views of Pluto (left) and Charon, which are shown at the same scale. [NASA, JHUAPL, SwRI]

[nomical objects](#). For features on bodies in the solar system, this scheme has been carefully thought out by members of the WGPSN. Formerly focused on Western names, the scheme now includes names from many of the world's cultures. "Since the IAU is now truly international, we have to make sure that when we name things in the solar system, we have the many different cultures represented," says Schulz.

While the IAU has given its sanction to names from a wide

Congratulations
to



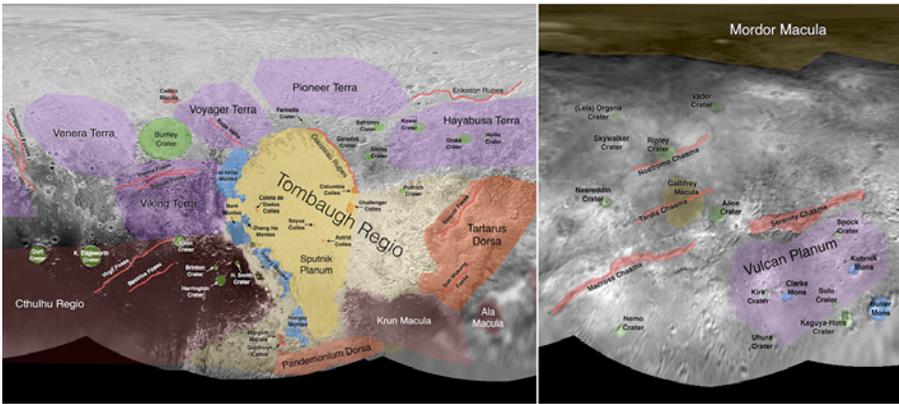
Beatriz Sabogal!



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be entered, at Exhibit Hall Booth 336





These excerpts from larger maps show some of the informal names being used by the New Horizons team for features and regions on the surfaces of Pluto (left) and Charon. Names were selected based on input received from the public and have not yet been (and some may never be) approved by the IAU. [SETI Institute, ourpluto.org]

variety of literature, from Shakespeare to Tolkien, it has not yet approved the use of names from television or cinema. “If the New Horizons team were to propose such names, our committee would have to evaluate whether movies can withstand the test of time,” Schulz explains. “And then there is, of course, the sticky

issue of copyright that needs thorough checking.”

Picking the right names for astronomical objects can be quite important, says Giovanni Valsecchi (Italian National Institute for Astrophysics), President of [Division F, Planetary Systems and Bioastronomy](#). “Just think of Halley’s comet. It became a prototype for a whole class of objects.”

The WGPSN eagerly awaits a formal application from the New Horizons team for names for some of the newly discovered regions. “We are looking forward to soon receiving the first of many naming proposals for features on the surfaces of the bodies in the Pluto system,” says Schulz.

“In my opinion the New Horizons team is making a mistake by promulgating nicknames,” Valsecchi concludes. 🌸



LOUISE GOOD is Publications Editor at the Institute for Astronomy – University of Hawai‘i at Mānoa. LARS LINDBERG CHRISTENSEN is IAU Press Officer and Head of the education and Public Outreach Department (ePOD) at the European Southern Observatory in Garching, Germany.

FOCUS MEETING 2

Protecting Our World, One Astronomy Site at a Time

By CLIVE RUGGLES

From the Pyramids of Giza to Pic du Midi, from Beijing’s ancient observatory to the Baikonur launch site, the IAU has been working with the [UNESCO World Heritage Centre](#) to recognize, protect, and promote the world’s most important astronomical heritage sites. This collaborative effort began in 2008 and seeks to cover the widest possible range of sites — including ancient sites with a connection to astronomy, historical and modern observatories, dark-sky preserves, and the technology associated with space exploration.

[Focus Meeting 2, Astronomical Heritage: Progressing the UNESCO–IAU Initiative](#), brings together IAU members, heritage professionals, historians, and archaeologists to discuss a wide range of topics and ongoing issues related to site protection. We particularly welcome Anna Sidorenko from the World Heritage Centre, who coordinates the initiative on behalf of UNESCO.

The IAU and UNESCO’s advisory body, the [International Council on Monuments and Sites \(ICOMOS\)](#), jointly developed [broad criteria](#) for assessing the heritage value and ultimately

**Focus Meeting 2:
Astronomical Heritage: Progressing the UNESCO–IAU Initiative**

Start date	Tuesday, 11 August
End date	Thursday, 13 August
Oral sessions	Room 301, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Coordinating Divisions	Division C: Education, Outreach and Heritage Division B: Facilities, Technologies and Data Science

For details on presenters, topics, and times see the [online program](#) or [mobile app](#).

the potential of inclusion on the World Heritage List for cultural sites of all ages and types relating to astronomy. For sites to be included on the list they must be of “outstanding universal value” and meet at least one of these criteria. More information is available in the [ICOMOS–IAU Thematic Study](#) and more generally on the [Portal to the Heritage of Astronomy website](#).

The long-term goal of this collaboration is to see more historically significant astronomical places recognized and protected through inclusion on the World Heritage List. This is beginning to happen, with three sites of utmost significance to humanity already being listed:

- [Ulugh Beg’s 15th-century observatory in Samarkand](#)
- [The Dengfeng large gnomon in China](#)
- [The 18th-century Jantar Mantar Observatory in Jaipur, India](#)

Additional sites on national “tentative lists” include the [13 towers of Chankillo](#), a 2,300-year-old solar observation device in Peru, and [Jodrell Bank Observatory](#) in the U.K. Since 2012, representatives of the IAU have been working with UNESCO member states to develop potential nominations to the World Heritage List. A complete roster of [current astronomical candidates](#) is available online.

