Kai'aleleiaka — THE MILKY WAY

Issue 1 — 3 August 2015

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Welcome to IAU General Assembly XXIX in Honolulu!

By NORIO KAIFU

It is my great pleasure to welcome IAU members and guests to the General Assembly XXIX in Honolulu, Hawai'i.

Hawai'i is a special cultural and economic center of the Pacific region, and it is one of the most active frontiers of astronomical observations in the world because of its unique geological, meteorological, and geographical features. This is a special occasion for the IAU, to hold the General Assembly in Hawai'i for the first time in its nearly 100-year history.

The Honolulu GA will also be historic because the IAU is completing the reform of its scientific organizational structure by total reconstruction of its Commissions. All new Commissions, which were approved by Executive Committee action in April, were organized through electronic voting in June and July, and they will begin activities for the coming triennium after Honolulu under a fresh, inclusive mandate. Through this reform the role of the nine Divisions becomes more central to IAU activity, and the Commissions will be flexible in responding to the rapid evolution of astronomy in the 21st century.

The meetings of the Honolulu GA are also organized under a new structure. Six IAU Symposia covering wide and attractive fields are being held, as usual. However, instead of the previous Joint Discussions and Special Sessions we now support 22 Focus Meetings of 2–3 days duration, in addition to Division Meetings organized by each Division. These changes are an inevitable and beneficial evolution for the IAU as a rapidly growing international union of scientists. Still, we need to observe activities under the new structure carefully, identify any problems that occur, and find better ways for the IAU of the future.

Throughout its long history astronomy has always been new and exciting. Now in the 21st century we are constructing 30-meter-class telescopes and working on the intercontinental Square Kilometre Array radio observatory. We are discussing how to prove the inflation hypothesis at the beginning of the expansion of the universe, how to reveal the nature of dark energy, and how we can detect evidence for life on other planets, including those in other planetary systems. The IAU remains youthful, with a continuously incoming generation of young members; in Honolulu more than 1,200 new individual members — many of whom are recent PhD's — will be added, which will increase our number of individual members by more than 10%!

The IAU is also broadening its connection with other communities in the world through education, the promotion of scientific knowledge, and contact with the general public. We are proud that the IAU is among the leading international scientific unions in such activities. The Office of Astronomy for Development (OAD) and the Office for Astronomy Outreach (OAO) have been actively developing cooperation with schoolteachers, students and children,

Kaiʻaleleiaka THE MILKY WAY

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Kaiʻaleleiaka (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.

amateur astronomers, and the general public worldwide. With the increasing scope of astronomy we acknowledge that occasional conflicts between our growing scientific activities and the interests of the public may occur. Here in Hawai'i we hear voices that criticize the development of telescopes atop Maunakea and Haleakalā, and in fact such criticism is not new for astronomers. The history of astronomy and its profoundly positive impact on civilization makes us 100% certain that astronomical observations and research will continue to open a vast new world for humankind, give us a better perspective to understand our world, and provide excitement and dreams to children in the world. In parallel, we truly wish to respect all cultures, to remain entirely open in our activity, and to live with all nations and cultures together.

We anticipate that the IAU General Assembly XXIX in Honolulu will be one of the most active and memorable such meetings in the history of the IAU. I wish all of us an exciting, fruitful, and joyful time during the GA.

Welcome to the GA! Welcome to Honolulu! ✿

NORIO KAIFU is Director of the National Astronomical Observatory of Japan and will complete his three-year term as IAU President at the second Business Meeting of the General Assembly on 13 August.

A Special Message from the Governor of Hawai'i

By DAVID Y. IGE

Aloha! On behalf of the people of the State of Hawai'i, I send my warmest greetings to all members of the International Astronomical Union (IAU) attending the 2015 IAU General Assembly.

Since 1919 the IAU has been the international authority for assigning designations to celestial bodies and the surface features on them. Representing the vast majority of professional astronomers, its mission is to promote and safeguard the science of astronomy through international cooperation.

I am pleased that the IAU has chosen to hold this year's assembly in Hawai'i, where interest in astronomy is deeply entrenched in our island heritage. The heavens played a central role in ancient Hawaiian culture, and early Polynesians relied on their knowledge of the stars to successfully navigate thousands of miles across the open ocean. Today, Hawai'i continues to be at the forefront of astronomical studies through the observatories at Maunakea on the island of Hawai'i and Haleakalā on Maui.

This triennial assembly promises to be an exciting and informative event, featuring more than 3,000 professional astronomers, and offering Symposia and Focus Meetings that cover a broad range of astronomical topics.

Mahalo [thank you] to the IAU, American Astronomical Society, University of Hawai'i at Mānoa Institute for Astronomy, and many event organizers for contributing to this worthy event. Please accept my best wishes for an enjoyable and successful meeting. ✿

Governor DAVID IGE was sworn in on 1 December 2014, becoming the fourth native-born Governor of Hawai'i and the first Governor in the United States of Okinawan descent. He holds a Bachelor of Science in electrical engineering and a Master of Business Administration in decision sciences.

How to Say It in Hawaiian

Hawaiians are proud of their language and culture and tend to appreciate visitors who express interest in learning about them. So why not try to speak a little Hawaiian while you're here? If you say it with a smile in the spirit of aloha, you'll do fine.

This brief guide, and the ones to follow over the next two weeks, are adapted from the website Hawaiian Words, where you can not only find many more words and phrases than we can introduce here, but also hear them pronounced by native speakers.

The Hawaiian alphabet includes five vowels (a, e, i, o, and u) and seven consonants (h, k ,l, m, n, p, and w). A consonant is always followed by a vowel, so all Hawaiian words end in a vowel.

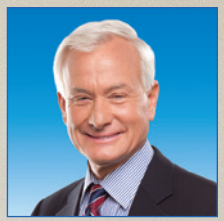
Names and words are easier to pronounce when you break them down into one-syllable chunks. Sometimes the letter w is pronounced the same as v, as in the traditional pronunciation of "Hawai'i," which is phonetically pronounced "huh-VAI-ee" rather than "huh-WHY-ee." Both versions are considered acceptable.

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 macron or, in Hawaiian, a kahakō), it means you hold the sound an extra beat. A **6**-shaped apostrophe, or 'okina, signals a glottal stop. This will all make a lot more sense if you go to Hawaiian Words and play some of the audio files!

We'll dispense with these preliminaries in future installments. To keep this from getting too long, let's just look at three words you've been hearing a lot — and perhaps using a lot — since you arrived in Honolulu:

- Hawai'i: from "ha" (breath), "wai" (water), and "'i," (life), i.e., "the breath and water of life."
- Aloha: love, affection, hello, goodbye
- Mahalo: thank you

— Rick Fienberg, Kai'aleleiaka



Proclamation

WHEREAS, the International Astronomical Union (IAU), founded in 1919, represents more than 10,000 of the world's astronomers; and

WHEREAS, the IAU promotes and safeguards the science of astronomy in all its aspects through international cooperation and is the internationally recognized authority for assigning designations to celestial bodies such as planets and moons; and

WHEREAS, the IAU General Assembly, which is conducted every three years, offers symposia, joint discussions and special sessions; and individual business and scientific meetings of divisions, commissions, and working groups; and

WHEREAS, the 2015 General Assembly, being held for the first time in Hawaii from August 3 through 14 at the Hawaii Convention Center in Honolulu, will recognize our islands' distinct importance to the science of astronomy; and

WHEREAS, this year's General Assembly is expected to be the largest in the history of the organization, with more than 3,000 attendees including nearly a third of the world's astronomers gathering to exchange knowledge and important advancements; and

WHEREAS, student outreach, stargazing, and other public events will be presented by members of the astronomy community,

NOW, THEREFORE, I, KIRK CALDWELL, Mayor of the City and County of Honolulu, do hereby proclaim August 3, 2015, to be

INTERNATIONAL ASTRONOMICAL UNION GENERAL ASSEMBLY DAY

in recognition of the IAU for its significant contributions to furthering our understanding of the universe and our world through scientific research and discoveries in astronomy.

Done this 3rd day of August, 2015,
in Honolulu, Hawaii.

KIRK CALDWELL

Inspiration, Appreciation, and Celebration

By LYNNE HILLENBRAND

Welcome to yet another inspiring location for an IAU General Assembly! Hawai‘i is a stunning natural environment, with significant diversity among the islands. Its residents boast a rich astronomical heritage — beginning with the Polynesian explorers who navigated the Pacific and arrived here more than a millennium ago, and continuing to today by hosting many of the frontier telescopes on the planet.

The American Astronomical Society (AAS) and an extraordinary inter-island Local Organizing Committee have organized a wonderful two weeks for us. In these pages you will see welcomes from the President of the IAU, the President and the Executive Officer of the AAS, and officials representing the State of Hawai‘i and City of Honolulu. I would like to add my own as Chair of the U.S. National Committee for the IAU (USNC-IAU).

In thinking back over my own history with the IAU (which I realize is limited compared to many of you who have much longer histories in the field), I have now attended General Assemblies in Sydney, Prague, Rio de Janeiro, Beijing, and Honolulu — locations spanning a good fraction of the globe.

Besides being afforded the opportunity through astronomy to explore these cities and the local cultural offerings of each host country, I have also come to appreciate through talking with par-

ticipants at IAU meetings how astronomy is carried out in different countries around the world.

Among us we have a diverse set of scientific interests, past educational opportunities, current types of jobs, and available resources for conducting our pursuits in astronomical research and education. And we are all here together in this beautiful environment to witness and appreciate Hawaiian culture, and to celebrate recent scientific progress and future scientific opportunities.

Let's get started! ✿

USNC-IAU Chair LYNNE HILLENBRAND is a professor of astronomy at the California Institute of Technology, where she studies star- and planet-formation. She has served on a wide variety of advisory committees, science steering committees, and organizational boards.

Schedule for the Opening Ceremony of the General Assembly	
4:00 to 6:00 pm, Ballroom B, Hawai'i Convention Center	
Master of Ceremonies: Günther Hasinger, Director, Institute for Astronomy, University of Hawai'i	
Oli Chant and Blessing	D. Akaka Jr.
Opening Address	Norio Kaifu, IAU President
Welcome Addresses	Megan Urry, AAS President
	David Ige, Governor of Hawai'i
	Kirk Caldwell, Mayor of Honolulu
	David Lassner, University of Hawaii President
	France Córdova, NSF Director
Gruber Foundation Presentations	Thierry Montmerle, IAU General Secretary
• Introduction of the 2015 Gruber Science Fellow in Astronomy	
• Award of the 2015 Gruber Cosmology Prize	
IAU-NASL Office for Young Astronomers	Oddbjørn Engvold, former IAU General Secretary
Astronomy Talk: East Asia Observatory	
Local Organizing Committee Event	
• Keiki Hula	
• Hanauna Hou	Hawaiian astronomers Paul Coleman, Ka'iu Kimura & Kālepa Baybayan

This Could Be the Start of Something Big

By C. MEGAN URRY

As a young astronomer, still in graduate school, I went to the 1982 IAU General Assembly in Patras, Greece. The colleagues I met at that meeting and its associated Symposia became some of my most important scientific collaborators.

Working with scientists from all over the world to answer profound questions about the universe has made astronomy an incredibly rewarding profession for me. The most difficult experiments, carried out with collaborators from the most countries, have proven to be the most fun. We continually challenge each other to improve upon incomplete or overly simple answers.

As the XXIX IAU General Assembly convenes in Hawai'i — a location that could not be more important to astronomers, nor more beautiful — I extend my welcome to all attendees and my best wishes that you — especially the youngest of you — will find new colleagues and friends with whom you will explore the universe in the future. ✿

MEG URRY is President of the American Astronomical Society. She works at Yale University in New Haven, Connecticut, where she is the Israel Munson Professor of Physics and Astronomy and Director of the Yale Center for Astronomy & Astrophysics.

The Organization of the General Assembly

The largest gathering of the world's professional astronomers doesn't happen by itself.

By KEVIN B. MARVEL

Aloha, and *thank you* for coming to the XXIX General Assembly of the International Astronomical Union!

It has been a challenge and a pleasure to oversee the organization for this important conference. Without attendees there could be no meeting, of course, but without the efforts of many people handling the innumerable organizational aspects, there could be no meeting either.

The American Astronomical Society (AAS), in partnership with the Institute for Astronomy (IfA) of the University of Hawai'i and the US National Committee of the IAU, presented a bid to the IAU Executive Committee in 2009 to host this General Assembly and was pleased to have our bid selected. The last General Assembly hosted by the United States was 27 years ago in Baltimore, Maryland, so it's been a long time, and we are thrilled to once again host the conference. With the IAU Executive Committee's acceptance of our proposal came the immediate need to start organizing, and we did so, securing the venue, hotels, and, over time, all the other contractors to make the meeting come to fruition.

Conference infrastructure is something that is often invisible to attendees. Something as simple as the meeting program in its various printed and electronic formats represents the input and work of many, many people. The IAU leadership had to receive and consider proposals for Focus Meetings, the Symposia organizers had to secure speakers, participants had to submit

abstracts, those abstracts had to be arranged and organized into sessions, errors and typos had to be caught and corrected, and the abstracts and associated metadata had to be converted to suitable formats and ultimately published. From the attendee's — that is, your — perspective, it's just a list of what is going on and the text of presentation abstracts, but it represents many thousands of hours of effort from tens of people. This is just one example of many. Similar levels of effort are needed to arrange for the Exhibit Hall, sponsorships, public-outreach events, security, Wi-Fi, food and beverage, Splinter Meetings, registration details, lodging, tours and special events, and more. It is a *lot* of work!

However, everyone involved has been driven by one overarching goal: to ensure the best possible General Assembly, one that maximizes the positive impact on our shared discipline of astronomy and that fosters scientific collaboration and communication at the highest possible level.

I am confident that we have achieved this goal, and I will be spending most of my time at the conference thanking the innumerable people who helped organize it — at the AAS, the IAU, the IfA, and elsewhere. I hope you will join me in expressing your thanks to those who helped make the conference possible as well.

Most importantly, I thank *you,* the attendees, who have traveled a great distance, to a remote and special place, to share your time, knowledge, and interest to help move human knowledge forward.

Please have a wonderful and productive time at the meeting and rely on our on-site staff to help with any challenges you might have. ✿

[AAS photo © 2014 Joson Images]

Next year KEVIN MARVEL will celebrate his 10th anniversary as Executive Officer of the AAS in Washington, DC. Before he began working at the AAS in 1998 he studied at the University of Arizona and New Mexico State University and did research in stellar radio astronomy.

ABOUT THE DAILY NEWSPAPER

Why *Kaiʻaleleiaka?* Why Digital?

By RICK FIENBERG, Editor in Chief

For more than a half century, beginning with the X General Assembly (GA) in Moscow in 1958, each triennial gathering of the IAU has featured a daily newspaper produced by astronomers and science writers appointed by the host organization. With previews by plenary speakers and session chairs, program updates and travel tips from local organizers, and news reports from each day's meetings and other activities, the GA newspaper is an important source of must-have information for attendees.

Traditionally the GA newspaper has been prepared each day, printed overnight, and distributed each morning. In Honolulu we are breaking with this tradition and starting a new one: The newspaper is being produced and distributed 100% digitally for viewing on attendees' laptops, tablets, and smartphones — though it is formatted for printing on U.S. standard 8½-by-11-inch paper for the convenience of those who prefer having their newspaper on actual paper.

Newspaper files are PDFs suitable for viewing in Adobe Acrobat Reader or any other PDF-compatible application. We chose PDF as our file format because PDFs can be read on machines of all types running all popular operating systems,

including Mac OS, iOS, Windows, Android, and Unix. Each daily edition will be available for downloading early each morning or perhaps late the preceding evening.

Note that even if we had wanted to print the newspaper in the traditional way, we would not have been able to do so, as no commercial printer on the island of O'ahu has enough press capacity to print another daily paper in addition to their regularly scheduled publications.

The XXIX GA newspaper is called *Kai'aleleiaka* ("kah-EE ah lay-lay-ee AH-kah"), which means "the Milky Way" in Hawaiian. As seen from Hawai'i in August, the galactic center stands high in the south during prime evening skygazing hours, and later at night you can trace the Milky Way from the southern horizon, through the zenith, to the northern horizon — though not necessarily from brightly lit Honolulu!

There are other ways to say "the Milky Way" in Hawaiian, but *Kai'aleleiaka* is especially well suited for our astronomical purpose, since it is a term commonly used by Polynesian voyagers who navigated the Pacific Ocean by the stars. The literal translation of *Kai'aleleiaka* is "the fish jumping [or flopping] in shadows,"

Both 10-meter telescopes of the W. M. Keck Observatory use their adaptive-optics lasers to study the supermassive black hole at the center of the Milky Way galaxy. *[Sean Goebel / sgphotos.com]*

an apt description of the dark-cloud-studded band of starlight rising in the east, culminating high overhead, and descending in the west. ✿

BEHIND THE BYLINES

Meet the Staff of *Kai'aleleiaka*

By RICK FIENBERG, Editor in Chief

Kevin Marvel, the American Astronomical Society's Executive Officer, didn't have far to look to find someone to manage the preparation and production of the XXIX General Assembly's daily newspaper. Before I joined the AAS staff as Press Officer, I spent 22 years at *Sky & Telescope* magazine, including 9 as Publisher and 8 as Editor in Chief. So I was thrilled when Kevin asked me to lead the newspaper team in Honolulu.

One reason I was excited to accept this responsibility was the opportunity that came with it, namely, to hand pick my staff of writers, editors, and designers. I think I've assembled a supremely capable team, and once I've introduced them to you, I'm sure you'll agree.

Ink-Stained Wretches

Every newspaper needs a managing editor to "keep the trains running on time," and in that role is **Sarah Reed**, Press Officer at the University of Leeds, UK. She has held a variety of positions in science journalism and communication. Most rel-

evant here, Sarah was the first Coordinator at the IAU Office for Astronomy Outreach in Tokyo and did a stint as Editor in Chief of *CAPjournal,* published under the auspices of (old) IAU Commission 55 (new number: C2), Communicating Astronomy with the Public. She also has IAU GA newspaper experience, having worked on *Inquiries of Heaven* at the XXVIII GA in Beijing, China, in 2012.

Our half dozen staff writers/editors will do a bit of everything: report and write stories about sessions, events, and activities; edit material submitted by meeting organizers, presenters, and other attendees; and even shoot some pictures. In alphabetical order we begin with **Gina Brissenden**, Associate Director of the Center for Astronomy Education at the University of Arizona in Tucson; she is also the AAS's Education and Outreach Coordinator. Gina regularly conducts astronomy-education workshops — she'll present three of them here in Honolulu — and is co-editor of *Spark,* the AAS education newsletter.

Pamela Gay is an astronomer, writer, and podcaster who uses new media to engage people in learning and doing science. Formerly an editor at *Astronomy* magazine and now on the faculty of Southern Illinois University Edwardsville, she co-hosts the popular Astronomy Cast podcast, directs the CosmoQuest citizen-science hub, and seems to be everywhere at once on social media.

Inge Heyer collected a spectacular assortment of aloha shirts during her five years as Public Information Officer at the Joint Astronomy Centre in Hilo. Since then she has earned her PhD in science education at the University of Wyoming; she now teaches at Loyola University Maryland. For more than a decade Inge, who originally hails from Berlin, Germany, has managed the newsroom at AAS meetings as volunteer Deputy Press Officer. An avid *Star Trek* fan, she blogs about astronomy for science-fiction enthusiasts at StarTrek.com.

Susanna Kohler recently joined the AAS staff as Editor of AAS Nova, a new online publication about which you'll hear more during the course of the GA. She has done outreach in astronomy and physics for more than a decade. While working toward her PhD at the University of Colorado, Boulder, she wrote for astrobites.com, where she is now an administrator. Susanna is also a founding organizer of ComSciCon, a science-communication workshop series for graduate students.

Larry Marschall is Professor of Physics, Emeritus, at Gettysburg College, Pennsylvania. He is an accomplished (and award-winning) educator, researcher, science writer — and bluegrass musician! Larry has written three books, many articles, and countless columns for *Natural History* and *The Sciences.* He is Newsletter Editor of IAU Commission 46, Astronomy Education and Development, and was Editor of *CCD Astronomy* magazine. He has volunteered as AAS Deputy Press Officer even longer than Inge — for more than 20 years.