Preserving dark skies is an issue of particular concern. While it is not straightforward to recognize the value of dark skies in a World Heritage context, our joint UNESCO–IAU initiative has explored this issue in detail. On Wednesday we join [Focus](#)



The [Aoraki-Mackenzie Dark Sky Reserve](#) in New Zealand features in the ICOMOS–IAU Thematic Study on the Heritage Sites of Astronomy. *[Fraser Gunn]*

[Meeting 21, Mitigating Threats of Light Pollution and Radio Frequency Interference](#), for two joint sessions focused on dark skies in the context of World Heritage.

Heritage is not just about places — it also includes the intangible heritage of cultural practices, including living indigenous knowledge and beliefs. We celebrate these cultural aspects in our final morning session on Thursday. We are honored to have [Patrick V. Kirch](#) (University of California, Berkeley), a leading archaeologist of Hawai'i and Polynesia, to open the session with a 60-minute keynote talk, “Temples of the Heavens: Explorations in Polynesian Archaeoastronomy.” 🌸



CLIVE RUGGLES is Emeritus Professor at the University of Leicester, U.K., and the IAU’s coordinator for the joint initiative with UNESCO on Astronomy and World Heritage. He is outgoing President of Commission 41 (History of Astronomy) and incoming President of Commission C4 (World Heritage and Astronomy).

Interstellar Matter and the Local Universe

By BRUCE ELMEGREEN

Newly organized Division H, Interstellar Matter and Local Universe, covers a wide range of science topics, with Commissions on the Local Universe (H1, President: Eva Grebel), Astrochemistry (H2, President: Tom Millar), and Planetary Nebulae (H3, President: Letizia Stanghellini) as well as an Inter-Division Commission on Stellar Clusters Throughout Cosmic Space and Time (H4, President: Richard de Grijs). The newly elected Vice-President of Division H is Leonardo Testi. He and I welcome our new Division members and all of the members of the former Divisions VI, Interstellar Matter, and VII, Galactic System.

The leadership of Division H by President Ewine van Dishoeck

and Vice-President Joss Bland-Hawthorn has been outstanding during the transition period of the last three years. We are grateful to them, to the three outgoing members of our Division Steering Committee (Eileen Friel, Thomas Henning, and Annie Robin), and to the three outgoing Commission presidents (Birgitta Nordstrom, C33; Sun Kwok, C34; and Giovanni Carraro, C37) for their dedicated work during this time. We welcome new Steering Committee members Eva Schinnerer, Ciska Kemper,



This image of the Milky Way and its two neighbors, the Large and Small Magellanic Clouds, was made from stellar-density data obtained by the Gaia satellite during drift scans across the sky. [ESA/Gaia, Edmund Serpell]

and Cristina Chiappini, who will join second-term members Holger Baumgardt, Diego Mardones, and Michael Meyer.

Interstellar matter and the local universe promise to be exciting fields in the next three years, with an ever-increasing database from large surveys, several new instruments, and new telescopes. [The Atacama Large Millimeter/submillimeter Array \(ALMA\)](#) is now operational, and our members will be using it to map the molecular structure and dynamics of protostellar disks; to study the chemistry, turbulence, and collapse of star-forming clouds in the Milky Way; and to observe gas and dust in the galactic center, the Magellanic Clouds, Local Group dwarfs, spirals, and other nearby galaxies.

The [Gaia satellite](#) for precision astrometry was launched in 2013 by the European Space Agency and will be measuring

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be entered, at Exhibit Hall Booth 336

parallaxes of 1 billion Milky Way stars over the next five years. Three new low-frequency telescopes are now observing the Milky Way's synchrotron emission, mapping its magnetic field, and discovering pulsars: [LOFAR](#), the Low Frequency Array in the Netherlands and Northern Europe; [MWA](#), the Murchison Widefield Array in Western Australia; and [PAPER](#), the Precision Array for Probing the Epoch of Reionization in South Africa.

The Large Sky Area Multi-Object Fiber Spectroscopic Telescope ([LAMOST](#)) at the Xinglong Station of the National Astronomical Observatory in China started its first year of regular observations in 2012; it will study Milky Way stars, stellar structure and kinematics. Also, the [Discovery Channel Telescope](#) at Lowell Observatory in Arizona is a 4.3-meter telescope that began operation in 2012; among its missions will be studies of

massive Milky Way stars and local dwarf galaxies.

Meetings coordinated by and/or relevant to Division H during the second week of the General Assembly include [Symposium 316](#), "Formation, Evolution, and Survival of Massive Star Clusters;" [Focus Meeting \(FM\) 5](#), "The Legacy of Planck;" [FM 7](#), "Stellar Physics in Galaxies Throughout the Universe;" and [FM 18](#), "Scale-free Processes in the Universe." Our Division H science meeting continues today (Monday, 10 August) in Room 313C. I hope to see you there! 🌸



Incoming Division H President **BRUCE ELMEGREEN** is a research staff member at the IBM Thomas J. Watson Research Center in Yorktown Heights, New York. He studies interstellar matter, star clusters, and galaxies.

WOMEN IN ASTRONOMY: SCATTERED TALK #2

Inclusive Astronomy 2015

By FRANCESCA PRIMAS

The [IAU Women in Astronomy Working Group \(WG\)](#) and the [AAS Committee on the Status of Women in Astronomy \(CSWA\)](#) have teamed up to present a series of three lunchtime "Scattered Talks" during the XXIX General Assembly. The first was held last Friday (see [page 9](#)).

The second Scattered Talk will be presented by CSWA member Meredith Hughes, Assistant Professor of Astronomy at Wesleyan University in Middletown, Connecticut. The event will take place today (Monday, 10 August) from 12:30 to 2:00 pm in Room 318A of the Hawai'i Convention Center. Please bring your own lunch.

Hughes will give an overview of the [Inclusive Astronomy 2015](#) meeting; she'll recap selected results and ideas from talks and



workshops and discuss the best-practices recommendations that were generated as an outcome of the conference. Topics will be drawn from the four broad areas of the meeting: Barriers to Access; Creating Inclusive Environments; Building a Community of Inclusive Practice; and Power, Policy, and Leadership. Time will be included for discussion and questions about the conference and its recommendations.

Each of our three presenters was asked to answer three questions. Dr. Hughes's answers follow here.

Q1: What is the topic of your Scattered Talk?

MH: I'll review the inaugural Inclusive Astronomy meeting that took place at Vanderbilt University in June 2015. I'll discuss the overall structure and goals of the meeting, presentation highlights, and the recommendations document that was the primary outcome.

Q2: What are you most excited about at the IAU XXIX General Assembly?

MH: This is my first time attending an IAU General Assembly, so I'm looking forward to seeing what it's all about and finding out about recent discoveries across all fields of astronomy and from all around the world.

Q3: What would be your key piece of a career advice for women based on your own experience?

MH: Find a supportive partner. 🌸



FRANCESCA PRIMAS is Chair of the IAU Executive Committee Working Group on Women in Astronomy. She is also Senior Astronomer at the European Southern Observatory in Garching, Germany.

How to Say It in Hawaiian



- Hoaloaha: friend
- Honu: turtle
- Kumu: teacher
- Nui: big, great, important
- 'Ono: tasty, delicious
- Pōhaku: stone, rock

Vowels are generally pronounced as follows: a "ah," e "eh," i "ee," o "oh," u "oo." If a vowel has a little horizontal line over it (a kahakō), it means you hold the sound an extra beat. A 6-shaped apostrophe, or 'okina, signals a [glottal stop](#). Source: [Hawaiian Words](#).

Discussing Harassment in Astronomy

Have you ever experienced or witnessed harassment in an astronomical context and wondered what to do? This was the topic of discussion during last Friday's Women in Astronomy Scattered Lunch Talk. The event was organized by Francesca Primas (European Southern Observatory) of the [IAU Women in Astronomy Working Group](#), and the discussion was led by Christina Richey (NASA Headquarters) of the [AAS Committee on the Status of Women in Astronomy \(CSWA\)](#).

Richey began by presenting the preliminary outcomes of the recently concluded CSWA Survey of Workplace Climate, which gathered responses from more than 400 professional astronomers. According to the results, not only have surprisingly high numbers of astronomers witnessed or experienced inappropriate language, verbal harassment, and physical assault at their home institutions or away at meetings, but these experiences have also led many to feel unsafe in their workplace and to pursue fewer scholarly opportunities as a result.

The open discussion that followed centered on strategies for responding to different types of harassment, as well as suggestions of ways to assist others — whether you are female, male, junior, or senior — if you witness harassment. Many of these suggestions, and a list of additional resources, will be readily available to all when Richey posts her presentation slides on the [Women in Astronomy blog](#) after the conference. The IAU General Assembly anti-harassment policy can be found in the [mobile app](#).

There are two more Women in Astronomy Scattered Talks at lunchtime: one today ([page 8](#)) and another on Thursday. Both are from 12:30 to 2:00 pm in Room 318A. Bring your own lunch!



Speaker Christina Richey presents the results of the CSWA Survey of Workplace Climate. [Susanna Kohler, Kai'aleleika]

— Susanna Kohler, Kai'aleleika

Swell Swag in the Exhibit Hall

You want free stuff? Our exhibitors and sponsors are giving away lots of free stuff!

By IRIS NIJMAN, *Kai'aleleika*

When you enter the Hawai'i Convention Center for the IAU General Assembly, one of the first places you'll probably visit is the [Exhibit Hall](#). This is a place where you can meet representatives from, and get information about, all of your favorite astronomical organizations. It's also a place where you can get some awesome swag — “stuff we all get,” i.e., freebies! To save you time in your busy day, I have searched every corner of the Exhibit Hall to identify giveaways that you definitely don't want to miss.

Be sure to visit the [National Astronomical Observatories of China](#) booth. They have beautiful **silk handkerchiefs**, handmade **paper cutouts**, and an enameled **USB stick**. At the IAU booth, which features representatives from the [Office of Astronomy for Development \(OAD\)](#) and [Office for Astronomy Outreach \(OAO\)](#), you can get **monoculars**, **buttons**, and **cookies** while sharing your dreams about astronomy for a better world.

At the [Institute of Physics \(IOP\) Publishing](#) booth, try your luck and spin the wheel to win swag like **sunglasses**, a **tie**, or a **pencil box**. Dress up for a **selfie with Elvis Presley** at the [American Astronomical Society \(AAS\)](#) booth on Tuesday, 11 August, from 3:00 to 4:00 pm. If you're a Society member, or want to become one, you can also collect a pair of AAS **flip flops** (sandals) at any time.

More **flip flops** are on offer at [the Square Kilometre Array \(SKA\)](#) booth. Be warned, though: you'll be helping to brand all of Hawai'i's beaches “SKA” with each footprint that you leave in the sand. The booth of the Chilean Astronomical Society (SOCHIAS) doesn't have any swag, but you should check out their **virtual-reality glasses**, which make you feel like you're actually visiting one of the many telescopes on a Chilean mountaintop.

At the [Associated Universities, Inc. \(AUI\)](#) booth, you can get some **baggage tags**, a **USB charger**, and an **ultraviolet-sensitive**



[Pamela Gay, Kai'aleleika]

wristband — a helpful reminder to reapply your sunscreen. At the [Thirty Meter Telescope \(TMT\)](#) booth, you'll find **beach bags** packed with **sunscreen**, **sunglasses**, a **T-shirt**, **chocolates**, and temporary **tattoos**.

Moving on from vacation/holiday essentials, at the [Australian Astronomy](#) booth you can get a cute **koala** toy, as well as chocolate **Tim Tams**. The [National Radio Astronomy Observatory \(NRAO\)](#) will give you a very nice **cube puzzle** that reveals numerous astronomical photos, and you can also enter a raffle con-



[IAU/B. Tafreshi, twanight.org]

test to win a **framed astrophoto** that will be shipped to your home. Get [Giant Magellan Telescope Organization \(GMTO\)](#) **M&M candies** and a **tote bag** while appreciating a hologram of their planned telescope.