Iris Nijman studied biomedical sciences at Leiden University in the Netherlands, where she also works in the Universe Awareness

How to Contribute to the Conference Newspaper

Kaiʻaleleiaka 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 Hawaiʻi 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

(UNAWE) outreach program. Having discovered that she very much enjoys writing about science for the general public, Iris specializes in science communication and has written numerous articles for the science page of her local Dutch newspaper.

Designing Women

One of the things I liked most about working at *Sky & Telescope,* where all the editors were amateur or professional astronomers, was interacting with our colleagues in art and design. These are the folks who help turn words into stories through the creative use of typography, layout, images, and illustrations. For this first-ever all-digital GA newspaper, I'm fortunate to have found two designers with vast experience in astronomy communication and digital production.

Design Director **Leslie Proudfit** is Media Specialist for Education & Public Outreach at NASA's Stratospheric Observatory for Infrared Astronomy (SOFIA), where she creates exhibits, flyers, brochures, and other materials for scientists, teachers, students, and the public. Leslie also maintains the SOFIA Science Center's website and serves as Senior Designer and Webmaster for the Astronomical Society of the Pacific (ASP), which promotes science literacy through astronomy.

Crystal Tinch is Communications Manager at the AAS and, having worked there for more than 13 years, knows more about Society operations than almost anyone else on the staff. She produces most of our print and online publications, including the popular AAS Wall Calendar and our biweekly enewsletter for members. Crystal also manages many of the AAS social-media accounts.

That's a lot of talent and experience! Oh, I almost forgot to mention that Larry and I are also veterans of a previous GA newspaper: *IAU Today* in Baltimore, Maryland, in 1988. I doubt either of us will be available to do it a third time when the U.S. next hosts a GA, so we're going to savor our two weeks in Honolulu and will, along with the rest of the *Kaiʻaleleiaka team,* do everything we can to help make your GA experience a great one! ✿

The *Kaiʻaleleiaka* team (sitting, left to right): Leslie Proudfit, Crystal Tinch, Rick Fienberg, and Inge Heyer; (standing, left to right): Iris Nijman, Larry Marschall, Gina Brissenden, Susanna Kohler, Pamela Gay, and Sarah Reed. *[AAS]*

Honolulu Almanac 3 August 2015

Sunrise / set	6:06 am / 7:09 pm
Twilight[1] start / end	4:45 am / 8:29 pm
Moonset / rise	9:32 am / 9:59 pm
Moon phase[2]	◯ Waning gibbous (87% illum.)
Evening planets[3]	Jupiter (W), Saturn (SSW)
Morning planets[3]	—

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

From Interstellar Clouds to Star-Forming Galaxies: Universal Processes?

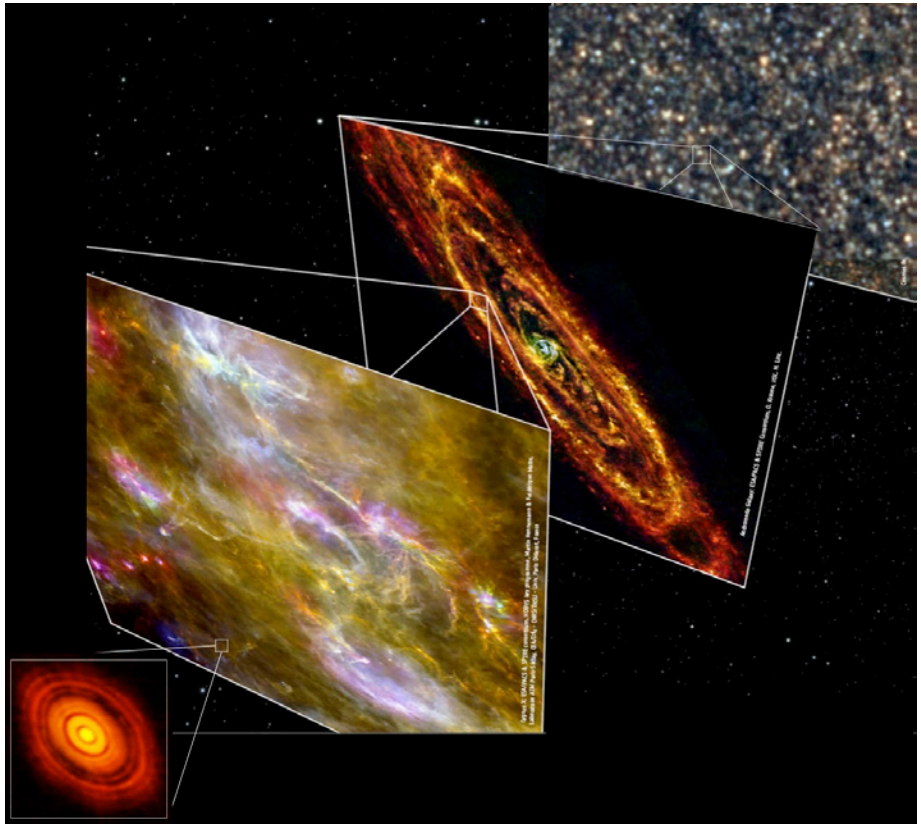
By PHILIPPE ANDRÉ, PASCALE JABLONKA & FLORIS VAN DER TAK

The link between the structure of the interstellar medium in galaxies and the star-formation process on both local and global scales is one of the fastest-growing areas of astrophysical research. IAU Symposium 315 will center around this theme in an effort to make connections between the most recent observations with, e.g., Herschel and ALMA, and the most advanced numerical simulations, on scales ranging from protostellar disks to the first star-forming galaxies in the universe.

The availability of wide-field far-infrared and submillimeter surveys with, e.g., the Spitzer, Herschel, Planck, WISE, and Akari space observatories, coupled with the much-improved capabilities of ground-based millimeter and submillimeter interferometers, has recently led to spectacular and decisive steps forward in our understanding of star-formation modes from solar-system scales (tens of astronomical units) to global (kiloparsec) scales in galaxies. In particular, it has been suggested that star formation in dense molecular gas may be governed by essentially the same "laws" in nearby galactic clouds and distant external galaxies. This raises the possibility of a unified picture of star formation in the universe from small scales (e.g., protostellar cores and disks, filaments, and molecular clouds) to galaxy-wide scales

IAU Symposium 315: From Interstellar Clouds to Star-Forming Galaxies: Universal Processes?	
Start date	Monday, 3 August
End date	Friday, 7 August
Oral sessions	Room 311, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Related event	S315 Plenary: Wednesday, 5 August, 8:30 to 10:00 am, Ballroom B, Hawai'i Convention Center
Coordinating Division	Division J: Galaxies and Cosmology

For details on presenters, topics, and times see the online program or mobile app.



Star-forming structures on scales large and small. From top right to bottom left: High-redshift star-forming galaxies as observed by Herschel in the GOODS-N deep field *[HerMES project]*; the Andromeda galaxy as imaged by Herschel *[HELGA project]*; structure of the Cygnus X giant molecular cloud in our own galaxy as revealed by Herschel *[HOBYS project]*; and detailed substructure in the protoplanetary disk surrounding the young star HL Tauri as revealed by ALMA *[NRAO/ESO/NAOJ]*.

(e.g., giant molecular clouds and galactic disks).

The goal of Symposium 315 is to debate this possibility and to start building up a coherent picture of how star formation is fuelled on a wide range of scales. Our ambition is to bring together observers and theorists working on star formation throughout the universe from nearby clouds, to local galaxies, to the first star-forming galaxies at high redshift, and to foster discussions around the fundamental question of whether the dominant mode of star formation is quasi-universal or environment-dependent.

With the advent of powerful observational facilities such as ALMA and high-resolution, multiscale numerical simulations, we believe the time is ripe for such a symposium aimed at establishing bridges between the galactic and extragalactic star-formation communities. ALMA will soon enter full operations, and the legacy of Herschel observations has now become fully clear. We therefore look forward to the wealth of exciting new results that will undoubtedly be presented and discussed.

We envision the Symposium as a starting point for a continuing discussion involving experts from the "local" to the "high-redshift" star-formation communities on a number of critical issues such as the origin and universality of the stellar initial mass function, the nature of star formation "laws," and the role of feedback and environmental effects. ✿

PHILIPPE ANDRÉ is Director of Research in the Astrophysics Laboratory of the Alternative Energies and Atomic Energy Commission (CEA) in Saclay, near Paris, France, and principal investigator of the Herschel Gould Belt Survey. PASCALE JABLONKA is Director of Research at the French National Centre for Scientific Research (CNRS) and on leave of absence from Paris Observatory in the Astrophysics Laboratory at the Swiss Federal Institute of Technology in Lausanne (EPFL). FLORIS VAN DER TAK is Senior Scientist at the Netherlands Institute for Space Research (SRON) and Professor in Submillimeter Astronomy at the University of Groningen.

General Assembly Draft Resolutions Announced

By THIERRY MONTMERLE

The four resolutions to be presented for voting at the XXIX General Assembly have been announced. They are currently in draft form, and some of the wording may change before the vote takes place during the second General Assembly session on Thursday afternoon, 13 August.

Resolution B1 addresses the 10-year IAU Strategic Plan for astronomy in the developing world. This strategic plan extends from 2010 to 2020, and this resolution looks to confirm the continuing pursuit of these goals, as well to plan for what comes next, in the form of an extended strategic plan, addressing the future of the Office of Astronomy for Development and its activities beyond 2021.

Resolution B2 is on the recommended zero points for the absolute and apparent bolometric magnitude scales. This is a

problem in astronomical literature, with pervasive variance in the zero points for bolometric magnitudes and bolometric corrections. This resolution seeks to adopt a standardized absolute and apparent bolometric magnitude scale that acts independently of the Sun.

Resolution B3 is on recommended nominal conversion constants for selected solar and planetary properties. It recommends the adoption of nominal values for the solar radius, total solar irradiance, solar luminosity, solar effective temperature, heliocentric gravitational constant, and solar mass. These nominal values would function as conversion factors only, allowing a uniform conversion to SI units. The resolution recommends that the same be done for the equatorial and polar radii of the Earth and Jupiter, as well as for the geocentric and jovicentric gravitational constants.

Resolution B4 addresses the protection of radio astronomy observations in the frequency range 76–81 GHz from interference caused by car radars, which have various applications, like determining distances and relative speeds of objects in front of, beside, or behind a car. It seeks to request that the World Radio Communication Conference 2015 takes all possible steps to protect radio astronomy observations in this frequency band that suffer as a result of car radars. Separating the observatories geographically from the radiation would seem the most effective method of protection, but in a world of ever-expanding technology that requires different wavelengths to operate, this is a pressing concern for astronomy.

Here are links to the full text of the draft resolutions and two related documents:

- Draft resolutions (zip archive, 175 KB)
- IAU Strategic Plan 2010–2020 (PDF, 3.4 MB)
- Resolution B4 briefing paper (PDF, 94 KB)

Once the resolution language has been finalized, we'll let you know where to find it online. ✿

THIERRY MONTMERLE will wrap up his three-year term as IAU General Secretary next week. He is based at the Institute of Astrophysics in Paris, France. This article is adapted from IAU Announcement ann15023.

IAU SYMPOSIUM 317

The General Assembly of Galaxy Halos: Structure, Origin & Evolution

By MAGDA ARNABOLDI & ANGELA BRAGAGLIA

The quest for understanding the physics of galaxy halos begins with a statement from O. J. Eggen, D. Lynden-Bell, and A. R. Sandage (1962, *ApJ*, **136**, 748): "The time required for stars in the [Milky Way's halo] to exchange their energies and momenta is very long compared with the age of the galaxy. Hence knowledge of the present energy and momenta of individual objects tells us something of the initial dynamic conditions under which they were formed." This statement, now more than a half century old, illustrates very clearly the motivation to study the dynamics and chemical composition of stars in galaxy halos and their implications for models of galaxy formation. This quest starts right at our doorsteps with the study of the Milky Way (MW) galaxy. Because we live inside it and its light dominates our skies, we can study its stars with state-of-the art instrumentation out to its farthest outskirts.

Measuring the physical parameters of the structural components of the MW — the thin and thick disk, bulge, and halo — with imaging and spectroscopic surveys from the ground tells us when these components formed and whether they were dominated by accretion or by dissipative collapse of the MW's own gas. These

IAU Symposium 317: The General Assembly of Galaxy Halos: Structure, Origin & Evolution	
Start date	Monday, 3 August
End date	Friday, 7 August
Oral sessions	Room 310, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Related event	S317 Plenary: Tuesday, 4 August, 8:30 to 10:00 am, Ballroom B, Hawai'i Convention Center
Coordinating Division	Division H: Interstellar Matter and Local Universe

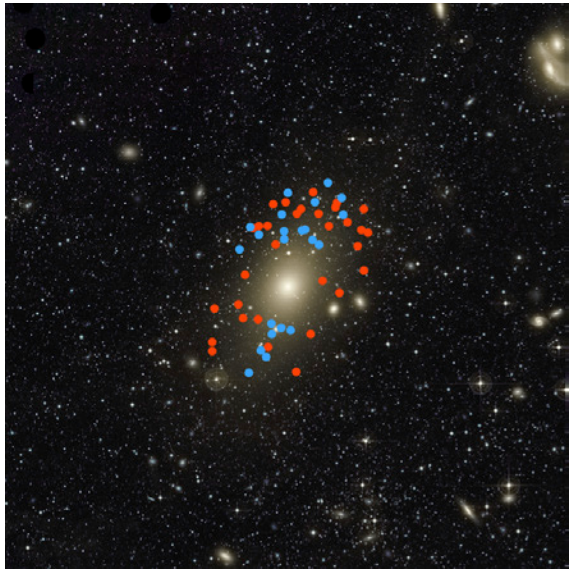
For details on presenters, topics, and times see the online program or mobile app.

surveys also tell us about the generations of stars that emit the light we see today in our sky, and about these stars' progenitors, which are responsible for their chemical content. Furthermore, the future is looking bright: astronomers are now preparing for a revolution to be brought about by the European Space Agency's Gaia satellite, which will measure the parallaxes and proper motions for a billion MW stars with exquisite precision. Gaia's three-dimensional map of the solar neighborhood will yield a kinematical and chemical census of all galactic components and strongly constrain models of the formation of the Milky Way.

What about the MW's halo? It turns out to be a livelier environment than we once thought. Accreted stars found in the halo are associated with several different substructures, such as the disrupted Sagittarius dwarf, which provides about 20% of all the debris of the MW's stellar halo, including multiple extended stellar streams. The modeling of these streams constrains the galaxy's potential and its associated mass to about 5–8 × 10^{11} $M_{\odot}$ within 200 kiloparsecs (kpc), in agreement with the kinematics of halo stars and satellites in the Local Group. The halo of the Andromeda galaxy (Messier 31) has a similarly complex network of structures. Numerous dwarf galaxies and globular clusters, but also streams without clear progenitors, contribute to this network, as shown by a map of the red giant stars in M31's halo from PAndAS, the Pan-Andromeda Archaeological Survey (McConnachie et al. 2009, *Nature*, **461**, 66).

Are halos and streams found only around disk galaxies? No — halos are ubiquitous in luminous galaxies, and we now know that they also extend out to 100 kpc; that they have complex morphologies with a mazy web of tails, plumes, and spurs; and that they harbor multiple stellar components with different chemical contents and ages. Vivid testimony of these intricate luminous substructures are shown by very deep images, reaching surface brightness levels to 1% of the night sky. Also, two-dimensional maps of discrete tracers such as planetary nebulae and globular clusters allow us to see substructures both in space and in velocity. A recent study of the giant elliptical galaxy Messier 87, shown below, reveals the debris of a satellite disrupted in its halo and provides evidence that the outer halo is still growing.

To understand how galaxy assembly took place we need to combine observations with theoretical modeling. This is because we deal with a long sequence of events, where mass accretion, i.e., stars and gas brought in by smaller satellites, and dissipative collapse of the galaxy's own gas have both played important roles, leading to the formation of different structural components that we see today in our own Milky Way and in external galaxies.



The "crown" of Messier 87's halo. Red and blue dots mark the positions of planetary nebulae whose motions reveal that M87 has been struck by another, smaller galaxy, which has now fully merged with it. Objects colored red/blue are moving away from/toward us with respect to the galaxy as a whole. [Longobardi et al. 2015, A&A, **579L**, 3 / ESO PR 1525]

IAU Symposium 317 provides a vibrant forum where experts will discuss many different aspects of the assembly, formation, and evolution of galaxy halos. We share the enthusiasm of our colleagues: by bringing together observers and theorists we endeavor to make progress toward a coherent picture of the formation and evolution of halos in the Milky Way, Andromeda, and other galaxies! ✿


MAGDA ARNABOLDI is an observational astronomer at the European Southern Observatory in Garching, Germany, where she works on the dynamics and evolution of galaxies. ANGELA BRAGAGLIA studies resolved stellar populations at the Italian National Institute of Astrophysics (INAF) Astronomical Observatory of Bologna.

IAU SYMPOSIUM 318

The Asteroid Belt: Crossroads of the Solar System

By STEVEN CHESLEY

Asteroids are the small, usually rocky bodies that reside primarily in a belt between Mars and Jupiter, though they have been scattered throughout the solar system to varying degrees. They carry the signature of the birth of the solar system in the way that they are organized, both individually and as a population, and so, in a real sense, form the fabric of our solar system. Their observed compositional, structural, and dynamical properties enable testing of current theories and facilitate development of new theories regarding the evolutionary processes that brought the solar system to its present state and that continue to act to reshape our planetary neighborhood. Thus the main asteroid belt can be considered a "crossroads" in the solar system, connected either genetically or dynamically to a host of other populations of small bodies.

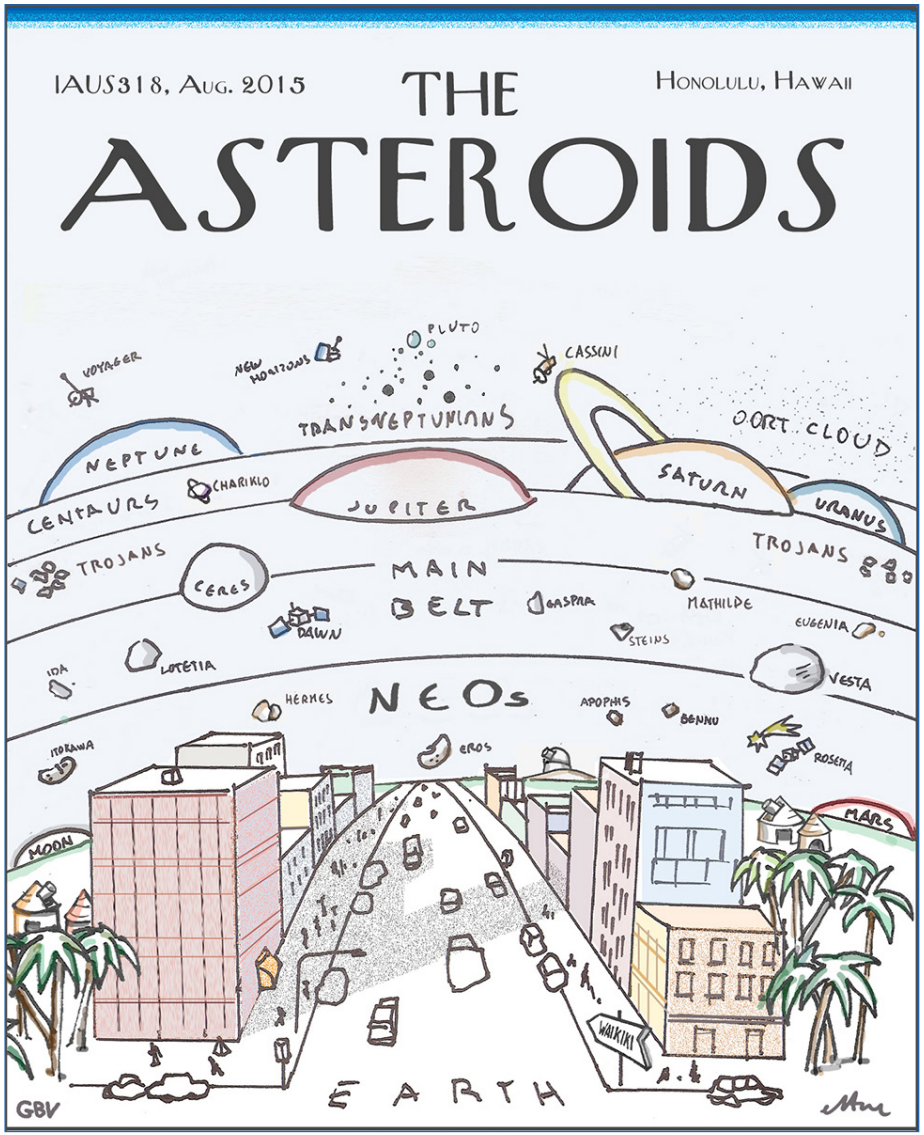
IAU Symposium 318, "Asteroids: New Observations, New Models," brings together more than 100 experts in the asteroid-research community to describe our current and evolving understanding of asteroids and related processes. The emphasis of the Symposium is on the main asteroid belt and related populations, including near-Earth asteroids.