If you like **posters, bookmarks, postcards, stickers, pens, and magnets**, you can get them at almost every booth. The [National Science Foundation \(NSF\)](#) and [NASA](#) booths also feature **speakers** expounding on a variety of topics. NASA is also conducting **technical demonstrations**; you can get the schedule at their booth. Other instrument highlights include a look at the innovative **observatory dome** of [Astro Haven](#) and the enormous **inflatable model of SKA**. Sorry, but those last two items aren't available as swag!

Last but not least, don't forget to write your signature on the IAU **surfboard** before leaving the Exhibit Hall (and no, that's not swag either)! 🌸

Travel Tips from a Local

When you spend a week or two at a conference, you eventually come to regard some of the people who staff the venue — security guards, concession-stand vendors, and the like — as acquaintances and perhaps even friends. This short interview is the first of several that will introduce you to locals who are helping to make the IAU General Assembly a success.

Name: Evelynnn

Age: 37

Profession: Security guard

Where are you from?

- I was born in American Samoa, but I grew up in Honolulu. I don't live in the city center, but in the countryside, because I don't like how busy it is in the city.

Where can we find the best food here in Honolulu?

- You should try to find local food on the west side of the city. Have some Native Hawaiian food like laulau, which is cooked shredded pork. Banana cooked in coconut milk is also really good. They sell it at [L&L Hawaiian Barbecue](#) in the Ala Moana Center shopping mall and at Walmart.

What do you think are the best places to visit on O'ahu?

- The [Polynesian Cultural Center](#), the north and west shores for beautiful beaches, and the Ko'Olina Lagoon for the best sunsets.

Do you like astronomy?

- I really like to watch the stars and the Moon on the west and north shores — there's no light pollution there.

Do you have a final tip for visitors to Hawai'i?

- Never take a taxi around the island — it's way too expensive. Take the bus, which costs only \$2.50. Go to buffet restaurants and local stores to save money that you can spend instead on souvenirs at the airport.

— Iris Nijman, Kai'aleiaka



[Iris Nijman, Kai'aleiaka]

The IAU Working Group on Solar Eclipses

By JAY M. PASACHOFF

The IAU Working Group on Solar Eclipses coordinates scientific research and public-information efforts in connection with solar eclipses. [Our website](#) offers a wide variety of information and resources, including links to maps and other websites dealing with solar eclipses; advice on how to observe the partial phases of solar eclipses safely; and explanations of why eclipses are interesting both scientifically and culturally.

We work with professional astronomers to help coordinate eclipse expeditions and to assist with the temporary importation of equipment through Customs. We also help outreach institutions in educating the public about why it is exciting and interesting to observe eclipses. Our website and members serve as

Total & Hybrid Solar Eclipses: The Past Triennium		
Date	Type of Eclipse	Visibility
13 November 2012	Total	North Australia, South Pacific Ocean
3 November 2013	Hybrid	Atlantic Ocean, Central Africa
20 March 2015	Total	North Atlantic Ocean, Faeroe Islands, Svalbard
Significant Solar Eclipses: The Next Triennium		
Date	Type of Eclipse	Visibility
9 March 2016	Total	Sumatra, Borneo, Sulawesi, Pacific Ocean
1 September 2016	Annular	Atlantic, Central Africa, Madagascar, Indian Ocean
26 February 2017	Annular	Pacific Ocean, Chile, Argentina, Atlantic Ocean, Africa
21 August 2017	Total	North Pacific Ocean, Continental United States, South Atlantic Ocean

Source: [NASA Eclipse Web Site](#)

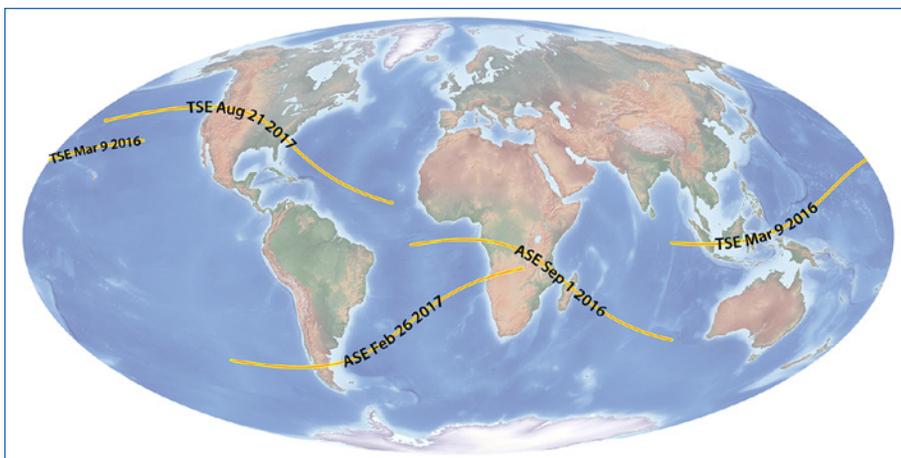


The 2013 total solar eclipse observed from Gabon, showing two coronal mass ejections (left and right) and an erupting prominence, along with coronal streamers symmetrically displayed as expected for a solar-maximum eclipse. Note also the pinkish solar chromosphere and prominences. [© 2013 Jay Pasachoff, Allen Davis & Vojtech Rusin / © 2014 Miloslav Druckmüller]

sources of accurate information about safe observing and work to counteract anti-eclipse statements that are often made as a result of misunderstanding of vision hazards.

Even in an era of continuous monitoring of the solar corona by spacecraft, total solar eclipses remain scientifically useful. Observations along the path of totality over several hours can reveal motions in coronal mass ejections and other changes in the corona, including in the innermost regions that are inaccessible to coronagraph-equipped space telescopes.

Our Working Group maintains information on both past and



Central solar eclipses from 2015 to 2018; TSE = total solar eclipse, ASE = annular solar eclipse.
 [Michael Zeiler, eclipse-maps.com, for the IAU Working Group on Solar Eclipses]

future eclipses. One eclipse of particular import is the 2017 total eclipse, which cuts across the continental U.S. from northwest to southeast on 21 August 2017. During this event some 500 million people will experience at least a partial solar eclipse. The American Astronomical Society has put together a task force, led by Shadia Habbal (University of Hawai'i) and Angela Speck (University of Missouri), to function as a think tank, coordinating body, and communication gateway for the public. In conjunction with our Working Group, the AAS task force will provide letters of invitation as needed for visas or other eclipse-related purposes.

You can learn more about the [members of our Working Group](#) and get references and other information on eclipses on [our website](#). Our report was part of a poster presentation last week, and I will speak about our outreach efforts today, 10 August, around 3:10 pm during the first afternoon session of the Division C meeting in Room 312 of the Hawai'i Convention Center. 🌸



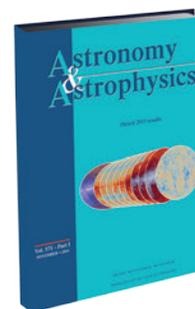
JAY M. PASACHOFF is Field Memorial Professor of Astronomy at Williams College in Williamstown, Massachusetts, and the author of many books and texts in astronomy, physics, mathematics, and other sciences. He is Chair of the IAU Working Group on Solar Eclipses.

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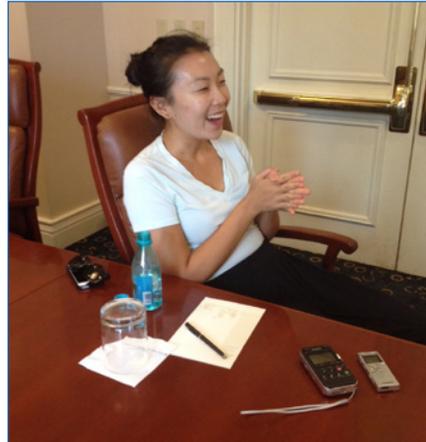
Desperately Seeking Interviews with Attendees

The AAS oral history project opens its doors to IAU General Assembly participants!

By JARITA C. HOLBROOK

The American Astronomical Society (AAS) oral history project seeks to document the lives of astronomers, not just in the United States but also internationally. This program is funded by the AAS and the American Institute of Physics (AIP) and is run by the [AAS Historical Astronomy Division \(HAD\)](#) in partnership with AIP's [Niels Bohr Library & Archives](#). Our goal is to interview 60 IAU and AAS members over the next year.

Thus far, more than 30 people have signed up to be interviewed during the IAU General



Wenli Mo (University of Florida) enjoyed her interview by Jim Lattis (University of Wisconsin). [Jarita C. Holbrook]

Honolulu Almanac 🌴 10 August 2015	
Sunrise / set	6:08 am / 7:05 pm
Twilight ¹ start / end	4:49 am / 8:24 pm
Moonrise / set	2:49 am / 4:15 pm
Moon phase ²	☾ Waning crescent (14% illum.)
Evening planet ³	Saturn (SSW)
Morning planet ³	Mars (E)

¹Astronomical twilight (Sun 18° below horizon). ²At meridian crossing ³Naked-eye planets. Source: timeanddate.com



Gianfranco Vidali!

You have won
two Orbs of O'ahu Driving Tour tickets
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Prizes can be redeemed, and raffles can be entered, at Exhibit Hall Booth 336

Assembly, but we have room for more! Interviews take place at the Hilton Hawaiian Village Waikīkī Beach Resort, which is about a 15-minute walk from the Hawai'i Convention Center. Each interview takes about 1.5 hours.

As of 5 August, nine astrophysicists had been interviewed. How well do you know your peers? Test your knowledge with our trivia quiz on the next [page!](#)

Please consider contributing your own story to this important project, and [make an appointment](#) to be interviewed. Thank you! 🌸



JARITA HOLBROOK is Associate Professor of Physics and a member of the Astronomy Group at the University of the Western Cape, South Africa. She is also a past chair of the AAS Historical Astronomy Division.

Who's Who? Match the Attendee to the Correct Fun Fact!



**Stephanie
LaMassa**



**Benoit
Carry**



**Debra
Elmegreen**



**Paula
Szkody**



**Fritz
Benedict**



**Cristina
Chiappini**



**Brent
Tully**



**Rajesh
Kochhar**



**Paul
Coleman**



A. In order to study in Italy, this person had to pass a language competency exam after an intense tutorial that crammed two years of work into two months.



B. This person was once stranded on Maunakea by car trouble after an observing run.



C. This person was once employed by IBM to study galaxy structure.



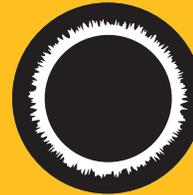
D. This person published a book about ancient people, and it became a best seller.



E. This person recently published a paper explaining why it would be impossible to use Kepler to measure stellar parallaxes or exoplanetary orbits.



F. This person turned down admission to the California and Massachusetts Institutes of Technology to play football for the University of Notre Dame.



G. This person was inspired to become an astronomer after seeing a total solar eclipse in 1999.



H. This person really likes working in collaborations of fewer than five people.



I. This person did research using classifications derived from Galaxy Zoo.

[Infographic: Leslie Proudfit, Kai'alelelaka]

Answers on [page 18](#).

Solar and Stellar Flares and Their Effects on Planets

By KAZUNARI SHIBATA

In 1859 English observer Richard Carrington saw a solar flare in white light. That event, now called the Carrington flare, was the largest observed until now and caused the biggest geomagnetic storm in the last 200 years. It is known that this magnetic storm induced several troubles in our civilization: telegraph systems all over Europe and North America failed, telegraph pylons threw sparks, and telegraph paper spontaneously caught fire.

Recent space observations of the Sun have revealed that the solar atmosphere is full of explosions, such as flares and flare-like phenomena. Major flares generate not only strong electromagnetic emissions but also non-thermal energetic particles and massive plasma ejections called coronal mass ejections (CMEs). These sometimes lead to geomagnetic storms and affect terrestrial environments and our civilization. As a result of major flares, various troubles occur for orbiting artificial satellites, power grids on the ground, and radio communication.