The main asteroid belt is a lively place where the physical, rotational, and orbital properties of objects are governed by a complicated interplay of collisions, planetary resonances, radiation forces, and the formation and fission of secondary bodies. The collisional, orbital, and rotational evolution are each individually complex and rich in detail, and yet they are each coupled to the others in ways that make the complete evolutionary picture for asteroids truly fascinating.

Recent and forthcoming observational surveys and space missions are affording new constraints on asteroid characteristics and tests of current theories, even as theories are developed and revised in order to describe what the asteroids are like and

IAU Symposium 318 — Asteroids: New Observations, New Models	
Start date	Monday, 3 August
End date	Friday, 7 August
Oral sessions	Room 315, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Related event	S318 Plenary: Wednesday, 5 August, 6:00 to 7:30 pm, Ballroom B, Hawai'i Convention Center
Coordinating Division	Division F: Planetary Systems and Bioastronomy

For details on presenters, topics, and times see the online program or mobile app.



IAU Symposium 318 focuses on the main asteroid belt and related populations, as suggested by the symposium artwork, which was inspired by a famous *New Yorker* cover. *[Ettore Perozzi & Giovanni Valsecchi]*

how they came to be so. The result of such work informs our understanding of the evolutionary processes taking place in other planetary systems at various stages of development across the Milky Way and thus has relevance to diverse cosmogonical fields, from circumstellar debris disks to exoplanets.

Right: Asteroids Ida (left) and Gaspra (right) are shown at the same scale in these images captured by the Galileo spacecraft while en route to Jupiter in the early 1990s. Since then many other asteroids have been visited by spacecraft, culminating in Dawn's current exploration of Ceres from a low orbit. Gaspra is about 10.5 miles (17 km) long, and Ida is about 18.6 miles long. *[NASA, JPL, USGS]*

The study of asteroids is fed by an immense and growing stream of data from systematic asteroid surveys, often operated in conjunction with astrophysical surveys. This wealth of data represents an exciting challenge to ensure that the data are processed, archived, and distributed in a way that maximizes the scientific return. This is the intersection of computer science and astronomy, and we are past the age where simple solutions suffice. Symposium 318 includes a Q&A (question-and-answer) panel session designed to bring representatives of data-processing centers and data producers together with the asteroid-research community to communicate capabilities and plans, as well as to understand the future data demands. ✿

STEVEN R. CHESLEY is Senior Research Scientist in NASA's Near-Earth Object Program Office at the Jet Propulsion Laboratory in Pasadena, California, and President of Commission 20. His research focuses on impact hazard assessment and precision orbit determination and ephemeris prediction for small bodies.

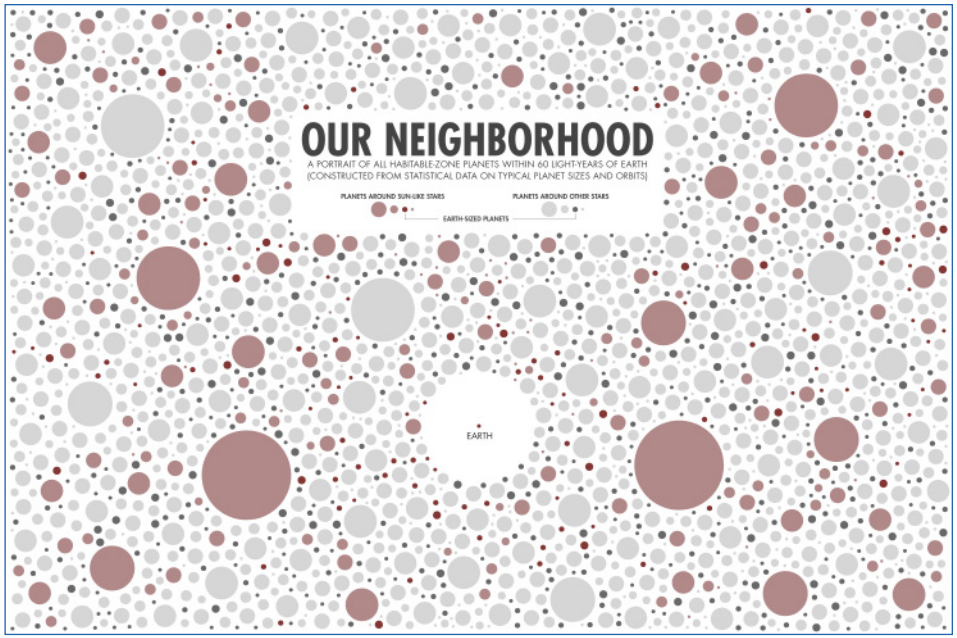
FOCUS MEETING 8

Statistics and Exoplanets

By SUZANNE AIGRAIN

Twenty years after the discovery of 51 Pegasi b, the era of exoplanets is well and truly under way. Thousands of planetary systems have been discovered, including many that are utterly unlike our own. We know that most stars in the Milky Way host at least one planet, and that planets smaller than Neptune are particularly common. Although we will never obtain images of most of the planets we know today, we are nonetheless able to study some of them in astonishing detail, even measuring how hot, moist, or cloudy their atmospheres are. We are on the cusp of robustly understanding the frequency of Earth-like planets, and it is not unreasonable to hope that genuine evidence for life outside the solar system might be found in our lifetimes.

However, exoplanets are much smaller and fainter than their host stars. The signals that we rely upon to detect and characterize them are often minute and dwarfed by random or systematic noise sources. Many of the exciting discoveries made to date have relied on very careful analyses of noisy data sets, and advanced statistical methods are increasingly being used to push back the limits of detectability, from radial-velocity and transit searches to atmospheric observations. With extensive data sets now available from large exoplanet surveys, the statistics of exoplanet populations is also a hot topic.



[xkcd.com]

From 3 to 5 August, Focus Meeting (FM) 8, "Statistics and Exoplanets," will bring together exoplanet and computational-statistics experts to discuss and address key challenges, including:

- The detection of exoplanets using a variety of methods, including radial velocity, astrometry, transits, direct imaging, and microlensing;
- The detailed modeling of planetary signals to extract information on planets' orbital, bulk, and atmospheric properties;
- Inferring the properties of the underlying planet population

Focus Meeting 8: Statistics and Exoplanets	
Start date	Monday, 3 August
End date	Wednesday, 5 August
Oral sessions	Room 312, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Related event	Software Hack Day: Thursday, 6 August, 9:00 am to 4:30 pm, Room 324, Hawai'i Convention Center
Coordinating Divisions	Division B: Facilities, Technologies and Data Science Division F: Planetary Systems and Bioastronomy

For details on presenters, topics, and times see the online program or mobile app.

from incomplete and biased samples from a range of surveys.

Although exoplanets are a particularly fertile ground for cross-disciplinary work, the increased importance of statistical methodology is a trend that extends across much of astronomy, and we hope to attract a broad spectrum of participants taking part in the IAU General Assembly.

To build on what we hope will be a productive exchange of ideas, we have also organized a day of tutorial-style and hands-on experimentation with algorithms and software packages. "Statistics and Exoplanets: Software Hack Day" is Thursday, 6 August, from 9:00 am to 4:30 pm in Room 324 of the Convention Center.

FM 8 is sponsored by the International Astronomical Union, the International Statistical Institute, the International Astrostatistics Association, and the Institute of Mathematical Statistics. For more information, see the FM 8 website and follow the hashtag #ExoStats15 on Twitter. ✿

SUZANNE AIGRAIN (@AirborneGrain) is Professor of Astrophysics at the University of Oxford, United Kingdom, and co-chair of the FM 8 Scientific Organizing Committee. Her research interests lie at the interface between exoplanets, stellar variability, and statistics.

FOCUS MEETING 12

Bridging Laboratory Astrophysics and Astronomy

By FARID SALAMA, LYUDMILA MASHONKINA & STEVE FEDERMAN

Focus Meeting 12: Bridging Laboratory Astrophysics and Astronomy	
Start date	Monday, 3 August
End date	Wednesday, 5 August
Oral sessions	Room 316C, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Coordinating Division	Division B: Facilities, Technologies and Data Science
For details on presenters, topics, and times see the online program or mobile app.	

Astronomy is primarily an observational science, detecting photons generated by atomic, molecular, chemical, and condensed-matter processes. Our understanding of the universe also relies on knowledge of the evolution of matter (nuclear and particle physics) and of the dynamical processes shaping it (plasma physics). Planetary science, involving in-situ measurements of solar-system bodies, requires knowledge from physics, chemistry, and geology. Exploring the question of life elsewhere in the universe draws on all the above as well as biology. Hence, our quest to understand the cosmos rests firmly on theoretical and experimental research in many different branches of science. Taken together, these astrophysically motivated theoretical and experimental studies are known as laboratory astrophysics.

Laboratory astrophysics is the Rosetta stone that enables astronomers to understand and interpret the cosmos. IAU Commission 14, Atomic and Molecular Data, and the AAS Laboratory Astrophysics Division (LAD) have coordinated their efforts to bring together expert providers and users of laboratory and astronomical data for Focus Meeting 12, "Bridging Laboratory Astrophysics and Astronomy." At this multidisciplinary meeting astronomers will join with theoretical and experimental chemists and physicists to discuss the state of the art in their respective disciplines and how their combined expertise can address important open questions in astronomy and astrophysics.

Numerous next-generation facilities and projects, including the Jansky Very Large Array (JVLA), Square Kilometre Array (SKA), Atacama Large Millimeter/submillimeter Array (ALMA), Panoramic

Survey Telescope & Rapid Response System (Pan-STARRS), Large Synoptic Survey Telescope (LSST), and James Webb Space Telescope (JWST) will produce a torrent of new data. FM 12 will consider how laboratory studies can best address the needs of astronomy during this new era as well as how to stimulate new observations with these telescopes. Attendees are encouraged to discuss the types of laboratory data they will need to properly interpret the astronomical phenomena that the next-generation facilities will likely reveal.

FM 12 is divided into topical sessions on atomic and molecular data, plasma physics, nuclear physics, and particle physics and their application to various domains, such as interplanetary, interstellar, and intergalactic matter; planetary surfaces; planetary and stellar atmospheres; the heliosphere; meteors, meteorites, and interplanetary dust; high-energy astrophysics; astrochemistry; and bioastronomy.

We would like to welcome all attendees to our multidisciplinary Focus Meeting. It will, no doubt, be of interest to the broad IAU community and promises to be a very exciting event! ✿



FARID SALAMA of NASA's Ames Research Center in California is the founding President of new IAU Commission B5, Laboratory Astrophysics, and incoming AAS LAD Chair. LYUDMILA MASHONKINA, current President of IAU Commission 14, works at the Institute of Astronomy of the Russian Academy of Sciences. STEVE FEDERMAN of the University of Toledo, Ohio, is the current AAS LAD Chair.

FOCUS MEETING 15

Search for Water and Life's Building Blocks in the Universe

By SUN KWOK

Water is the common ground between astronomy and planetary science, as the presence of water on a planet is universally accepted as essential for its potential habitability. Water assists many biological chemical reactions, leading to complexity by acting as an effective solvent. It shapes the geology and climate on rocky planets and is a major or primary constituent of the solid bodies of the outer solar system.

Water ice seems ubiquitous in space and is by far the most abundant condensed-phase species in our universe. Water-rich icy layers cover dust particles within the cold regions of the interstellar medium, and molecular ices are widespread in the solar system. The poles of Earth and Mars, and most of the outer-solar-system satellites, are covered with ice. Smaller solar-system bodies, such as comets and Kuiper Belt objects (KBOs), contain a significant fraction of water ice and trace amounts of organics.

Focus Meeting 15: Search for Water and Life's Building Blocks in the Universe	
Start date	Monday, 3 August
End date	Wednesday, 5 August
Oral sessions	Room 316A, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Coordinating Division	Division F: Planetary Systems and Bioastronomy
For details on presenters, topics, and times see the online program or mobile app.	

And liquid-water oceans probably exist beneath the icy crusts of several moons of Jupiter and Saturn.

In addition to water, another requirement for life as we know it is organic compounds. Our understanding of the evolution of organic molecules and their journey from molecular clouds to the early solar system and Earth provides important constraints on the

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emergence of life on Earth and possibly elsewhere. Astronomical observations have shown that carbonaceous matter is ubiquitous, and a significant number of molecules that are used in contemporary biochemistry on Earth are found in interstellar and circumstellar regions as well as protoplanetary environments.

To date about 180 molecules have been detected in interstellar and circumstellar gas. In circumstellar envelopes, small carbon compounds are converted to larger species and into solid organic compounds with mixed aromatic (ring) and aliphatic (chain) structures. During the formation of our solar system, this interstellar organic material was chemically processed and later integrated into the presolar nebula from which planets and small bodies formed. The large quantities of extraterrestrial material — both water and organics — delivered to young planetary surfaces may have played an important role in life's origin.

In Focus Meeting 15 we will discuss the development of simple organics in space to provide the initial context for understanding their subsequent evolution within a young planet-forming disk. Among the topics of presentation are discussions of water and organic formation in space, their transport to a forming disk, their delivery to forming terrestrial planets, and their incorporation into giant-planet atmospheres. The various potential sources of volatile delivery — such as comets, asteroids, and volcanism — will be presented along with a discussion of the early development of life on Earth. ✿

SUN KWOK, of the University of Hong Kong, China–Nanjing, works on the synthesis of organic compounds in the late stages of stellar evolution. He is the author of several books, including *Stardust: The Cosmic Seeds of Life* (Springer 2013). He acknowledges assistance with this article from Edwin Bergin and Pascale Ehrenfreund, his co-chairs on the FM 15 Scientific Organizing Committee.

FOCUS MEETING 22

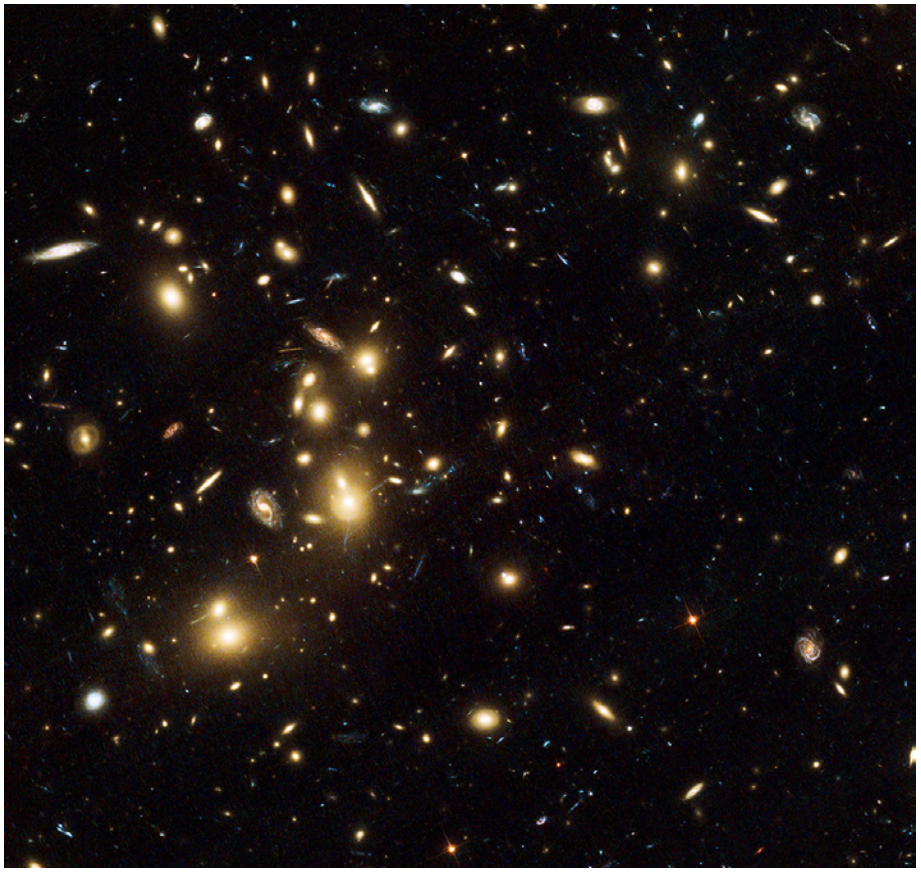
The Frontier Fields: Transforming Our Understanding of Cluster and Galaxy Evolution

By HARALD EBELING, PRIYA NATARAJAN & JEAN-PAUL KNEIB

Perhaps we should be embarrassed by our choice of words in the title of Focus Meeting 22. Along with "unique," "transformational" is probably the most overused (and abused) qualifier in astronomy. Then again, this is an exceptional program, certainly in its design and in the ambitiousness of its goals. Whether it is as transformational as we envisaged will hopefully become clear in the course of FM 22, which attempts to review the program's progress and results after 1½ years of data gathering.

Clusters of galaxies, the most recently assembled and most massive structures in the universe, are nature's most efficient telescopes. Predicted by Einstein's general theory of relativity, gravitational lensing — light deflection by matter — is copiously produced by clusters. It is a fitting tribute to Einstein as we celebrate the centennial of the publication of his theory this year. Clusters are crowded places: violent, dynamic, and evolving. Lensing by clusters has opened new windows to observe structure formation and evolution in action.

Devoting almost 600 hours (840 orbits) of Hubble Space Telescope (HST) Director's Discretionary Time to a novel, deep, extragalactic imaging effort, the Frontier Fields (FF) Program targets six massive galaxy clusters at redshift $z > 0.3$ in seven filters. At a total of more than 90 hours (140 orbits) per cluster, the FF reach to apparent magnitude ~29 across the entire optical and near-infrared window, an unprecedented depth for cluster observations with HST — deeper than even the Hubble Ultra-Deep Field if lensing magnification is accounted for.



Abell 2744 is one of six galaxy clusters targeted by the Frontier Fields program. The blue streaks and arcs are gravitationally lensed images of remote background galaxies. *[NASA, ESA, R. Dupke et al.]*

Focus Meeting 22: The Frontier Fields: Transforming Our Understanding of Cluster and Galaxy Evolution	
Start date	Monday, 3 August
End date	Wednesday, 5 August
Oral sessions	Room 314, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Coordinating Division	Division J: Galaxies and Cosmology
For details on presenters, topics, and times see the online program or mobile app.	

Complemented by 600 hours of Spitzer time for deep infrared imaging, hundreds of hours of Chandra ACIS-I X-ray observations, and extensive investments of observing time on ground-based facilities, the FF project certainly deserves the label "unique" based on invested resources alone. Just as exceptional is the rationale behind this initiative, namely, to fully exploit the magnifying power of gravitational lensing by the FF clusters to probe the population of background galaxies to greater depth than ever before, both in redshift and in luminosity.

IAU Focus Meeting 22, "The Frontier Fields," held at roughly the midpoint of the FF observing schedule, was conceived to bring together scientists — junior as well as seasoned — from the enormous range of research topics addressed by the FF observations. The subjects of talks and posters run the gamut of extragalactic astronomy, from transient phenomena (among them the spectacular discovery of multiple occurrences of Supernova Refsdal); through properties of the lensing clusters (specifically the dynamics and distribution of dark and luminous matter, but also the physics of galaxy evolution in clusters), and cutting-edge techniques

for precise lens modeling; to a slew of studies of the lensed background universe. FM 22 presentations cover all modes of research: theory, numerical simulations, and, of course, observations.