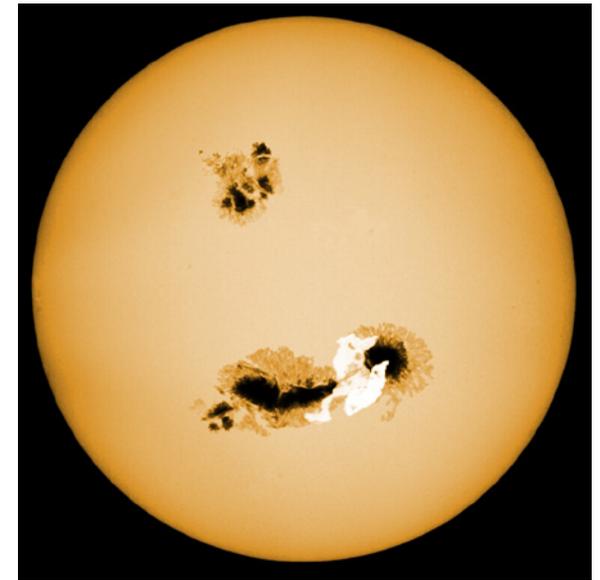
IAU Symposium 320: Solar and Stellar Flares and Their Effects on Planets	
Start date	Monday, 10 August
End date	Friday, 14 August
Oral sessions	Room 315, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Related event	S320 Plenary: Monday, 10 August, 6:00 to 7:30 pm, Ballroom B, Hawai'i Convention Center
Coordinating Division	Division E: Sun and Heliosphere
<i>For details on presenters, topics, and times see the online program or mobile app.</i>	

Solar flares are a prototype of various explosions in our universe, and hence are important for not only geophysics and environmental science but also astrophysics.

The energy source of solar flares is now established to be magnetic energy stored near sunspots. There is increasing observational evidence that solar flares are caused by magnetic reconnection, merging of anti-parallel magnetic field lines, and associated magneto-plasma dynamics.

It has also been known that many stars show flares similar to solar flares, and often such stellar flares are much more energetic than solar flares. The total energy of a solar flare is typically 10^{29} to 10^{32} erg. On the other hand, there are much more energetic flares (10^{33} to 10^{38} erg) in stars, especially in young stars. These are called superflares. These superflares on stars seem to be understood in a unified way based on the reconnection mechanism.

Since 2012, using Kepler mission data, many superflares have been discovered on solar type stars (G-type dwarfs) by Maehara



Artist's view of a superflare on a Sun-like star in visible light.
[Kyoto University]

et al., which revealed that superflares with energy of 10^{34} to 10^{35} erg (100 to 1,000 times more than the largest solar flares) occur once every 800 to 5,000 years on Sun-like stars. This was an amazing discovery because previous researchers believed that superflares would not occur on the Sun (and Sun-like stars), since the Sun is old and is rotating slowly.

Can superflares occur on the present Sun? What is the true nature of superflares or superflare stars? What are the effects of superflares on the Earth as well as on exoplanets? These new

questions, and old questions such as the mechanism of solar flares, will be discussed in detail in my plenary presentation and the associated IAU Symposium. 🌸



KAZUNARI SHIBATA is a professor and director at Kwasan and Hida Observatories at Kyoto University in Japan. His work focuses on magnetohydrodynamic explosive phenomena such as flares and jets in the Sun and more remote astrophysical objects.

AAS WORKING GROUP ON LGBTIQ EQUALITY

Moving Toward True Meritocracy

By WILLIAM VAN DYKE DIXON

LGBTIQ (lesbian, gay, bisexual, transgender, intersex, and queer or questioning) people can be found in all corners of society, including within the astronomical community. While many institutions have adopted non-discrimination policies, discrimination is unfortunately still prevalent and in some cases legal. In 28 of the 50 United States, it is legal to fire someone solely because they are lesbian, gay, or bisexual, and in 32 states it is legal to fire someone solely for being transgender. While most workplaces do choose to prohibit discrimination based on sexual orientation, such policies are not universal, and bans against discrimination based on gender identity or expression are still rare. This “Swiss cheese” of protections means that hostile scientific work environments still exist. For the LGBTIQ scientists working in these places, the consequences to productivity and well being can be devastating, and the effects are often worst on the most junior researchers.

To address these issues, the American Astronomical Society established the [Working Group on LGBTIQ Equality \(WGLE, pronounced “wiggly”\)](#) to promote equality for LGBTIQ individuals within our profession. WGLE has developed a set of best practices for institutions and departments that wish to be more wel-

coming to their LGBTIQ colleagues, staff, and students. Additionally, WGLE provides training and materials on LGBTIQ issues and diversity and promotes mentoring and networking within the LGBTIQ community.

Finally, since homophobia, sexism, and racism have common roots, WGLE collaborates with other groups that are working to increase opportunities for all who wish to pursue a career in astronomy.

Discrimination and hostile-workplace issues should concern all astronomers. Meritocracy should be central to any scientific society, and discrimination based on sexual orientation or gender identity is profoundly anti-meritocratic. Through WGLE, we are working to make our profession more equitable and more diverse.

As part of our effort to build community, WGLE is sponsoring



an LGBTIQ Networking Dinner on Monday evening, 10 August. All are invited to join us. We'll meet in front of the IAU Registration Desk at 6:30 pm and walk to a local restaurant. Please bring a method of payment for this dinner. 🌸



VAN DIXON is an astronomer at the Space Telescope Science Institute in Baltimore, Maryland, where he works in observational cosmology. He is also Chair of the AAS Working Group on LGBTIQ Equality (WGLE).

Answers to the quiz on page 15:

A: Cristina Chiappini, **B:** Paula Szkody,
C: Debra Elmegreen, **D:** Rajesh Kochhar,
E: Fritz Benedict, **F:** Paul Coleman,
G: Benoit Carry, **H:** Brent Tully, **I:** Stephanie LaMassa



We hope you enjoyed your weekend off between Week One and Week Two of the General Assembly! [IAU/B. Tafreshi, twanight.org]

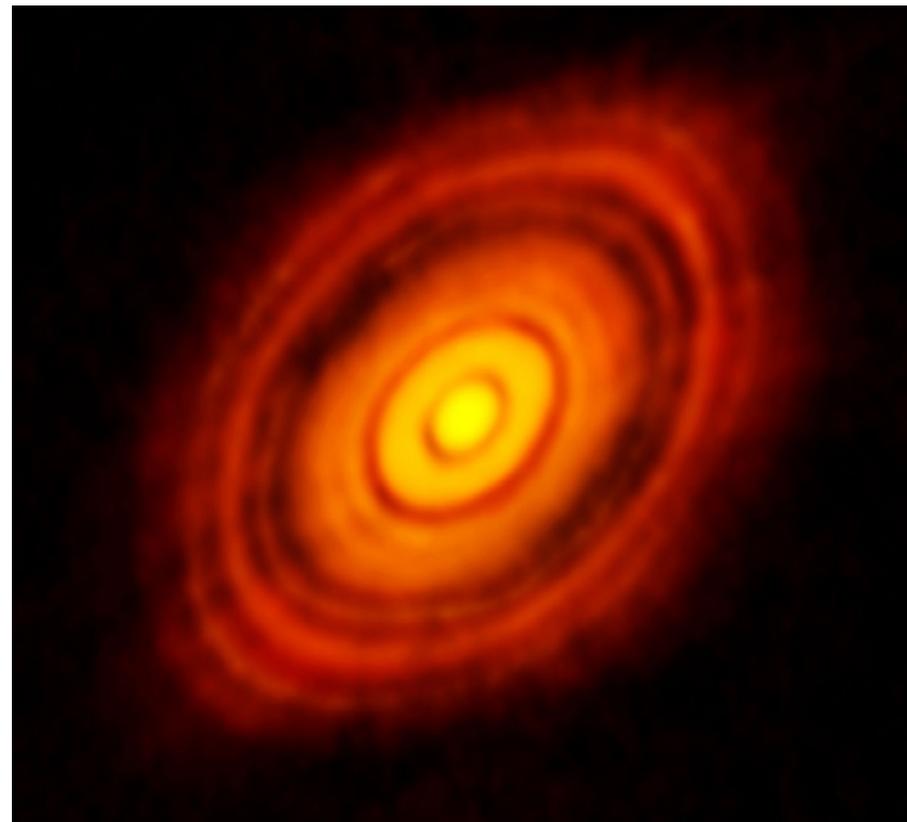
A New Beginning for Planetary Science and Astrobiology

By NADER HAGHIGHIPOUR

The past several years have seen remarkable discoveries in our solar system and in planetary systems around other stars. Successful space missions have provided us with new information on the physical and dynamical characteristics of several solar-system bodies, and ground- and space-based telescopes have brought us a treasure trove of thousands of exoplanetary systems, including some potentially capable of harboring life. While confronting us with many new challenges, these achievements have opened new chapters of research in planetary science and astrobiology and have revolutionized our understanding of the formation, evolution, and habitability of planetary systems.

Accompanying this revolution in science is an evolution in the IAU Division structure. To meet the needs of the planetary science and astrobiology communities, the IAU established [Division F, Planetary Systems and Bioastronomy](#). This Division promotes and supports planetary research and works to ensure the development of new strategies for advancing modern planetary science, including the study of exoplanets.

Division F replaces the old Division III, Planetary Systems Sciences, which had addressed matters related to our solar system, exoplanets, and astrobiology. Its goal was to promote studies of planetary systems, including our own. Focuses included solar-system formation and evolution as well the study of conditions favorable to the development of life in the universe. As part



The Atacama Large Millimeter/submillimeter Array (ALMA) in Chile is providing our first detailed views of protoplanetary disks like this one around HL Tauri. [ALMA (ESO, NAOJ, NRAO)]



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#IAU2015

of its responsibilities, Division III also promoted the dissemination of reliable physical and dynamical data about astronomical objects in our solar system, and in exoplanetary systems, and helped oversee the assignment of proper nomenclature and discovery credit where appropriate.

The recent restructuring of IAU Divisions has provided us with an opportunity to ensure that while our Division continues with its traditional responsibilities, it will do so in ways compatible with modern trends in planetary science. The latter require that, as the main authority in planetary science, our Division become (and stay) visible, and maintain relevance, to the scientific community. While the Division's Executive Committee will ensure that proper strategies are adopted in meeting this goal, success requires the participation and involvement of our members; the new Division F will maintain an open-door policy for our members' concerns, suggestions, and criticisms at all times.

Division F will also be heavily involved in education and public outreach (EPO) programs. Our Division benefits from the involvement of some of the most experienced EPO organizers in the field, and they currently have several projects in the works. As part of our open-door policy, we also strongly welcome, encourage, and support ideas related to EPO from our own members, as well as from the astronomy community at large.

In closing, I must state that I am humbled by our membership's confidence in me, and as the new President of Division F, I am delighted to have been given the opportunity to serve our community and to ensure that our goals will be achieved. 🌸



[NADER HAGHIGHIPOUR](#) is an astronomer at the Institute for Astronomy and the NASA Astrobiology Institute at the University of Hawai'i at Mānoa. He is the incoming President of Division F and was Vice-President from 2012 to 2015.

LIVE DEMO IN THE EXHIBIT HALL

Do You Want to Drive the Dish?

By ROBERT HOLLOW & RYAN SHANNON

[PULSE@Parkes](#) is an innovative and engaging educational program run by CASS, the Astronomy and Space Science division of Australia's [Commonwealth Scientific and Industrial Research Organisation \(CSIRO\)](#). It provides high-school students the opportunity to control the iconic 64-meter Parkes radio telescope (subject of the 2000 film *The Dish* [<http://www.imdb.com/title/tt0205873/>]) in Australia remotely via the internet to observe pulsars and then analyze their data. All the program data are publicly available and archived, and some of the data have been used for published scientific research.