We aimed specifically at giving the next generation of researchers ample opportunity to present their results, leaving time for discussion, and focusing not just on present-day findings from this invaluable data set but also on how to leverage them best for future space- and ground-based explorations of the early universe. ✿



HARALD EBELING of the University of Hawai'i's Institute for Astronomy is an expert in X-ray cluster surveys and a developer of image-analysis software. PRIYA NATARAJAN is a professor of astronomy and physics Yale University, where she maps dark matter and dark energy via gravitational lensing. JEAN-PAUL KNEIB works on cosmological surveys at the EPFL Laboratory of Astrophysics in Switzerland.

Honolulu Weather Forecast 3–4 August 2015

MONDAY, 3 AUGUST

Morning	Afternoon	Evening
Sunny	Sunny	Clear skies
0% chance of rain	0% chance of rain	0% chance of rain

TUESDAY, 4 AUGUST

Morning	Afternoon	Evening
Scattered clouds	Scattered clouds	Scattered clouds
20% chance of rain	40% chance of rain	17% chance of rain

Extended forecast: Current forecasts indicate that category 2 Hurricane Guillermo will reach O'ahu on Wednesday or Thursday, 5 or 6 August, bringing heavy rainfall and 40 mph gusts. A high surf advisory with a warning of rip currents for east-facing shores of O'ahu was issued on Sunday, 2 August, and will remain in effect until at least 6 pm on Tuesday. Source: Weather Underground.

Kaiʻaleleiaka — THE MILKY WAY

Issue 2 — 4 August 2015


Wally Pacholka / AstroPics.com

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WELCOME ADDRESS

Exploring the Heavens, Discovering Our Humanity

A transcript of remarks by the NSF Director at the General Assembly Opening Ceremony.

By FRANCE A. CÓRDOVA

Let me thank President Kaifu, President Urry, and Director Hasinger for their invitation to deliver the inaugural address of this XXIX General Assembly of the International Astronomical Union.

[Sandy Schaeffer, National Science Foundation]

It is a great honor to represent the Obama Administration at this historic event. As an astrophysicist myself, I am delighted to say "aloha" to my fellow IAU members and welcome all of you to this meeting.

I am also honored to represent the National Science Foundation — the premier U.S. basic scientific research agency and one of the world's leading institutions in astronomy.

For more than six decades, NSF-funded researchers and facilities have been exploring the most intriguing mysteries of the heavens. Today, among those mysteries are the origin and evolution of stars and galaxies, the formation of solar systems, the existence of habitable planets, and the nature of dark matter and dark energy.

And what do we seek to discover from our observations of the heavens?

"To know the unknowable" — this quote will be familiar to native Hawaiians.

In my own case, as a girl I had an early yearning to understand the mysteries of the universe. I didn't know what astrophysics was, but I had always loved looking at the night sky and asking, "Why are there stars? How are they formed? Why are there so many — and no more? Why are some bright, while others are barely visible?"

Thinking about those questions resonated with me, as I am sure it does with you.

I started my career as an X-ray astronomer. Some years later, I was honored to become NASA's first female chief scientist.

And let me take this opportunity to congratulate our NASA colleagues for the spectacular success of their New Horizons Pluto Mission — talk about new mysteries to solve!

As New Horizons has so vividly reminded us, people everywhere have a deep-seated yearning to understand the universe in which we live.

In October 2009, President Barack Obama invited a group of astronomers to the White House to mark the International Year of Astronomy, the 400th anniversary of Galileo's first use of a telescope to observe the night sky.

The President has long emphasized the study of science and astronomy in order to increase understanding of the natural world — and to

Kaiʻaleleiaka THE MILKY WAY

EDITORIAL

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encourage greater scientific cooperation across national borders.

Nobel Prize-winning chemist Ei-ichi Negishi, in his 2010 speech accepting the award, said "The final reward for any researcher is to see his or her lifetime of work extend beyond academia and laboratories, into the mainstream of global society where it can breathe hope into the world."

Isn't that the goal that all of us in the global research community strive to achieve? And let me add that the U.S. is proud to partner with many countries around the world in exploring the heavens.

Basic research is the primary focus of the National Science Foundation, including astronomical breakthroughs that have changed our understanding of the universe.

One significant NSF-funded effort resulted last year in University of Hawai'i at Mānoa astronomer Brent Tully being awarded the 2014 Gruber Cosmology Prize and the 2014 Victor Ambartsumian International Prize.

Dr. Tully led an international team of astronomers in defining the contours of the supercluster of galaxies containing our own Milky Way.

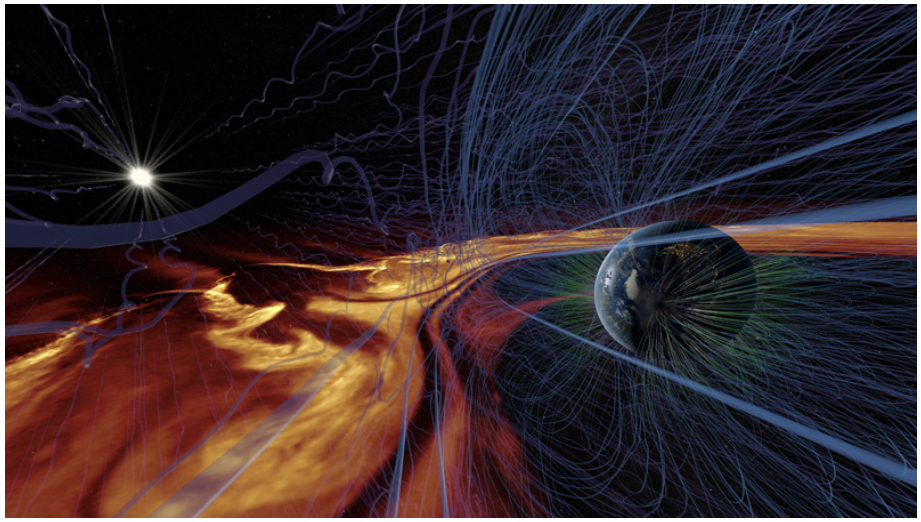
Those astronomers named the supercluster "Laniakea," meaning "immense heaven" in Hawaiian, to honor Polynesian navigators who used knowledge of the heavens to voyage across the immense Pacific Ocean.

The name was suggested by Nawa'a Napoleon, an associate professor of Hawaiian language at Kapi'olani Community College.

One new significant challenge for the National Science Foundation is the enormous increase in raw research data resulting from vastly increased computational capabilities — also known as "Big Data."

The growing field of machine learning — in which computers learn from large data sets and find patterns that humans don't easily recognize — has great long-term implications for astronomy.

For example, the image at right is from "Solar Superstorms," an ultrahigh-resolution demonstration that takes viewers into the magnetic fields and superhot plasma surrounding the Sun as it produces dramatic flares, violent solar tornadoes, and coronal



[National Center for Supercomputing Applications]

mass ejections.

This groundbreaking scientific visualization is based on computations from the NSF-supported supercomputing initiative, Blue Waters, at the National Center for Supercomputing Applications at the University of Illinois.

As dramatic as the visualization is, it is only a hint of the advances Big Data may produce in years ahead.

While the National Science Foundation is widely recognized as our nation's premier basic scientific research agency, we find there are more international partnerships emerging that enable NSF to extend our ability to produce significant scientific research.

We have found that global collaborations accelerate the progress of science and improve health, security, and prosperity throughout the world.

For example, the Atacama Large Millimeter/submillimeter Array — or ALMA — telescope has received more than $1 billion in investments from a broad international coalition including Europe, East Asia — led by Japan — and Chile, with North American funding led by NSF.

ALMA is providing a testing ground for theories of star birth and stellar evolution, and solar system and galaxy formation.

A remarkable ALMA image of the young star HL Tau and its

protoplanetary disk reveals multiple rings and gaps that herald the presence of emerging planets as they sweep their orbits clear of dust and gas.

Another significant NSF partnership involves the Gemini team of twin 8.1-meter optical/infrared telescopes on Cerro Pachón in Chile and on Maunakea here in Hawai‘i.

The International Gemini Observatory is a partnership of the U.S., Canada, Australia, Brazil, Argentina, and Chile, as well as the University of Hawai‘i as the host of the northern site. The Republic of Korea joined the partnership in 2015 as a limited-term collaborator and is expected to become a full partner in 2017.

Gemini’s capabilities — full-sky coverage, rapid response to transients, agile scheduling, and specialized optics — enabled it to capture an image of the Kronberger 61 nebula, showing an ionized shell of expelled gas resembling a soccer ball. Incidentally, the nebula was named for an amateur astronomer in Austria.

The image was made by the Gemini Multi-Object Spectrograph — GMOS — on the Gemini North telescope on Maunakea.

Another cutting-edge, NSF-supported observatory is the Daniel K. Inouye Solar Telescope, now under construction on Haleakalā. This next-generation solar telescope represents a collaboration of 22 institutions, reflecting a broad segment of the solar-physics community.

Once completed, it will be the premier ground-based solar observatory. Thanks to the people of Hawai‘i, It will enable astronomers everywhere to glean new insights into solar phenomena, including what are the mechanisms responsible for solar storms that ultimately affect the Earth.

Furthermore, we expect that this increased understanding of the Sun will help protect vital space-based assets — such as communication and weather satellites and the power grids here on Earth.

The top recommendation of the 2010 National Academy of Sciences decadal survey of astronomy was the Large Synoptic Survey Telescope — LSST — which is now under construction on Cerro Pachón in Chile. Just a few months ago, I participated in the exciting “first stone ceremony” to launch LSST construction.

[Large Synoptic Survey Telescope]

LSST will be a wide-field “survey” telescope that photographs the entire available sky every few nights. Advanced computers will gather and analyze the millions of gigabytes of data LSST will generate each year.

A pilot project called the Deep Lens Survey uses imaging from NSF’s four-meter telescopes to suggest what half a degree of sky will look like when LSST is in operation, projected to begin in 2022.

An innovative citizen-science program will involve people of all ages in LSST discoveries, making discovery opportunities available to K-12 students as easily as to the professional astronomer. This is just one example of NSF’s commitment to engaging the public in the thrill of discovery and increasing public understanding of scientific research.

Far from the 2,700-meter high Cerro Pachón in Chile lies NSF’s IceCube Neutrino Observatory at the Amundsen-Scott South Pole Station in Antarctica.

IceCube is the world’s largest neutrino detector and is among the most ambitious scientific construction projects ever attempted. It searches for neutrinos from the most violent astrophysical sources: exploding stars, gamma-ray bursts, and cataclysmic phenomena involving black holes and neutron stars.

[HAWC Gamma-Ray Observatory / Jordanagoodman]

The highest-energy neutrino ever observed by IceCube, with an estimated energy of 1.14 peta-electron-volts (PeV), was nicknamed "Ernie" by IceCube physicists.

I recently attended the inauguration of the High Altitude Water Cherenkov — or HAWC — gamma-ray observatory near Puebla, Mexico.

HAWC represents a unique partnership between the National Science Foundation, the U.S. Department of Energy, and CONACYT — Mexico's National Council of Science and Technology. HAWC will give scientists a new window for detecting and recording gamma rays and cosmic rays emitted by black holes, merging neutron stars, streams of hot gas moving at close to the speed of light, and other exotic phenomena in the universe.

HAWC will monitor approximately two-thirds of the sky every 24 hours with unprecedented sensitivity to the highest-energy gamma rays. HAWC will complement the operations of NASA's Fermi Gamma-ray Space Telescope and the VERITAS gamma-ray observatory.

It will also be part of the growing field of "multi-messenger astrophysics" that includes cosmic ray observatories, IceCube, and the Advanced Laser Interferometer Gravitational-Wave Observatory.

Finally, I would like to say a few words about the beautiful setting that the IAU chose for its first General Assembly in the U.S. in nearly three decades.

No doubt the IAU was attracted by Hawai'i's breathtaking beauty, unique cultural heritage, and aloha spirit of its friendly people — all great reasons for holding this assembly here.

The National Science Foundation — and many other scientific institutions worldwide — come to partner in scientific research at an extraordinary site.

With its biodiversity on land and in the surrounding oceans, its unique geological history and formations, and its high volcanic peaks, Hawai'i is one of the Earth's great scientific treasures. It is a treasure that all of us want to see honored, preserved, and protected.

The National Science Foundation has partnered with the people of Hawai'i and Hawaiian institutions for many years and takes seriously its responsibilities to be a good steward of Hawai'i's unique natural resources and cultural heritage — and to be respectful of Hawai'i's people and customs.

We hope to continue our partnerships in order to create opportunity for the next generations of seekers of knowledge — for many years to come.

Let me again thank the International Astronomical Union for the opportunity to be with you for this historic General Assembly. Just as the universe knows no borders, the science community's exploration of its mysteries has always been an international endeavor. We look forward to the promise of even greater cooperation among nations and institutions as we expand scientific understanding of this endlessly fascinating challenge.

Again, I wish you all a productive meeting. Mahalo! ✿

Astrophysicist FRANCE A. CÓRDOVA is Director of the National Science Foundation in Washington, D.C. A former NASA Chief Scientist, she has served in top leadership positions at Purdue University in Indiana and at the Riverside and Santa Barbara campuses of the University of California. The slides from her General Assembly welcome address will be available on the NSF website later this week.

New Office to Support International Schools for Young Astronomers

By ODDBJØRN ENGVOLD

The International Schools for Young Astronomers (ISYA) is an essential and highly valued educational program of the IAU. Normally three weeks long, ISYAs are international postgraduate schools for regions where students have fewer opportunities to be directly exposed to up-to-date astrophysics. The schools are intended for young astronomers who are mainly — but not exclusively — from astronomically developing countries and who have already finished their first-degree studies. The main objective of ISYAs is to provide participants with exposure to modern astrophysics through lectures from an international faculty on selected topics of astronomy, seminars, practical exercises and observations, and exchange of experiences.

Since the first ISYA in 1967, 36 have been organized in 24 countries. The number of students per school has varied between 30 and 50, representing between 5 and 25 different nationalities in the host regions. The current success of the ISYA program is a result of dedicated organization and efforts by a number of individuals under the leadership of the ISYA Director, Jean-Pierre de Greve, and Deputy Director, Kam-Ching Leung.

Group photo from the 2013 ISYA held in Indonesia. *[ISYA]*

Locations where ISYAs have been held once (red stars), twice (blue stars), or three times (purple stars) since 1967. *[ISYA]*

The IAU wishes to establish a robust financial and organizational basis for this highly valued educational program. To this end, the Norwegian Academy of Sciences and Letters' financial contributions to the ISYAs since 2009 allowed the IAU and NASL to establish an Office for Young Astronomers (OYA). The OYA is a virtual office, housed at the NASL in Oslo, Norway, consisting of a Steering Committee with overall responsibility for program operations. An IAU Vice-President chairs the Steering Committee; other members are the ISYA Director and Deputy Director, a representative from NASL, and the President of IAU Division C, Education, Outreach, and Heritage.

The objective of this new OYA is to strengthen the overall organization of the ISYAs by functioning as a supporting structure for the Director and working with the local organizers of each individual school. The schools are organized each year by invitation

of a host country, and the individual ISYAs are prepared in close collaboration with local organizations. The ISYA Director and the local organizer determine the curriculum for each school, in agreement with the OYA Steering Committee. Strong involvement of the local organizers and community of the individual ISYAs will be essential to ensure positive follow-up and growth afterwards.

The establishment of the OYA is one of the latest projects in a history of collaborations between the IAU and the NASL. The IAU Executive Committee has long advised the NASL on appointments of new committee members for the international Kavli Prize in Astrophysics, and the NASL has provided financial support for the ISYAs and for the Young Astronomers Luncheons at recent IAU General Assemblies — including the one at this GA. ✿

ODDBJØRN ENGVOLD was IAU General Secretary from 2003 to 2006 and Chair of the Kavli Prize Committee in Astrophysics from 2008 to 2012. He is Professor Emeritus at the Institute of Theoretical Astrophysics, University of Oslo, Norway.

IAU NATIONAL REPRESENTATIVE BUSINESS MEETING

Votes, Rules & Dues: A World of Policy

By INGE HEYER, *Kaiʻaleleiaka*

The IAU national representatives met on Monday morning, 3 August to discuss public interaction and engagement, voting rules, Union finances, and Union membership.

While traditionally astronomical objects and features have been named by committees of the IAU, the public has more recently been invited to help name the two most recently discovered moons of Pluto, features on Pluto's surface, craters on Mercury's surface, and exoplanets around other stars. This new trend invites more worldwide participation of the public in astronomical nomenclature.

The current elected members of the Special Nominating Committee were named at the Business Meeting, together with 12 candidates proposed by the Division Presidents. The election rules stipulate that there can be only one member from any given country elected to the Committee. It is also desirable to have diversity in both gender and geography. The Committee consists of the current IAU President, the former President, one member appointed by the Executive Committee, plus four members selected from among the 12 candidates by the national representatives next week. There was some discussion on procedure, given that the United States has several candidates, whereas other countries have only one each. Some mechanism needs to be devised to ensure that the "one member per country" rule is adhered to.

The Finance Committee had sent out a detailed financial report to the national representatives earlier via email. Special expenses were mentioned at this meeting, such as one-off expenses for the restructuring of the Divisions and Commissions, as well as seed funds for projects related to the International Year of Light 2015. Ongoing special expenses were incurred for the Office for Astronomy Outreach (OAO) and the Office of Astronomy for Development (OAD). The IAU uses electronic banking, ensuring that all necessary personnel have access, yet maintaining the security of two independent auditing procedures done by outside auditors. It is vital that this system is robust to successive elected officials, yet flexible enough to adapt to changing circumstances.

It was noted that most of the expenses went toward education (24%), science (16%), and the General Assembly (14%), rather than to operations. The Finance Committee will need membership

How to Say It in Hawaiian

- Makai: toward the sea; the ocean side
- Aloha ʻāina: love of the land; to nurture and care for the land
- Kāne: man
- Wahine: woman
- Hale: house, home, building
- Wikiwiki: fast, speedy

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 ʻokina, signals a glottal stop. Source: Hawaiian Words.

approval for a 2% increase in the budget for the next three years. The members will also have to elect two new Committee members from among three candidates.

A lively discussion ensued around the topic of dues, specifically how much each member country pays to the IAU. The countries are sorted into dues categories, depending on the number of astronomers, the country’s Gross Domestic Product, and its state of economic development. However, this scheme may not always ensure equitable results. For example, although the United States pays much higher dues than Egypt, the dues per member for Egypt are about 20 times higher than for the U.S. It was suggested that a serious discussion about this needs to occur at the 2018 GA in Vienna, Austria, and that a Working Group consisting of members from countries in different dues categories should be formed to study this issue.

The question was raised if there were quotas for each country for IAU membership. The answer is “no, definitely not,” though some countries apparently don’t wish to have too many members for fear that they might be moved into a higher dues category.

The Membership Committee, which controls the nominations process for new members, reported that it had received 1,275 nominations from 49 countries, 93% of which were accepted. An example of a reason for rejection is insufficient experience because the Ph.D. is too recent. While the IAU has certain criteria for membership, individual national committees often add their own rules, some of which are not transparent. The United States is the only country with its own application form. It was suggested that countries should spell out their nomination criteria on their websites, in order to make the process more transparent. The only rule stipulated by the IAU at this time is that candidates have a Ph.D. related to astronomy. The U.S. requires in addition that the Ph.D. is held for three years before applying for IAU membership.

IAU national representatives listen to presentations on public engagement, voting rules, financial accounting, and membership issues. *[Inge Heyer]*

IAU President Norio Kaifu, former IAU President Robert Williams, and IAU General Secretary Thierry Montmerle facilitated the presentations and discussions. *[Inge Heyer]*

Complicating this process is the fact that many people, especially younger ones, move to different countries for professional reasons. While national committees are tasked with keeping track of their members, members relocating or leaving the field makes this task rather difficult. The IAU will not remove any member from its rolls unless requested to do so by that member.