We have conducted more than 100 PULSE@Parkes sessions to date, with nearly 1,400 students and hundreds of teachers controlling the telescope. Sessions are typically held at the

Science Operations Centre at CASS headquarters in Sydney, though we regularly hold other sessions with partner institutions across Australia. We have also run sessions in the U.K., the Netherlands, and Canada, as well as two longer tours to Japan in 2013 and



The 64-meter CSIRO Parkes radio telescope in New South Wales, Australia. [Shaun Amy]



Students observing with the Parkes telescope in the CASS Science Operations Centre in Sydney, Australia, assisted by Project Scientist George Hobbs. [Robert Hollow]

webcam and then be able to view the data via our online pulsar data monitor. Once you have obtained your data you can use our online module to determine the distance to your pulsar.

The undersigned will be on hand to guide you through your observations and answer questions about the program. We are keen to discuss possible uses of our program and data with you! 🌸



ROBERT HOLLOW is Education Specialist for CASS and coordinates the PULSE@Parkes program. He is a member of the IAU's OAD Task Force 2: Astronomy for Children and Schools, and he is currently Chair of the Education and Public Outreach Chapter of the Astronomical Society of Australia. **RYAN SHANNON** is a research fellow with CASS and the International Centre for Radio Astronomy Research.

PULSE@Parkes Live Observing Session	
Date	Tuesday, 11 August
Time	10:00 am to 12:00 pm
Location	Australian Astronomy, Booth 236, Exhibit Hall 1, Hawai'i Convention Center

2014, which demonstrated the value of the program for cultural engagement via science and education.

We will be running a hands-on observing session at the Australian Astronomy booth in the Exhibit Hall on Tuesday, 11 August, starting during the morning coffee break. You'll be able to control the telescope, select a pulsar, and observe it. We will guide you through our control software and telescope-monitoring interface. You will see the telescope move in real time via a

Honolulu Weather Forecast 🌩️ 10-11 August 2015			
MONDAY, 10 AUGUST		High: 87°F / 31°C Low: 76°F / 24°C	
Morning	Afternoon	Evening	
Clear to partly cloudy	Partly cloudy	Clear	
5% chance of rain	5% chance of rain	5% chance of rain	
TUESDAY, 11 AUGUST		High: 87°F / 31°C Low: 76°F / 24°C	
Morning	Afternoon	Evening	
Clear	Partly cloudy	Partly cloudy	
10% chance of rain	25% chance of rain	25% chance of rain	
<p>Extended forecast: Trade winds will gradually decrease as high pressure centered far north of the islands shifts east and weakens. Heading into the middle of the work week, the local forecast hinges on the evolution of hurricane Hilda, which is weakening as it heads northwest toward Hawai'i. Source: Weather Underground, National Weather Service.</p>			

“Relativity Tour” Comes to Honolulu

If a fellow attendee at the IAU General Assembly were to ask, “What is relativity?” you’d surely be able to give a perfectly good answer. But what if a non-scientist acquaintance, friend, or relative were to ask the same question? Would you be able to reply without relying on technical jargon?

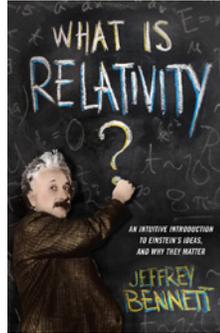
If you’re not sure you would, here’s an idea: get yourself (and your family, if they’re with you in Honolulu) to the [University of Hawai‘i at Mānoa Art Building Auditorium](#) at 7:30 pm Monday, 10 August. Jeffrey Bennett (Big Kid Science, Boulder, Colorado) is presenting a free public lecture based on his book [What Is Relativity? An Intuitive Introduction to Einstein’s Ideas and Why They Matter](#) (Columbia University Press, 2014). This is the latest stop on Bennett’s nationwide “Relativity Tour” celebrating the 100th anniversary of Einstein’s general theory of relativity during 2015, the [International Year of Light](#).

Among the topics Bennett will cover in his presentation:

- How Einstein’s theories of relativity underlie nearly all of modern science and technology.
- How relativity provides our current understanding of the nature of space, time, and gravity.
- Why “black holes don’t suck.”
- The mind-bending ideas of time dilation, length contraction, and space-time curvature.
- The most famous equation in history: $E = mc^2$.
- How Einstein’s work is a shining example of what human beings can do when they put their minds to work for positive things rather than negative things.

Bennett’s free public lecture will be preceded by a book signing at 7:00 pm. For directions to the event, see the [UH Mānoa website](#).

— Rick Fienberg, Kai‘aleleika



Congratulations
to



Michael Hahn!

You have won a
sunrise or sunset tour for two (value: \$170) from
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Prizes can be redeemed, and raffles can
be entered, at Exhibit Hall Booth 336

How to Contribute to the Conference Newspaper



Kai‘aleleika welcomes news, reviews, and opinions from attendees. Articles should be 300 to 500 words. Please also supply a relevant photo or illustration with a brief caption, as well as a photo and brief bio of you, the author. In case of multiple authors (no more than three, please), we’ll need photos and bios of all of you.

We prefer receiving a Microsoft Word document, but a plain text file or even an email message will suffice. Graphics should be in TIFF, JPG, or PNG format; author photos can be 250 pixels wide by 300 pixels tall, but larger photos or illustrations should be at least 800 pixels wide and tall.

Please email your materials to newspaper@astronomy2015.org or bring them to our office, Room 302, in the Hawai‘i Convention Center, Monday through Friday, 8 am to 6 pm. Note that if you want an article to appear on a particular day, you need to get it into our hands a day or two earlier.

We reserve the right to reject contributed materials for any reason and to edit all contributions for length, style, and clarity.

Rick Fienberg, Editor in Chief