The session adjourned with action items of studying the voting procedures to ensure adherence to the rules, voting in new members for several committees by the national representatives, and investigating in greater detail the issue of dues categories. ✿

Scenes from the IAU GA Opening Ceremony

The IAU XXIX General Assembly in Honolulu officially began with a traditional Hawaiian chant by Daniel Akaka Jr. *(upper left, accompanied by his daughter)* on Monday afternoon, 3 August. Attendees packed into Ballroom B of the Hawai'i Convention Center then heard welcome addresses from numerous dignitaries, including IAU President Norio Kaifu *(bottom left)*, Hawai'i Governor David Ige *(upper right)*, and NSF Director France Córdova *(top center)*. All photos are by Babak Tafreshi (twanight.org) except for those of Akaka and Kaifu, which are by *Kai'aleleiaka*'s Pamela L. Gay.

Hawai‘i and the Thirty Meter Telescope

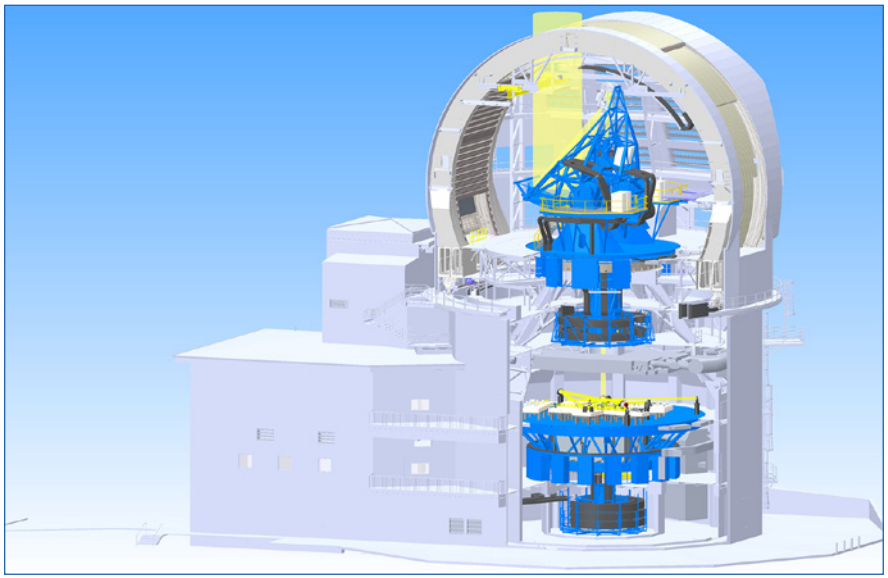
Some thoughts on the Maunakea controversy from the President of the AAS.

By C. MEGAN URRY

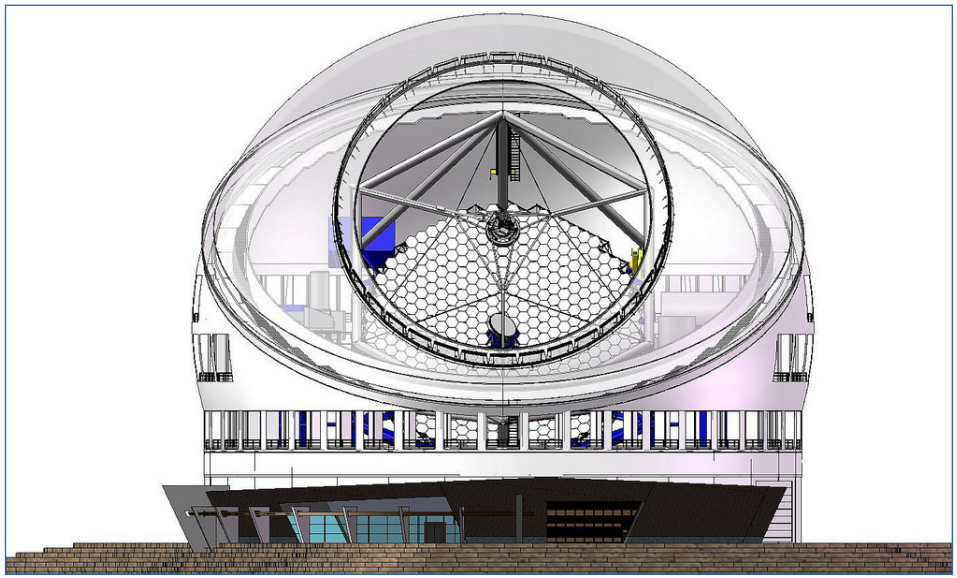
Over the century since the IAU was founded, new telescopes have contributed enormously to our understanding of the universe in which we live. We now know that it mostly consists of the simplest atoms, hydrogen and helium; that atoms essential to life, like carbon, nitrogen, and oxygen — including every such atom in our bodies — were produced inside stars and distributed into space by stellar eruptions and explosions; that most stars like our Sun host planets, some of which are very similar to Earth (rocky and in the habitable zone); that our universe is rapidly expanding; and that the dominant constituent of the universe today is not matter at all but some mysterious kind of energy or anti-gravity that in the current epoch is accelerating the expansion.

Starting with the invention of the telescope by Dutch opticians in the early 1600s, each subsequent technical improvement in astronomers' ability to observe the universe has led inexorably to new discoveries. In modern times, such improvements have included larger telescopes, more sensitive detectors, careful selection of the best observing sites, and improved resolution with adaptive optics.

It is so appropriate that IAU's XXIX General Assembly is in Hawai‘i, home to some of the world's most important telescopes. Maui's Haleakalā summit hosts the innovative Pan-STARRS sky-survey telescope and the forthcoming Daniel K. Inouye Solar Telescope, while Hawai‘i Island's Maunakea summit, one of the very best astronomical sites in the world, hosts the world's largest, most powerful telescopes for studying our galaxy and beyond. The preeminence of Maunakea as an astronomical site



[L. Phelps / Daniel K. Inouye Solar Telescope]



[Thirty Meter Telescope]

A twilight view of the Gemini North Observatory on the summit of Maunakea. Visible behind Gemini is the Canada-France-Hawai'i Telescope, or CFHT. *[Gemini Observatory]*

comes from the smooth airflow over its summit, its height above the usual cloud cover, and its isolation from city lights and air pollution — and it is the only site for a next-generation telescope to view the northern skies.

But, of course, the summits of Hawai'i's mountains are not the exclusive domain of astronomers — they are a shared space of central importance to the people of the islands and to a culture about which I continue to learn. As an astronomer, it is perhaps easiest to focus on the value of mountaintops for astronomy. But we also are driven by a desire to know more about the world around us, and not just in astronomical terms.

The Pan-STARRS 1 Observatory atop Haleakalā on Maui, with Maunakea (left) and Maunaloa on Hawai'i Island visible in the background. *[Rob Ratkowski, © 2009 PS1 Science Consortium]*

Now, as we meet here in Honolulu, we have a wonderful opportunity to listen and learn from local communities about their views of Maunakea and Haleakalā and their most important priorities. I am optimistic that we will learn from each other and be the better for it.

The IAU program is of course focused on astronomy. But astronomers in attendance have several opportunities to listen and learn. On Tuesday morning, a press conference called by a local protest leader, Lanakila Mangauil, will be held in front of the Hawai'i Convention Center. The Common Ground talks organized by the Hilo-Hamakua Community Development Corporation, featuring many local leaders and astronomers talking about Maunakea and the Thirty Meter Telescope (TMT), are another valuable source of information.

Disagreement or conflict is never comfortable, at least not for me. But we should remember that difference carries the seeds of learning and innovation. It is no coincidence that the greatest civilizations arose at the intersections of trade routes, where different peoples encountered new ways of thinking. When we talk to ourselves, we don't learn anything new, so we don't make progress. We need to talk with, and listen to, others.

I am optimistic that astronomers and local communities can together find common ground and move forward in the spirit of aloha. Let us all remember that a broad community reveres Maunakea and that the wishes of one group need not preclude the wishes of another. Let us learn more about each world. Let us find ways to work together for the benefit of all humanity. ✿

MEG URRY is President of the American Astronomical Society and a professor of astrophysics at Yale University in New Haven, Connecticut.

SPLINTER MEETING

Hawai‘i Astronomy: Past, Present, and Future

By PAUL COLEMAN, GÜNTHER HASINGER & MARY BETH LAYCHAK

The summits of Maunakea and Haleakalā are among the best astronomical observing sites in the world, and as a result they now host the largest collection of modern observatories ever assembled. A significant fraction of global astronomical research can be directly traced to Hawai‘i-based facilities, which are geographically at the nexus of leading scientific and economic arenas in North and South America, Asia, and Australia.

The two summits have attracted world-class facilities and astronomers to Hawai‘i and have generated strong collaborations with institutes all over the globe. The unprecedented growth over the last 45 years has allowed astronomy to become one of the State of Hawai‘i’s economic engines. Interestingly, astronomy has always been an important and defining part of Hawaiian culture. Today’s extraordinary fusion of modern astronomical expertise in one of the world’s most remote archipelagos is, in the eyes of many, a tribute to the traditions of the past.

Splinter Meeting — Hawai‘i Astronomy: Past, Present, and Future		
2:00 to 6:00 pm, Room 313B, Hawai‘i Convention Center		
Time	**Title**	**Speaker**
2:00 pm	Astronomy in Hawai‘i (pre-contact/contact)	Paul Coleman
2:25 pm	Unique Seeing Conditions on Maunakea	Mark Chun
2:50 pm	Adaptive Optics on Maunakea	Olivier Lai
3:15 pm	CSO Pioneering the Way to ALMA	Ted Bergin
3:40 pm	Coffee Break	
4:10 pm	Subaru Strategy as Cosmology Machine (HSC & PFS)	Nobuo Arimoto
4:35 pm	Daniel K. Inouye Solar Telescope on Haleakalā	Jeff Kuhn
5:00 pm	The TMT and Its Benefits for Hawai‘i	Mike Bolte
5:25 pm	Future Astronomy and a Pan-Pacific Observatory	Doug Simons

This IAU General Assembly offers an ideal opportunity to present the depth and breadth of connections of astronomy to Hawai‘i’s past, present, and future. The splinter meeting “Hawai‘i Astronomy: Past, Present, and Future,” to be held in Room 313B today, 4 August, will provide a venue for a diverse group of participants to share the rich history of astronomy in Hawai‘i. Topics will include current front-line research efforts and facilities and the vision for the future of astronomy in Hawai‘i.

The session begins with a talk by Paul Coleman from the University of Hawai‘i’s Institute for Astronomy on pre- and post-contact astronomical observations of Native Hawaiians. The

session progresses through the unique seeing conditions of Maunakea that contribute to its premier stature among observational sites worldwide and the utilization of those conditions to advance astronomy through adaptive optics and the precursors to the next-generation telescopes now in development. The second half of the session looks at the future of astronomy in Hawai'i with the Daniel K. Inouye Solar Telescope on Haleakalā, the Thirty Meter Telescope on Maunakea, and beyond. The session speakers have deep ties to astronomy in Hawai'i and represent some of the leading astronomical voices in the state. ✿



[Jennifer Boyd]


PAUL COLEMAN is an astrophysicist at the institute for Astronomy (IfA) and a member of the Kuali'i Council, a group of Native Hawaiians at the University of Hawai'i's Mānoa campus. GÜNTHER HASINGER is Director of the IfA. MARY BETH LAYCHAK manages outreach programs at the Canada-France-Hawaii Telescope.

INVITED DISCOURSE 1

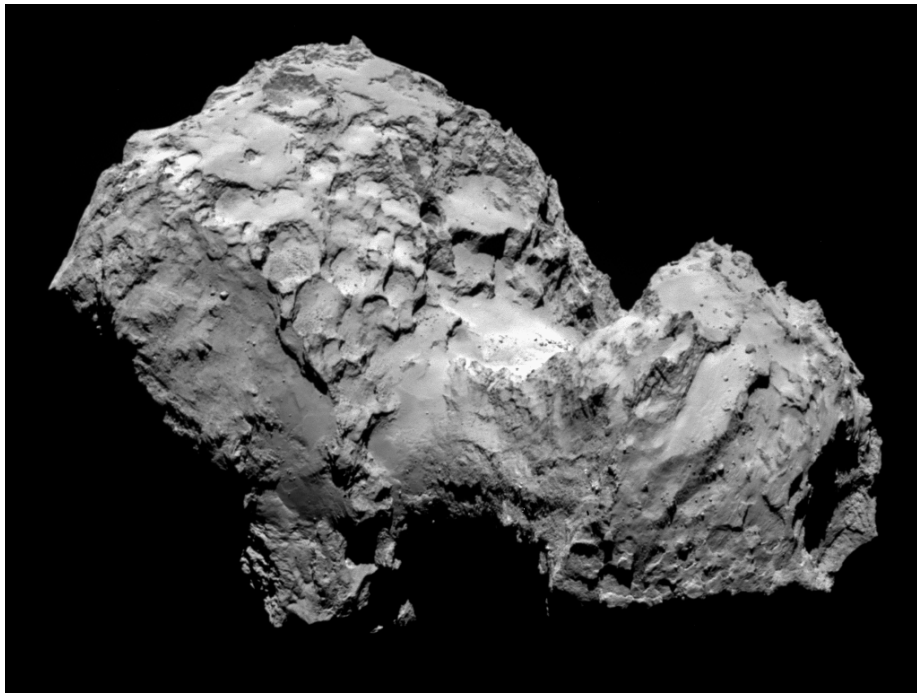
Rosetta and the Origin of the Solar System

By WILLY BENZ

Even though thousands of exoplanets have been discovered, our solar system remains undoubtedly special. Not only is it our home, but it is also the only system in which planetary and smaller bodies can be studied remotely by robotic explorers or analyzed in a laboratory via sample-return missions. Therefore, while exoplanets provide a measure of the existing diversity of planets, our solar system remains a unique testing ground for our understanding of planet formation and evolution.

Among all the small bodies, comets have always received particular attention. Besides at times providing magnificent displays in the sky — which historically were interpreted either as good or bad omens — we know today that comet nuclei are actually leftovers from the formation of the solar system, stored at large distances from the Sun for billions of years. By chance, some of these bodies manage from time to time to enter the inner regions of the solar system, thereby providing us with opportunities to study the building blocks of our own planetary system.

The European Space Agency (ESA) Rosetta spacecraft, which is following the comet 67P/Churyumov-Gerasimenko along its orbit, delivers for the first time a snapshot in time of a comet



The nucleus of comet 67P/Churyumov-Gerasimenko on 3 August 2014, as seen from a distance of 285 kilometers (177 miles) by the Rosetta orbiter. *[ESA]*

Invited Discourse 1 — Peter Gruber Memorial Lecture: Rosetta and the Formation of the Solar System	
Speaker	Willy Benz (University of Bern, Switzerland)
Date	Tuesday, 4 August
Time	6:00 to 7:30 pm
Location	Ballroom B, Hawai'i Convention Center

nucleus and its full-time dependent evolution as it approaches the Sun. With the lander Philae hopping on the surface of the comet, capturing the imagination of scientists and the public alike, the mission has been a unique success. Just like the stone that gave the name to the mission, the wealth of data recorded should help astronomers decipher the 4.5-billion-year-long story of our solar system.

Reconstituting the formation of our solar system from the data collected by visiting a handful of comet nuclei, even now for an extended period of time, is a difficult challenge. It is only when these data are coupled with the many advances made over the past few years, in particular the discovery of exoplanets, that a consistent scenario is slowly emerging.

Dust and gas, planetary migration, instabilities, collisions, and material properties all seem to have helped shape our solar system into what it is today. Multidisciplinary approaches are therefore essential to make sense of the story that is being told by space missions and ground-based telescopes that are exploring objects in our own planetary system and in the ones beyond. Even if we have not yet gotten to the end of it, this story is fascinating indeed! ✿

WILLY BENZ is a professor and institute director at the Physics Institute at the University of Bern, Switzerland, and president of the Space Science Advisory Committee of the European Space Agency.

IAU SYMPOSIUM 317 PLENARY

The Milky Way, the Galactic Halo, and Halos of Galaxies

By ORTWIN E. GERHARD

The Milky Way, "our" galaxy, is currently the subject of intense study with many ground-based surveys in anticipation of upcoming results from the European Space Agency's Gaia mission. From this work we have been learning about the full three-dimensional structure of the galactic box/peanut bulge, the distribution of stars in the bar and disk, and the many streams in the galactic halo. These data tell us that most of the galactic bulge formed from the disk, and that a large fraction of the galactic halo has been accreted from outside.

Similarly, in many external galaxy halos there is now evidence for tidal streams and accretion of satellites. To see these features requires exquisite data — mostly very deep photometry, but some halo substructures have also been found with kinematic data. These observations illustrate how galaxy halos are still

IAU Symposium 317 Plenary: The Milky Way, the Galactic Halo, and the Halos of Galaxies	
Speaker	Ortwin E. Gerhard (Max Planck Institute for Extraterrestrial Physics)
Date	Tuesday, 4 August
Time	8:30 to 10:00 am
Location	Ballroom B, Hawai'i Convention Center

growing and sometimes can be used to date (approximately!) the accretion events. In comparison with cosmological simulations, these fossils of past events that appear in the structure of galaxy halos vividly illustrate the hierarchical nature of our universe. ✿

ORTWIN E. GERHARD is a group leader at the Max Planck Institute for Extraterrestrial Physics in Garching, Germany. His research interests include stellar dynamics and galactic structure, galaxy formation and evolution, and the nature and distribution of dark matter.

WORKSHOPS

Center for Astronomy Education Comes to the GA

By GINA BRISSENDEN & EDWARD E. PRATHER

The Center for Astronomy Education (CAE), at the University of Arizona's Steward Observatory in Tucson, was established in 2004 to improve the teaching of college-level science courses. CAE is dedicated to helping current and future astronomy, Earth-science, space-science, and physics instructors create effective and productive active-learning classrooms.

The CAE has worked to create a national community of practice with more than 4,000 members who have access to a wide range of resources. These include the CAE Teaching Excellence Workshops, Short Courses, and Regional Teaching Exchanges; the online academic peer-mentoring group AstroIrner@CAE; and research-validated instructional and assessment materials.

Members of the CAE have been national leaders in investigating the difficulties that students have in reasoning about concepts in astronomy, Earth, space science, and physics. Their work has informed many instructional strategies proven to improve students' knowledge, skills, and reasoning abilities in these science domains. In collaboration with science educators across the United States, CAE researchers have developed several research-validated assessment methods and tools to evaluate the effectiveness of classroom instruction.

The CAE has provided one of the most comprehensive professional development programs for astronomy and space-science educators in the United States:

- More than 3,000 instructors, postdocs, graduate students, and education and public outreach professionals have participated in CAE workshops and short-courses;
- Participants have come from every U.S. state (plus Washington, D.C.), Puerto Rico, Canada, South America, Europe, Asia, and Africa;
- CAE educational professional development events have been held in nearly three-quarters of U.S. states;
- More than 25,000 students use instructional and assessment materials developed by the CAE in hundreds of classrooms each year.

For the first time ever, the CAE is bringing its professional

We Need More Classroom Astronomers!

Astronomy and Hawai'i share a long and deep connection. The IAU General Assembly affords a great opportunity for Hawaiian schoolchildren to interact with astronomers from around the world.

Public schools are already in session, and teachers representing more than 2,000 students have invited GA attendees to come share a talk or activity with them. So far, we have only enough volunteers to serve a quarter of these requests.

If you're willing to spend an hour in a classroom while you're in Honolulu, please sign up at on the conference website. We can reimburse your local travel costs. Questions? Contact me at rgal@ifa.hawaii.edu.

— Roy Gal (Institute for Astronomy, University of Hawaii)

In 2013 the CAE held a special Teaching Excellence Workshop on Hawai'i Island for rising stars in astronomy, Earth science, and space science — an elite group of graduate students and postdocs dedicated to excelling as educators. *[Wayne Schlingman]*

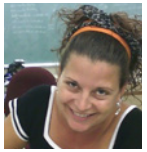
development efforts to an IAU General Assembly. We cordially invite you to attend one of three different short courses, all being held from 10:00 to 11:30 am in Room 318B:

1. Tuesday, 4 August: Best Teaching Practices for Using Think-Pair-Share/Peer Instruction
2. Wednesday, 5 August: Best Teaching Practices for Using Lecture Tutorials
3. Thursday, 6 August: Best Teaching Practices for Using Animations and Simulations

By participating in these workshops, you will learn ways to help your students increase their conceptual understanding and critical-thinking abilities and to better be able to interpret discipline representations, reason about quantitative data, and appropriately predict and explain physical outcomes.

You will be provided with experiences that have been shown to help instructors increase their implementation knowledge and abilities. You will also have ample opportunity to put your new knowledge to use during several microteaching events in which you will assess and critique many different examples of using these instructional strategies.

The CAE's professional development programs are sponsored and supported by the NASA Exoplanet Exploration Program. ✿



GINA BRISSENDEN is Associate Director of the Center for Astronomy Education (CAE) at the University of Arizona, Tucson, and serves as AAS Education and Outreach Coordinator. ED PRATHER is Executive Director of the CAE and outgoing AAS Education Officer. He was recently awarded the Astronomical Society of the Pacific's 2015 Richard H. Emmons Award for excellence in college astronomy teaching.

WORKSHOPS

Improve Your Teaching Skills

Several short courses precede the first meeting of the IAU Working Group on Astronomy Education.

By TIMOTHY F. SLATER

Everyone knows that the IAU provides a unique opportunity for scientists from across the planet to work together to do astronomy. What you might not know is that the IAU also provides numerous opportunities for astronomers to become better astronomy teachers. Several intensive teaching-improvement workshops are scheduled throughout the first week of the

General Assembly for scientists interested in enhancing their teaching skills and expanding their teaching toolkits.

At 10:00 am on Tuesday, 4 August, in Room 318B, Ed Prather and his colleagues will demonstrate how astronomy professors can improve class discussion by asking students to vote on astronomy questions, just like the GA did in 2006 when categorizing Pluto as a dwarf planet. Following, from 12:30 to 3:30 pm, Stephanie Slater and her colleagues will provide a hands-on workshop on teaching non-science students how to mine online astronomy databases to conduct authentic research. Participants are encouraged to bring their laptops to that workshop. The following day, at 10:00 am on Wednesday, 5 August, also in Room 318B, Ed Prather's team will teach attendees how to reallocate lecture time to more effective, collaborative group-learning activities.

Sky, a 20-year-old hyacinth macaw from Brazil, spent Monday hanging out in the Speaker Ready Room (317A), supervising the upload of speakers' presentations. He may come back another day, or he may send one of his friends. If you happen to encounter a magnificent feathered creature in Room 317A, be sure to keep your fingers to yourself. Among his many talents, Sky can easily and instantly crack raw Macadamia nuts with his beak. *[Lisa Idem, AAS]*

Later in the week, at 10:00 am on Thursday, 6 August, in Room 318B, Ed Prather and his colleagues will show how digital animations, movies, and simulations can be used to improve students' understanding of complex ideas in astronomy. At 10:30 am that same day, in Room 328, Sharon Schleigh and her colleagues will teach professors interested in improving their astronomy courses how to educate students in the art of scientific argumentation.

At Keaukaha Elementary School on Hawai'i island, Stephanie Slater teaches a class about the solar system. *[Inge Heyer]*

All of these open-attendance teaching workshops are leading up to the education-focused Division and Commission meetings held on Friday of the first week and Monday of the second week. These meetings look and feel much like the science-specific subgroup and Working Group meetings occurring at the GA but are completely dedicated to improving the understanding of astronomy across the globe.

Finally, on Tuesday, 11 August, the first meeting of the IAU Working Group on Astronomy Education: Research on Theory & Methods will be held. Chaired by Paulo Bretones, this group is charged with creating an international database of astronomy education research, much of which is not published in traditional venues, and with planning IAU Symposium 326, "Future Directions of Astronomy Education Research," to be held 3-7 October 2016 in Heidelberg, Germany. The Working Group meeting is open to any registered GA attendee interested in international astronomy education research, IAU member or not.

Taken together, these activities reflect the enormous interest the IAU community has in working collaboratively on enhancing teaching in order to improve the world's enthusiasm for astronomy. ✿

TIM SLATER is the University of Wyoming Excellence in Higher Education Endowed Professor of Science Education and serves as the editor of the *Journal of Astronomy & Earth Sciences Education*.

FOCUS MEETING 3

Scholarly Publication in Astronomy: Evolution or Revolution?

By LANCE D. UTLEY

Do you want a peek at what's next in scholarly publishing? Do you have an unrealized need or service you've always wished astronomy publishing offered? Are you excited about the opportunity to grow collaboration between the professions of publishing, astronomy, and librarianship? Focus Meeting 3 is the place to gain new insight into what's evolving in scholarly publishing.

Scholarly publishing is an indelible part of academic astronomy, but it is ever changing. Technology, government mandates, institutional pressures, and individual preferences are all driving new publishing paradigms for sharing information. The need to adapt while maintaining quality in publishing provides opportunities for astronomers, librarians, and publishers alike, particularly in partnership with each other. Focus Meeting 3 (FM 3) is a venue for anyone interested in the future of scholarly publishing in astronomy.

FM 3 offers attendees the chance to peek behind the scenes of the publishing industry and discover what new things are ahead. Our invited speaker, Jeffrey Beall, a noted expert on open access and predatory publications, will provide an analysis of publishers whose motivations are not rooted in the pursuit of academic quality and research integrity. Other talks will also focus on what publishers do behind the scenes and on what their operations cost, how publishers are adapting to offer new services to the scientific community, and publishers' perspectives on what the future of scholarly publishing has in store.

One of the growing demands on scholarly publication is the need for openness between the published work and the data related to the work. Tying data to the published work isn't a new demand in astronomy, but it's one that is surging in large part due to government mandates for transparency. Talks will also detail how scientific publishing can add value and deliver greater impact through integrating other media with the published text, how these media should inter-operate, what challenges arise in making publications more dynamic, and how these needs inform next-generation publishing.

Partnership opportunities abound as scientific publishing evolves. Astronomers, publishers, and librarians have a long history of collaboration between one group and another, but perhaps less so as a larger community across all three disciplines. Librarians are already involved in many of the institutional

Focus Meeting 3 — Scholarly Publication in Astronomy: Evolution or Revolution?	
Start date	Wednesday, 5 August
End date	Thursday, 6 August
Oral sessions	Room 320, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Coordinating Division	Division B: Facilities, Technologies and Data Science

For details on presenters, topics, and times see the online program or mobile app.

Big Data initiatives, some of which will be discussed in FM 3. As publishers create new opportunities to bring data to the scholarly literature, the larger community can work together to evolve scholarly astronomy publishing in a way that makes it more dynamic without losing integrity. Presenters will discuss ways librarians can enhance author attribution, author and institutional impact factors, and bibliometric tools to evaluate how effective new paradigms are on the quality of the research record.

FM 3 will also feature a panel discussion in which publishers, astronomers, and librarians can gain insight into each other's perspectives and how roles can evolve to best support one another. ✿

LANCE UTLEY is a librarian with the National Radio Astronomy Observatory in Charlottesville, Virginia. He edited the proceedings of the 2012 meeting of the IAU Division XII Commission 5 Working Group on Libraries, held in Beijing, China.

SPLINTER MEETING

Identification of the Diffuse Interstellar & Unidentified IR Bands

By FRED JOHNSON

It took 60 years of experimental research to discover a complete solution to the identity of the chromophores responsible for the diffuse interstellar bands (DIBs) and unidentified infrared (UIR) bands.

Come to this Splinter Meeting on Wednesday, 5 August, from 1:30 to 4:30 pm in Room 326B, to explore the methodology utilized and the surprises encountered while conducting this research. Several implications will go against the grain of present-day cosmology. There were indeed many unexpected surprises that finally led to the solution of a long-standing astronomical enigma.

Enormous efforts are presently under way using large telescopes and advanced spectroscopic techniques to measure these DIBs — all to no avail in providing a solution, thus far. One of the reasons for these failures is traceable to Mother Nature's trickery: With few exceptions the majority of the more than 400 DIBs are observed as absorption bands, but in reality they arise from fluorescence signals that are lost in the interstellar fluffy dust cocoons. The transmitted radiation therefore has missing energy, and thus the signals will appear as absorption bands.

Honolulu Almanac 🐟 4 August 2015

Sunrise / set	6:06 am / 7:09 pm
Twilight[1] start / end	4:46 am / 8:29 pm
Moonset / rise	10:34 am / 10:44 pm
Moon phase[2]	❍ Waning gibbous (77% illum.)
Evening planets[3]	Jupiter (W), Saturn (SSW)
Morning planets[3]	—

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

Many questions remain, and important implications will be addressed at the session:

- Where and are how are these complex molecules produced?
- How did they end up in the interstellar medium?
- What are the implications of the chromophore identification on the early evolution of the solar system? ✿

FRED M. JOHNSON is Emeritus Professor of Physics at California State University, Fullerton. He chaired the physics department at the university and is a Fellow of the American Physical Society.

COMMISSION H3

A New IAU Commission: Planetary Nebulae

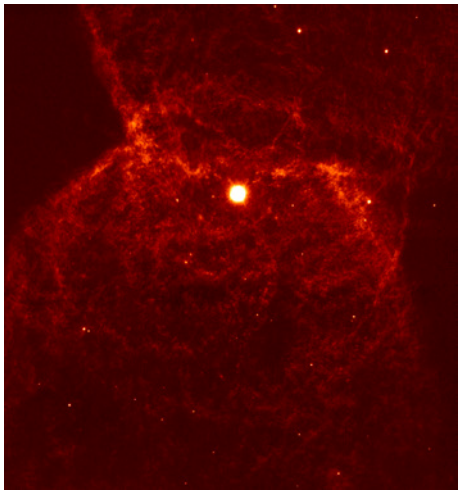
By LETIZIA STANGHELLINI

The IAU has recently approved a new Commission, H3, "Planetary Nebulae." Previously, the Planetary Nebulae Working Group represented this field within the IAU, organizing periodic Symposia.

The field of planetary nebula research, while focused, does interconnect with many areas of astronomical exploration and astrophysical interpretation. Planetary nebulae are tools and probes in astrophysics. In a broad sense, it is very difficult to do astrophysics without knowledge of them, and vice-versa. This goes well beyond the interest of the objects themselves, which are nonetheless remarkable.

The founders of the Commission H3 are You-Hua Chu (Taiwan), Arturo Manchado (Spain), Silvia Torres-Peimbert (Mexico), and me. With the support of Sun Kwok (Hong Kong) and the IAU Planetary Nebulae Working Group, we are working toward continuing the field's traditions, exploring new avenues of research, and exploiting interconnections between planetary nebula research and other science fields.

Commission H3 will propose and organize general and focused Symposia, engage the international student community, and work toward the publication of a Commission white paper. To this end, the IAU Planetary Nebulae Commission is ideally suited to solicit feedback from the community via broad surveys and other specific actions. ✿



This new image of planetary nebula NGC 2346 from one of the Gemini 8.1-meter telescopes shows unprecedented resolution of the molecular hydrogen gas. *[Gemini Observatory]*

LETIZIA STANGHELLINI is an associate astronomer at the National Optical Astronomy Observatory in Tucson, Arizona. She has worked on a variety of planetary-nebula subjects, both galactic and extragalactic, since the 1980s and is the President of the new IAU Commission H3, Planetary Nebulae.

SPLINTER MEETING

Celebrating Radio Astronomy's Golden Years

By KEN KELLERMANN

The 1960s were truly the golden years of radio and radar astronomy. That decade saw a number of major discoveries that transformed our understanding of the universe and its contents. Discoveries included quasars, pulsars, the cosmic microwave background (CMB), cosmic masers, radio recombination lines, interstellar molecules, extragalactic radio source variability, and the rotation of Mercury and Venus.

The 1960s also heralded a new generation of radio telescopes: the Parkes 64-meter dish, the Haystack 37m dish, the Green Bank 42m and 91m dishes, and the Owens Valley Radio Observatory interferometer. The latter made the first full aperture-synthesis observations, introduced the CLEAN algorithm, and completed the first very-long-baseline-interferometry observations. Interestingly, the major discoveries listed above and the introduction of these large dishes were unrelated events. The scientific breakthroughs were mostly serendipitous, and often occurred while observers were looking for something else, and theory played little or no role.

To mark the 50th anniversary of these discoveries, the IAU Working Group on Historical Radio Astronomy has organized two sessions: Wednesday, 5 August, 10:30 am – 12:30 pm and 4:00 – 6:00 pm in Room 328. Sessions will include a series of historical talks, often given by the history makers themselves.

Jocelyn Bell-Burnell at the 4.5-acre telescope at Mullard Radio Observatory in England. *[University of California, Berkeley]*

Jocelyn Bell-Burnell will reflect on her discovery of pulsars, and Dave Jauncey will discuss the circumstances surrounding the Parkes Telescope's 3C 273 lunar-occultation observations that led to the discovery of quasars by Maarten Schmidt. Jim Moran will review how high angular, temporal, and spectroscopic resolution led to the recognition of cosmic masers. Bob Wilson will discuss the events that led to his and Arno Penzias's discovery of the CMB. Jack Welch and Richard Wielebinski will talk about the astrochemistry of interstellar molecules and cosmic magnetism, respectively. Sergei Gulyaev and Leonid Gurvits will describe how Western scientists were initially skeptical of the Russian discovery of radio recombination lines and radio source variability. In addition, Ron Ekers will review the impact of the new generation of user-oriented radio telescopes and how they changed the culture of astronomy, and of radio astronomy in particular.

The Historical Radio Astronomy Working Group will also hold an open session on 5 August from 2:00 to 3:30 pm. This session will include a brief business meeting and three contributed papers: Tony Tyson will describe Karl Jansky's relatively unknown 1937 return to radio astronomy, Miller Goss will describe his discovery of the original data from Joe Pawsey's 1945 detection of the million-degree solar corona, and George Miley will discuss the scientific and political impact of the Jodrell Bank Long Baseline Interferometer. ✿

KEN KELLERMANN is the chair of the C40/C41 Working Group on Historical Radio Astronomy and a Senior Scientist at the National Radio Astronomy Observatory in Charlottesville, Virginia.

PUBLIC TALK

In Losing Sight of the Land, You Discover the Stars

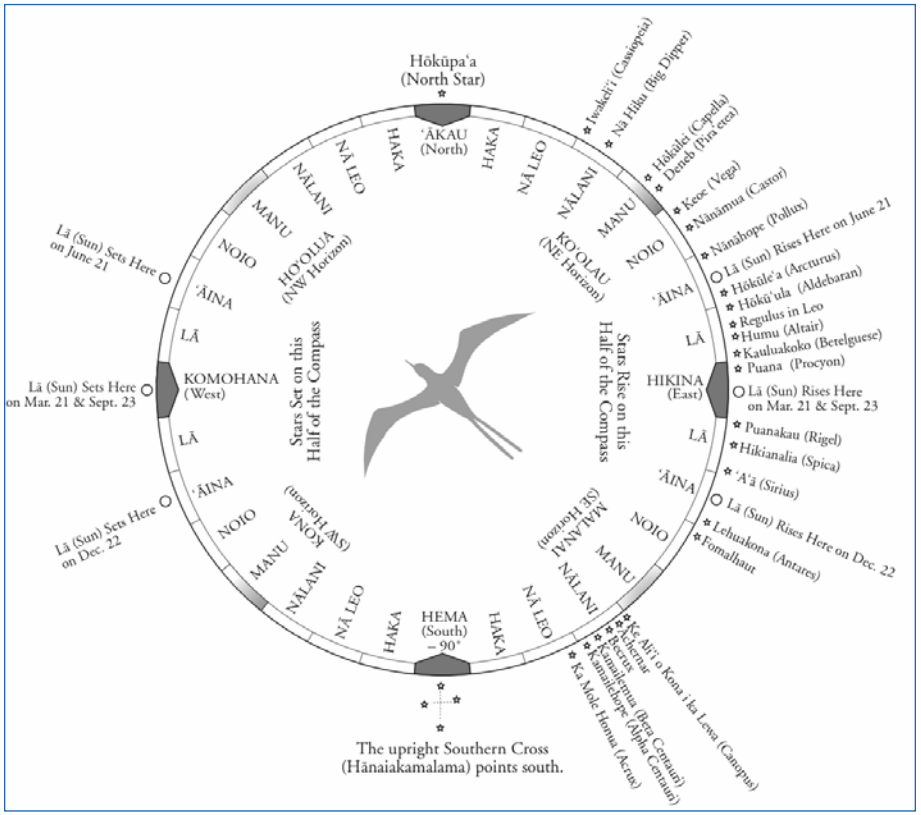
Native Hawaiian Chad Kālepa Baybayan sees wayfinding as a way of living.

By IRIS NIJMAN, *Kaiʻaleleiaka*

Chad Kālepa Baybayan, born on Maui and captain and navigator of the Hawaiian deep-sea voyaging canoes Hōkūleʻa, Hawaiʻiloa, and Hōkūalakaʻi, will give a public talk on the indigenous system of orientation and navigation at sea on Tuesday evening, 4 August.

Baybayan is an expert in ancient ways of navigation without modern instruments and Navigator in Residence at the ʻImiloa Astronomy Center of Hawaiʻi, where he develops wayfinding activities, curricula, and education materials. The ʻImiloa Astronomy Center is a gathering place that advances the integration of science and exploration, indigenous culture, and the wonders of astronomy to inspire and give hope to generations. Indeed, Baybayan, who has a master's degree in education, wants to engage learners and educators of all ages to explore the universe and realize their full potential. Baybayan first started sailing in 1975, when he was 19, and has since sailed on all the major voyages of Hōkūleʻa throughout the South Pacific, along the West Coast of North America, and around Micronesia and Japan. In 2007 Baybayan and four other Hawaiian men were initiated into the Order of Pwo, a 3,000-year-old society of master deep-sea navigators by their teacher, Master Navigator Mau Piailug, on the island of Satawal. During all his years of sailing, Baybayan learned the skill of navigation and seamanship from qualified navigators on the canoe. But he learned more than how to navigate without the use of instruments of charts; he integrates all he has learned into the general philosophy of wayfinding. "Wayfinding is a natural orientation process that uses surrounding environmental clues — Sun, Moon, stars, waves, and animals — to help set direction," says Baybayan in a National Geographic interview. As quoted on the website Hawaiian Voyaging Traditions, Baybayan calls wayfinding "a way of organizing the world; a way of leading, of finding a vision; a set of values; a way to take care of the Earth," and, in general, "a model for living my life." Baybayan says that the key to wayfinding is to employ a set of

Chad Kālepa Baybayan, ʻImiloa's Resident Navigator. *[ʻImiloa Astronomy Center]*



This Hawaiian star compass can be used for navigation. All the stars have a house: the place where they come out of the ocean and go back into the ocean. If you can identify the stars as they rise and set, and if you have memorized *where* they rise and set, you can find your direction. *[Nainoa Thompson, "On Wayfinding," Hawaiian Voyaging Traditions]*

values, like a strong background in ocean sciences, oceanography, meteorology, and environmental sciences. You need to know how to run a ship and get a cohesive crew that works together with deep respect for each other. You need vision, planning, training, discipline, and aloha for others. "After a while, if you apply all those values, it becomes a way of life," he says.

Today the ancient philosophy of wayfinding is finding its way from the ocean to the shore, as lessons learned at sea are now being applied to the land. "Here in Hawai'i we are surrounded by the world's largest ocean," says Baybayan on the Hawaiian Voyaging Traditions site. "But Earth itself is also a kind of island, surrounded by an ocean of space. In the end, every single one of us — no matter what our ethnic background or nationality — is native to this planet. As the native community of Earth we should all ensure that the next century is the century of pono — of balance — between all people, all living things, and the resources of our planet." ✿

Public Talk: He Lani Ko Luna, A Sky Above	
Speaker	Chad Kālepa Baybayan, 'Imiloa Astronomy Center
Date	Tuesday, 4 August
Location	Ballroom B, Hawai'i Convention Center
Time	7:30 to 8:30 pm

Regular registered attendees of the IAU GA will be admitted upon showing their meeting badges. Registered guests, anyone with an Exhibit Hall Only badge, and unregistered members of the public must register online.

Honolulu Weather Forecast 4–5 August 2015

TUESDAY, 4 AUGUST		***High: 86°F/30°C Low: 75°F/24°C***
Morning	**Afternoon**	**Evening**
Sunny	Sunny	Scattered clouds
0% chance of rain	15% chance of rain	45% chance of rain
WEDNESDAY, 5 AUGUST		***High: 85°F/29°C Low: 75°F/24°C***
Morning	**Afternoon**	**Evening**
Scattered clouds	Scattered clouds	Scattered clouds
35% chance of rain	50% chance of rain	25% chance of rain

Extended forecast: Guillermo has weakened from a category 2 hurricane to a tropical storm and will reach O'ahu on Thursday, bringing heavy rainfall. A high surf advisory with a warning of rip currents for east-facing shores of O'ahu was issued on Sunday and will remain in effect until at least 6 pm on Tuesday. Source: Weather Underground.

Kai'aleleiaka THE MILKY WAY

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INTERNATIONAL YEAR OF LIGHT 2015

COSMIC LIGHT IAU

GRUBER COSMOLOGY PRIZE LECTURE I

Concordance Cosmology and Dark Matter

By JEREMIAH P. OSTRIKER

Cosmology is in a rather happy state at present. Due to a combination of observational advances made possible by rapidly advancing technology and the application of fundamental physical theory, we now have a model for the universe that has passed every test that we can set for it: the Lambda cold dark matter (ΛCDM) model.

The model states that cold dark matter (CDM) is the basic source of gravity holding the universe together, while dark energy (denoted by the Greek letter Lambda) is pushing it apart. For most of cosmic history gravity was winning, but now the dark energy seems to be the dominant force and is causing galaxies to accelerate away from one another.

Whenever there is a more powerful telescope or a new range of wavelengths utilized to study the cosmos, predictions are made on the basis of the ΛCDM model. It has been an amazing two decades since this model was proposed, and its parameters have since been refined to an ever higher degree of accuracy.

Dark matter was first proposed in the 1930s by the brilliant and eccentric Swiss astronomer Fritz Zwicky using studies of clusters of galaxies. Over the decades these measurements grew stronger and were supplemented by many other diagnostics based on galaxy rotation curves, gravitational lensing, the growth of structure and the microwave background, with all metrics giving essentially the same answer: Dark matter is between 20% and 25% of the critical density of the universe – more abundant than the ordinary baryonic chemical elements by a factor of four or five!

Despite decades of research, we still don't know what dark energy and dark matter are. For dark energy, Einstein's much reviled cosmological constant does seem to be a perfect fit to the data. But for the dark matter, we have been looking for a fundamental particle and so far all efforts to detect it have failed.

However, there are tantalizing clues. On the smallest scales (kilo-parsecs and smaller) there are fewer galaxies and their dark matter densities are lower than expected. Warm dark matter, which would produce structures deviating from those made by cold dark matter on small scales in this fashion, is an example of a mild variant of the standard ΛCDM model that is currently being studied. But it is too soon to take any of the variants as either serious candidates for CDM or competitors to it. Stay tuned! ✿

JEREMIAH (JERRY) P. OSTRIKER is a theoretical astrophysicist who, after his Ph.D. with S. Chandrasekhar at the University of Chicago, has spent most of his career at Princeton University and is now teaching at Columbia University. He is one of the winners of this year's Gruber Cosmology Prize, which was awarded at the opening ceremony of the IAU General Assembly.

Kai'aleleiaka THE MILKY WAY

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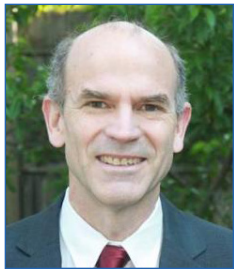
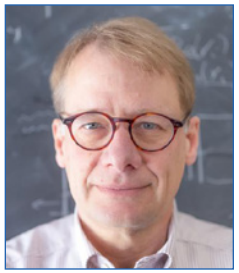
GRUBER COSMOLOGY PRIZE LECTURE II

The Cosmic Microwave Background: Where We Are and Where We're Headed

By JOHN CARLSTROM & LYMAN A. PAGE Jr.





Since the discovery of the cosmic microwave background (CMB) 50 years ago, increasingly sensitive and accurate measurements of it have given us unique insights into the origin, composition and evolution of the universe. Measurements of the CMB provide evidence for a quantum mechanical origin of all the structure in the universe and are consistent with the theory of cosmic inflation, leading to a fertile connection between cosmology and the frontiers of physics, between the largest and smallest size scales, and between the lowest and highest energy scales.

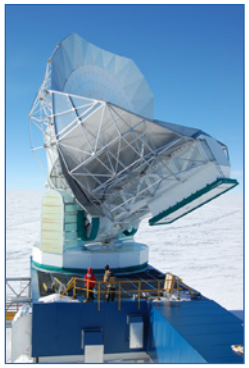
Measurements of the CMB provide the precise foundation for the now standard Lambda cold dark matter (ΛCDM) model of cosmology, a model that accounts for all cosmological observations. (See Jeremiah P. Ostriker's article above for more information.)

There is much more to learn from the CMB. For example, CMB polarization measurements soon will be sufficiently advanced to provide precise independent checks of the results from the temperature anisotropy. Furthermore, both anisotropy spectra are sensitive to the number of neutrino species (as well as any unknown light relativistic species) and their masses. The impact of the cosmic neutrino background on the CMB spectra has been detected at high confidence. Future measurements will provide stringent tests of our understanding of particle physics. The CMB already provides the best limit on the sum of the neutrino masses and should soon have sufficient sensitivity to determine the masses, providing critical information on the neutrino mass hierarchy.

There may be new significant component to the standard model that we have simply missed due to the lack of sensitivity. If the early universe produced gravitational waves through quantum fluctuations they would leave a distinctive imprint on the CMB, the so-called "primordial B-mode polarization," making it possible to image the quantum gravity fluctuations. While the level expected from some of the simplest models of the early universe has been ruled out, there are well-motivated models that suggest it may be within an order-of-magnitude in amplitude below the current upper limits.

On finer angular scales, the CMB is rapidly becoming a powerful tool for measuring evolution of structure in the universe. Hundreds of galaxy clusters have been discovered via the thermal Sunyaev-Zel'dovich (SZ) effect in the last few years and soon there will be many

thousands, providing a nearly redshift-independent, mass-limited sample. The initial detections of the kinematic SZ effect will eventually lead to mapping of the universe in momentum, as opposed to density. Measurements of the gravitational lensing of the CMB will be used to constrain the growth of structure, and by correlating with other surveys, such as galaxies, to assemble a 3D tomographic picture of the universe.



The 10-meter South Pole Telescope at the NSF Amundsen Scott Research Station *[John Carlstrom]*

The Atacama Cosmology Telescope on Cerro Toco in the Atacama Desert, Chile. *[Lyman Page]*

Page and Carlstrom lead the Atacama Cosmology Telescope (ACT) in the Chilean Atacama Desert, and the South Pole Telescope (SPT) projects, respectively. These are the two largest telescopes dedicated to observations of the CMB. They cover over half the sky at arc minute resolution. Each has thousands of state-of-the-art polarization-sensitive cryogenic detectors. Combined, the teams comprise well over 100 exceptional faculty, researchers, postdocs, graduate students, and undergraduates from around the world. They do everything from developing the crucial detector systems to devising new algorithms for reducing multi-terabyte data sets to precise maps, to extracting the cosmological constraints. Currently both teams are working on major upgrades that will increase dramatically the sensitivity and speed of these telescopes for pushing the frontier of this exciting field over the next several years, while also pointing the way to an even more ambitious CMB program in the future. ✿

JOHN E. CARLSTROM is Professor of Astronomy and Physics at the University of Chicago, Illinois, where he is also the Deputy Director of the Kavli Institute for Cosmological Physics. LYMAN A. PAGE Jr. is the James S. McDonnell Distinguished University Professor of Physics and Department Chair at Princeton University. Carlstrom and Page are two of the winners of this year's Gruber Cosmology Prize, which was awarded at the opening ceremony of the IAU XXIX General Assembly.

FOCUS MEETING 4

Planetary Nebulae as Probes of Galactic Structure and Evolution

By ROBERTO MENDEZ, LETIZIA STANGHELLINI & MIRIAM PEÑA

Surprisingly, we have discovered more planetary nebulae (PNe) in other galaxies than we have found in our own. What are the reasons for this? Historically, the first motivation to target searches beyond our galaxy was related to their potential for distance determination. The planetary nebula luminosity function (PNLF) was empirically shown to have a constant bright end, which allows it to be used as a standard candle. Twenty-five years ago, the PNLF distances were among the first to point to a Hubble constant near 70 km/s/Mpc, subsequently confirmed with

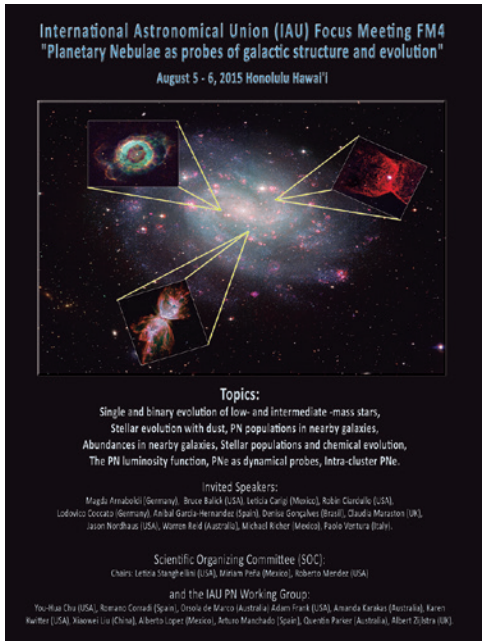
Focus Meeting 4: Planetary Nebulae as Probes of Galactic Structure and Evolution	
Start date	Wednesday, 5 August
End date	Thursday, 6 August
Oral sessions	Room 313B, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Coordinating Divisions	Division H: Interstellar Matter and Local Universe Division G: Stars and Stellar Physics Division J: Galaxies and Cosmology
For details on presenters, topics, and times see the online program or mobile app.	

other techniques. We are still trying to understand why the PNLF works so well as a distance indicator. This will eventually lead us to new knowledge of single- and double-star evolution.

PNe can be used as probes of the intermediate-age stellar population in our galaxy and beyond; their chemical abundances are relatively easy to measure, and they are formed during a definite stage of stellar evolution, which means they can be associated to a specific progenitor mass range. The populations of galactic and Magellanic Cloud PNe have been studied in detail by spectroscopic means to determine the metal distribution in our galaxy and in the Magellanic neighbors.

Moving now to harder observational goals, we have started measuring chemical abundances in more distant extragalactic PNe. What limits can we impose on galaxy formation by merging the observed metallicity gradients in galaxies with a variety of morphologies? This kind of project will eventually need the light-collecting power of 30-meter-class telescopes, but it is time to discuss preliminary strategies, models, and observations.

It was clear from the very beginning that extragalactic PNe would be excellent kinematic probes of the stellar populations they represent. As soon as new, more efficient slitless methods for radial velocity measurement were implemented, this potential was exploited. We know of a few flattened elliptical galaxies that show a Keplerian decline of line-of-sight velocity dispersion with projected distance from the galaxy center, opening a way to learn about dark matter distribution or the presence of radial anisotropy in the velocity dispersion. We need empirical ways to decide which of the two interpretations (or three, if we include Modified Newtonian Dynamics) is correct.



We also know of elliptical galaxies where PNe indicate a clear presence of dark matter, in agreement with other techniques (e.g., X-ray emitting gas, or globular clusters). This indicates that PNe are indeed reliable kinematic probes.

As a forum to discuss and define the above topics, we are holding Focus Meeting 4: Planetary Nebulae as Probes of Galactic Structure and Evolution (FM 4) at this IAU General Assembly. FM 4 is chaired by Letizia Stanghellini, Miriam Peña, and Roberto Mendez, and is mostly about extragalactic PNe. However, some studies of the population of PNe in our galaxy are illuminating, so we will also have presentations about, for example, deep echelle spectrophotometry and Gaia astrometric observations. ✿



ROBERTO MENDEZ is Research Astronomer at the Institute for Astronomy, University of Hawai'i. LETIZIA STANGHELLINI is an Associate Astronomer at the National Optical Astronomy Observatory. She is the President of the IAU Commission 34 Working Group, Planetary Nebulae. MIRIAM PEÑA is a researcher at Instituto de Astronomia, Universidad Nacional Autonoma de México.

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FOCUS MEETING 6

X-ray Surveys of the Hot and Energetic Cosmos

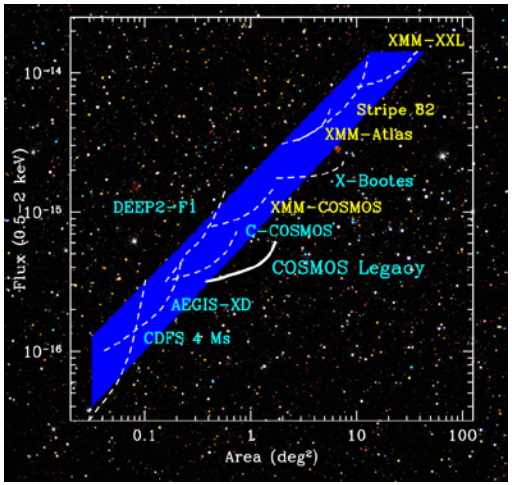
By ANDREA COMASTRI

X-ray surveys are playing a key role in our understanding of the hot and energetic component of our universe. Since their launch in 1999, both the XMM-Newton and Chandra surveys have transformed our understanding of the sources of the cosmic X-ray background, shedding light on their cosmological evolution and the physical processes shaping their properties.

Detailed investigations of the physics and evolution of X-ray-selected sources were addressed with massive observations along the entire electromagnetic spectrum (such as the COSMOS, ECDFS, and AEGIS surveys). X-ray-survey science is still actively pursued by the scientific community and well received by the XMM and Chandra Time Allocation Committee, which has recently granted major programs (e.g., the Chandra Ultradeep 7Ms Survey in the Chandra Deep Field-South, the 3Ms COSMOS Legacy Survey, and the large-area surveys with XMM: XXL and Stripe 82X).

The 2012 launch of the Nuclear Spectroscopic Telescope Array (NuSTAR), with its advanced imaging capabilities, has provided access to even fainter sources than with previous surveys. The key goal of the NuSTAR surveys is to learn more about the hard-X-ray background and its sources. The Japanese mission ASTRO-H, due for launch in 2016, will also survey the hard-X-ray sky; its broad band coupled with high energy resolution will open an enormous discovery space for a wide variety of objects — particularly accreting black holes and clusters of galaxies.

Starting in 2017 the extended Röntgen Survey with an Imaging Telescope Array (eROSITA) will survey the entire sky, pushing into new energy regimes and revolutionizing our view of the high-energy sky. The detection of very large samples (roughly 100,000 objects) of galaxy clusters out to redshifts of $z > 1$ will allow us to study the large-scale structure in the universe and test and characterize cosmological models including dark energy. eROSITA is also expected to yield a sample of around 3 million active galactic nuclei, providing a unique view of the evolution of supermassive black holes within the emerging cosmic structure.



This figure plots the coverage of various X-ray surveys in area-flux space, with XMM surveys in yellow and Chandra surveys in cyan. The Chandra COSMOS Legacy survey is exploring a new regime outside of that covered by previous surveys (indicated by blue shading). The background is the three-color X-ray mosaic of the C-COSMOS survey. *[Plot: Civano et al. 2015 (submitted). Background: Elvis et al. 2009]*

The title of the IAU Focus Meeting 6 (FM 6), The Hot and Energetic Cosmos, is also the science theme of the European Space Agency's Advanced Telescope for High-Energy Astrophysics (ATHENA) mission, foreseen for a 2028 launch. The mission aims to explore how ordinary matter assembles into large-scale structure and how black holes grow.

The aim of FM 6 will be to review and discuss the recent observational advances obtained by X-ray surveys and complemented by multi-wavelength follow-up programs, alongside progress in theory and simulation. The scientific program, distributed over seven sessions, will touch on most of the "hot and energetic" questions about the physics of clusters of galaxies,

the cosmic evolution of accreting black holes, and the high-energy phenomena in starbursts and normal galaxies. The final roundtable will be chaired by Günther Hasinger, Director of the Institute for Astronomy at the University of Hawai'i, and attended by top-level researchers in the field. This discussion will address the way forward for future missions, including synergies with multi-wavelength facilities. ✿

ANDREA COMASTRI is Staff Astronomer at the Italian National Institute of Astrophysics (INAF) and Director of the Bologna Astronomical Observatory in Italy. He co-chairs the FM 6 Scientific Organizing Committee.

SOFIA: The View from the Stratosphere

By DANA BACKMAN, RAVI SANKRIT & JEONGHEE RHO

Flying at altitudes of 12 to 14 kilometers, above 99% of the water vapor in the Earth's atmosphere, the Stratospheric Observatory for Infrared Astronomy (SOFIA) — a modified Boeing 747SP jetliner carrying a 2.5-meter telescope — is able to observe at mid- and far-infrared wavelengths invisible to ground based observatories.

SOFIA has just returned to its home base in California after a six-week deployment to the Southern Hemisphere. Operating from Christchurch, New Zealand, SOFIA conducted a total of 14 science flights using FORCAST, a mid-infrared camera and grism spectrometer, and GREAT, a high-resolution far-infrared heterodyne spectrograph. An additional flight used the near-infrared camera FLITECAM, the fast optical photometer HIPO, and the FPI+ optical camera to successfully observe the occultation of a bright star by Pluto.

A SOFIA Splinter Session will be held at 6 pm this evening in Room 313B. Science Mission Operations Director Erick Young, Deputy Director Hans Zinnecker, and Deputy Project Scientist Tom Roellig will present the status of the program, describe some recent exciting scientific results, and describe the current 3rd-generation instrument call for proposals.

For more information about SOFIA, visit the German SOFIA Institute (DSI) display in Booth 325-327 in the main exhibit hall, and the SOFIA table within the NASA Science Mission Directorate's exhibit area. Also, members of the SOFIA Science Center staff will highlight SOFIA imaging and spectroscopic results at the NASA "Hyperwall" during both weeks of the IAU General Assembly. ✿

The SOFIA observatory in the air. *[NASA/Jim Ross]*



DANA BACKMAN is the Director of SOFIA's education and public outreach efforts. RAVI SANKRIT is a user support scientist for SOFIA. JEONGHEE RHO is a research scientist at the SETI Institute.

EXPERIMENT IN BOOTH 329

Using Sound to See Better

By WANDA DIAZ MERCED

Late-onset diseases that affect the visual system, such as diabetes and glaucoma, are among the leading causes of blindness in adults in the United States. Unlike children who lose their sight while still young, adults who develop late-onset blindness are often already installed in successful careers. As a consequence they must be retrained to make use of technological accommodations if they are to retain quality of life. This is especially true for adults who have unique visual expertise prior to blindness, say, because they were engineers, scientists, or physicians.

So far, no data-analysis tool, processing tool, or algorithm is more powerful than the human brain for data analysis and pattern recognition. Astronomy searches for the unknown, for the invisible. Searching for cost-effective tools that may be used to bring everyone on board, the IAU Office of Astronomy for Development (OAD) has come across "multimodal perception," i.e., using multiple senses simultaneously. This could be used to improve data analysis, which will help to foster cutting-edge

Volunteer for the Experiment

Wanda Diaz Merced is conducting an experiment to test a tool that uses sound as an adjunct for visual processing, facilitating the identification of signal in noisy data. The tool is designed to enhance your ability to spot low-level features in data and to facilitate data analysis by scientists with impaired vision. This work is part of AOD AstroSense, a program to increase astronomy and science accessibility for individuals with different abilities and learning styles.

Do you work with astronomical data, such as time-series data or spectra that are typically represented as a two-dimensional graph? Are you interested in finding new ways to enhance your abilities to spot low-level features in your data? Then please volunteer for this experiment. Your contribution will help to develop ways to use your hearing capabilities to improve visual detections.

A volunteer tests the experimental tool for Wanda Diaz Merced. *[Iris Nijman, Kaiʻaleleiaka]*

Each iteration will take about 45 minutes of your time, and you will be contributing to a great endeavor. All you need to do is look at graphs on a screen while listening to sounds and press a button on a keyboard when you think you see or hear a pattern. It is like a video game, and people generally find it a lot of fun. Depending on your results, you might be asked to come back for a second iteration. Every day this week, 10 volunteers are needed for the experiments. Please sign up!

Honolulu Almanac 5 August 2015

Sunrise / set	6:06 am / 7:08 pm
Twilight[1] start / end	4:46 am / 8:28 pm
Moonset / rise	11:34 am / 11:31 pm
Moon phase[2]	◑ Waning gibbous (66% illum.)
Evening planets[3]	Jupiter (W), Saturn (SSW)
Morning planet[3]	Mars (E)

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

research capabilities and augment the possibility of discoveries.

The OAD is currently developing ways to put complex astrophysics data into a more interpretable form. This will increase the sensitivity to detect events in space-physics numerical data. As part of the research we evidenced that sound increases sensitivity to visually ambiguous events embedded in different types of time series.

Another phase of the research is investigating the effects of plasticity using sonification (convert a data waveform into the audible domain) in a sample of normally sighted astronomers who have career-related expertise in the visual interpretation of time-series data. Using a multimodal perceptualization and user-centered framework, we will develop training intervention for late-onset blind physicists. ✿

WANDA DIAZ MERCED is a postdoctoral fellow at the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts. Her research on multimodal perception involves collaboration with the IAU Office of Astronomy for Development and the University of Massachusetts, Boston.

Two Cultures, One Mountain

By INGE HEYER, *Kaiʻaleleiaka*

At 10 am Tuesday, 4 August, about 50 local residents assembled in front of the Hawaiʻi Convention Center to raise awareness of cultural and environmental issues and to promote an "aloha ʻāina" march of solidarity and sharing scheduled for Sunday, 9 August, and going from Saratoga Road through Waikīkī to Kapiʻolani Park.

Reporters on the scene were addressed by two principal speakers: Jonathan Osorio and Joshua Lanakila Mangauil, Both stressed that the gathering was not in opposition to the IAU XXIX General Assembly nor to astronomy more generally. They stated that they object to the commercialization of their homeland and to intrusions into their sacred spaces. They feel that Mauna a Wākea, or Maunakea, is a poor choice for the location of telescopes.

Today marks the 133rd day of protesters' vigil on the mountain. Osorio and Mangauil asserted that both the State of Hawaiʻi and the University of Hawaiʻi have failed to protect their sacred land. They said that the sanctity of Maunakea derives not only from cultural and religious values, but also from the fragile nature of its environment. "We all need to feel connected to this place; only then can we begin to take care of it, to serve

The scene outside the Hawaiʻi Convention Center on Tuesday morning. *[IAU/B. Tafreshi, twanight.org]*

and to honor it, and to protect and watch it," they said. "The Hawaiian culture is science-minded; we do not see a divide between culture and science. However, both need to respect

The two principal speakers at Tuesday morning's rally, Jonathan Osorio (left) and Joshua Lanakila Mangauil, answer questions from the media. *[Inge Heyer]*

the land on which they exist."

Piero Benvenuti, the incoming General Secretary of the IAU, said, "We are deeply respectful of the views of all parties on this issue and hope that by engaging in open dialogue, this will encourage a collaborative, positive vision for the future of Maunakea. We support an open exchange of ideas on how science and culture intersect in Hawai'i and around the world."

Ka'iu Kimura, Executive Director of the 'Imiloa Astronomy Center of Hawai'i, offered her own statement: "To create a better, more cohesive and collective vision for the future of Maunakea, we have to listen and understand one another. It's all about relationships. We call on our community to join in having mindful, productive conversations about the future. Together we can find a way to bridge our desire to preserve the majesty of Maunakea with the scientific possibilities that only our mountain can provide." ✿

General Assembly Resolutions Finalized

The four resolutions to be voted on at the Business Meeting of the General Assembly II on Thursday, 13 August, have now been finalized. Only a few minor changes were made to the drafts announced earlier (*Kaiʻaleleiaka* Issue 1). See IAU Announcement 15023 for brief summaries of the resolutions, a link to a zip archive containing PDFs of the complete text, and two related documents. Note that although Announcement 15023 still refers to the resolutions as drafts, the link to the zip archive now points to the final versions. If you'd prefer a shortcut, here's a direct link to the 175-kilobyte zip file. We encourage all IAU members to review the four resolutions carefully before coming to Ballroom B at 4:00 pm Thursday, 13 August, to cast your votes.

Workshop for Journal Authors & Referees

By JULIE STEFFEN

Here's an opportunity that you won't want to miss while you're in Honolulu for the IAU General Assembly: The editors, publishers, and staff of some of the leading journals in the astronomical sciences are offering a workshop for current and prospective authors and referees. It will be offered twice: on Wednesday, 5 August, and Monday, 10 August, from 10:00 am to 3:00 pm in Room 323B of the Hawai'i Convention Center.

Hosting the workshop are the American Astronomical Society (AAS) and Institute of Physics (IOP) Publishing, partners in publication of the *Astronomical Journal* and the *Astrophysical Journal*, *ApJ Letters*, and *ApJ Supplements*; Oxford University Press, publisher of *Publications of the Astronomical Society of*

Japan and Monthly Notices of the Royal Astronomical Society (the latter in partnership with the Royal Astronomical Society in the United Kingdom); and EDP Sciences, publisher of Astronomy & Astrophysics.

Topics include writing a good paper for submission to a journal, representing data, the peer-review process, and a Q&A (question-and-answer) session with journal editors. Lunch will be provided.

There is no cost to attend either workshop, but you must be registered to attend the General Assembly to participate. ✿

JULIE STEFFEN, the AAS Director of Publishing, is based in Tucson, Arizona. Formerly at the University of Chicago Press, she has many years of experience in scientific journal publishing.

ORAL HISTORY PROJECT

Let Us Interview You!

By JARITA C. HOLBROOK

The AAS Historical Astronomy Division (HAD) has been running an oral history project for two years, partially funded by the American Institute of Physics Niels Bohr Library, with ongoing funding coming from the AAS. Throughout the IAU General Assembly in Honolulu, we are conducting oral history interviews with U.S. and international attendees.

Our goal is to interview 60 people during the two weeks of the GA. Each interview lasts 1.5 hours, during which we will discuss your education, career moves and strategies, work-life balance, intellectual preferences, collaborations, reputation, leadership, and mentoring. We like to end with career advice to the next generation. We would like astronomers at all career stages, from graduate student to emeritus, to sign up to be interviewed.

We have a team of five people interviewing from 10:30 am to 9:30 pm, Monday through Friday, in the Ilima Boardroom and Tiare Suite at the Hilton Hawaiian Village. If you are interested in interviewing another astronomer for the project, we have training sessions each Wednesday from 10:30 am to 12 noon in Room 326B of the Hawai'i Convention Center. After training you are welcome to use our equipment and our interview rooms; you just need to schedule a time. It is easiest to interview someone you know, but you can use interviewing as a way to get to know someone new.

Meet the Mentors

The IAU Executive Committee Working Group "Women in Astronomy" and the AAS Committee on the Status of Women in Astronomy are pleased to announce the beginning of our Meet-the-Mentor events. These offer early-career members a chance to meet with leaders in the field to discuss work-life balance, networking strategies, and other issues of concern. Meet-the-Mentor sessions will occur twice daily, at 10:00 am and 2:00 pm, through Wednesday, 12 August. We invite students who haven't already signed up for one to visit the Student Pavilion in the Exhibit Hall to choose an available slot. See the conference website for a PDF list of participating mentors, their areas of career expertise, and which sessions they'll attend. Questions? Contact Francesca Primas or Christina Richey.

To arrange to be interviewed, please fill out our sign-up form. To arrange a time to conduct an interview, please email me.

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.

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Dyas Utomo!

How to Contribute to the Conference Newspaper

Kaiʻaleleiaka 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 Hawaiʻi 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

Australia's Got SPIRIT: Internet Telescopes for Students

By KIRSTEN GOTTSCHALK

Come by the Australian Astronomy booth (#236) in the Exhibit Hall and try your hand at imaging with a research-grade educational telescope located in Perth, Western Australia.

SPIRIT I (13 inches/35 cm) and SPIRIT II (16 inches/43 cm) are two fully automated telescopes designed for educational use by high-school students. They include accompanying curriculum resources and lesson plans, as well as a professional learning program for teachers conducted by the Perth branch of the curriculum support center SPICE.

Both telescopes include multiple filters, and SPIRIT II also includes a low-resolution, web-enabled bright star spectroscope. Full technical details of both telescopes are available on the project's website.

High-school students use SPIRIT to image and track minor planets, to investigate the solar system (including calculating the mass of Jupiter by observing the Galilean satellites), and to get hands-on experience with astronomy research.

Weather permitting (it is winter in Perth), both SPIRIT telescopes will be operational each morning of the first week of the IAU General Assembly from 10:00 am at the Australian Astronomy booth (look for the giant inflatable SKA telescope to find us). There will also be a demonstration of the simple custom-built control system that allows high-school students to operate the telescope and image the sky with almost no learning curve. ✿

KIRSTEN GOTTSCHALK is the Astronomy Ambassador at the International Centre for Radio Astronomy Research in Perth, Western Australia. After completing her studies in astronomy in Australia, she realized her passion was in talking about it rather than doing it, and she hasn't looked back since!

Iranian photographer Babak Tafreshi found an ideal vantage from which to create this stunning panorama of Honolulu and Diamond Head State Monument. Founder of The World at Night, Tafreshi is internationally renowned for advancing the state of the art of landscape astrophotography and time-lapse video. *[IAU/B. Tafreshi, twanight.org]*

STAR PARTY ON THE BEACH

Spotting Saturn and Stars from the Shoreline

By IRIS NIJMAN, *Kaiʻaleleiaka*

A clear night sky, a few telescopes, dedicated volunteers, and an enthusiastic audience: All of the ingredients that you need for a successful stargazing party.

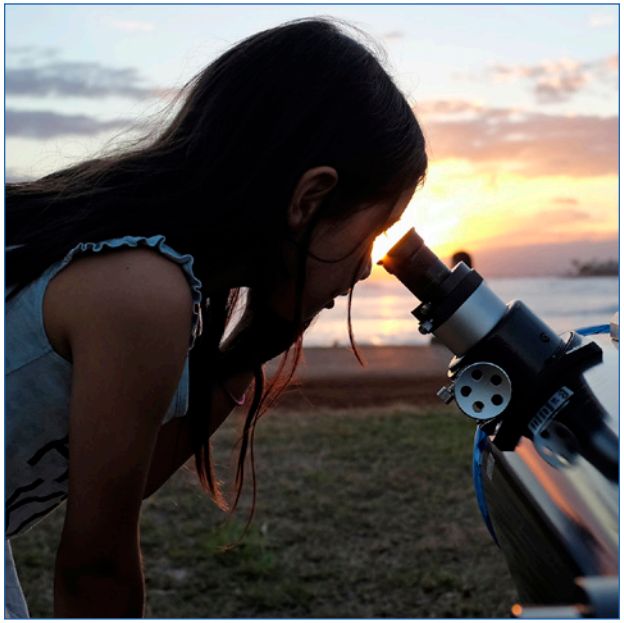
A few hundred people gathered on Monday evening, 3 August, in Ala Moana Beach Park for a stargazing party, organized by the Hawaiian Astronomical Society and the Institute for Astronomy at the University of Hawaiʻi. It was the first in a program of public events organized for the IAU General Assembly.

Stargazing parties are a fantastic way to introduce people to observational astronomy for the first time — and Monday night was no exception. Saturn's ring system is an enthralling sight for everyone, and the planet was high in the sky for the stargazing party-goers. "Wow! It's great that you do this, thank you!" exclaimed one lady after she had seen Saturn for the first time.

Dyron Meck, a member of the Hawaiian Astronomical Society, aimed his telescope at the ringed planet. Being an enthusiastic amateur astronomer, he has bought his own telescope and takes pride in sharing his passion for astronomy with others. "Attending stargazing parties like this is something that I've been doing a lot with my family," he said.

Another volunteer at the park, Mike Lum, a Californian graduate student at the University of Hawaiʻi, aimed his telescope toward star cluster M21 and the Trifid Nebula. "Nebulae are space clouds," he explained to his audience. "Everything we see tonight is located within our galaxy, which is like a thin pizza."

The Institute for Astronomy organizes about 10 stargazing



[University of Hawai'i]

[IAU/B. Tafreshi, twanight.org]

[University of Hawai'i]

events every year. “I love to do this. I wish we did this more often,” said Lum, whose father is Hawaiian. “I moved back to Hawai‘i because of the good Ph.D. program here, and to be close to my family.”

Did you miss this stargazing party? Join the next one on Thursday, 13 August, at sundown in Ala Moana Beach Park. ✿

The Women in Astronomy Luncheon

Finding ways to build on 15.9%.

By PAMELA L. GAY, *Kai‘aleleiaka*

If you look around the IAU General Assembly, you will see women in every arena. From the Executive Committee of the IAU to the youngest postdocs presenting, women are taking part in every scientific, educational, and communications aspect of this meeting. That said, only 15.9% of the IAU membership is female, and women make up only about 30%* of the registrants.

Recognizing the importance of creating a space for these women to gather, the IAU has been hosting a Women in Astronomy lunch for more than a decade. This year’s luncheon, held Tuesday, 4 August, brought together several hundred people (about 90% women) to listen to speakers and to openly discuss the problems that women face within academia.

The luncheon opened with remarks by AAS President Meg Urry, a woman who has over and over again been “the first woman to.” Over the 30 years of her career, she has seen remarkable change in not just astronomy, but in Western culture. How we view sex and gender has expanded, and the need to support diversity in all its forms is becoming embraced, if slowly. As she reflected on not just the hard road of her generation (and the harder road of the prior generation), she acknowledged that progress comes from recognizing that we don’t know everything, from listening, and from continually learning. As we meet here in Hawai‘i, we can take a page from the native Hawaiian people, who embrace individuals whose gender lies between traditional male and female gender roles with the word “mahu.”

AAS President Meg Urry (left) and NSF Director France Córdova. *[Pamela L. Gay, Kai‘aleleiaka]*

Also speaking at the luncheon was the former IAU President Bob Williams and President-Elect Silvia Torres-Peimbert. With very different styles, they both addressed the lack of women in our field and the complexity of finding solutions. As Williams pointed out, some suggested solutions, like quotas, may increase participation of women, while also increasing the cultural issues that drive women out of astronomy. Torres-Peimbert noted the

**Of the 3,181 registered attendees, 2,616 answered the “gender” question, with 788 indicating female.*

percent of women in the IAU, which represents the senior members of our field, has not substantially changed for six years, and we need to purposely work to change this. In the past, she pointed out bluntly, men where part of the problem, but today it is political correct to support women and this will help.

In addition to these speakers, the session also left 30 minutes for table discussions. As this reporter wandered the room, I heard voices that balanced hope and frustration. Table after table echoed the same problems. Women are told the field needs strong leaders, but when we are strong we are called aggressive. Women aren't listened to in meetings and are spoken over. Mentoring too often focuses on how to be appropriately feminine (how to dress and act) to be heard, and not on how to appropriately just do astronomy. Problem after problem was reiterated, but so were desired solutions: group mentoring, senior people to advocate for junior women, and acceptance within the field that astronomers are diverse in gender expression. Things can improve, but, everyone agreed, it will take effort.

Women in Astronomy Scattered Lunch Talks	
All talks are in room 318A from 12:30 to 2:00 pm	
Friday, 7 August	CSWA Survey on Workplace Climate, by Christina Richey
Monday, 10 August	Inclusive Astronomy 2015, by Meredith Hughes
Wednesday, 13 August	Unconscious Bias, by Pat Knezek

The luncheon was organized on behalf of the IAU Executive Committee Working Group "Women in Astronomy," led by Francesca Primas, with help from Christina Richey of the AAS Committee on the Status of Women in Astronomy. More information will be posted on the Women in Astronomy Blog. ✿

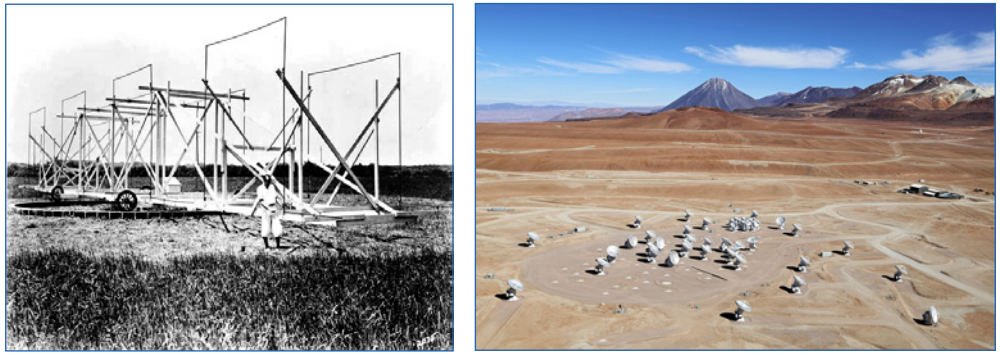
COMMISSION B4

From C40 to B4, It's All Radio Astronomy

By GABRIELE GIOVANNINI

We are now living in a golden renaissance of radio astronomy. The international community is making a phenomenal investment in the development of facilities at a scale that significantly benefits the global community. There are both major enhancements to existing facilities and the development of new facilities. The Atacama Large Millimeter/submillimeter Array (ALMA) represents one of the first truly international radio observatories, and will be followed by the similarly global Square Kilometre Array (SKA).

Radio astronomy observations provide the most sensitive, highest angular resolution, and broadest fractional wavelength coverage observations in modern astronomy. Moreover, we must not forget that from its beginning, radio astronomy has contributed to multiwavelength studies. The



Radio astronomy has come a long way since its primitive early days. In 1931 Karl Jansky used a 14.6-meter rotatable, directional antenna system *(left)* to make the first positive identification of extraterrestrial radio signals. *[NRAO]* Today, more than 80 years later, the 66 7- to 12-meter dish antennas of the sprawling Atacama Large Millimeter/submillimeter Array regularly acquire our most detailed and deep images of the radio sky. *[ALMA (ESO/NAOJ/NRAO)]*

importance of results only obtainable in the radio band (e.g., magnetic fields, radio spectral line emission) indicates that radio astronomy needs to be adequately represented in multi-wavelength astronomy.

The new IAU Commission B4, Radio Astronomy, builds upon the previous IAU Commission 40, which was established in 1948 and played an essential role in growing the radio astronomy community into a mature field. Now Commission B4 brings together scientists and engineers who carry out observational and theoretical research in radio astronomy, and who develop and operate the ground and space-based facilities that are used to explore the universe at radio wavelengths.

Key goals for B4 include the following:

1. Stimulate and support IAU Symposia and other international meetings, especially on cross-disciplinary themes where radio astronomy can play an important role and where work spans more than one facility (e.g., major surveys and science data processing).
2. Connect radio astronomy to the wider astronomy community by making data accessible to non-expert users and by providing tools to use archival radio data within general, multi-wavelength studies that address a broad range of science questions.
3. Place radio astronomy in the broader context of IAU Division B, Facilities, Technologies and Data Science. This includes, connecting radio astronomy to informatics and statistics.
4. Foster discussions and share information on topics of current interest to radio astronomers around the world and provide up to date information on radio science, data, facilities and techniques. Special attention will be devoted to the new radio astronomy bands at ultrahigh frequencies with ALMA and mm-VLBI, and low frequencies with LOFAR, ASKAP, MeerKAT, MWA, and the SKA.
5. Act as an interface between the large number of individuals and groups working in this field and other

Are IAU Members Getting Younger?

On Wednesday, 5 August, you may notice a sizable contingent of rather young people in Exhibit Hall 1. These are not IAU members, but we can hope that in time some of them will be inspired to become IAU members. Right now they are students at local primary and secondary schools, home schools, and camps. With generous support from Associated Universities, Inc., the IAU and AAS have invited these youngsters and their teachers, parents, and counselors to interact with scientists from some of the observatories, organizations, and institutions that have set up displays in the Exhibit Hall. The students will participate in hands-on educational activities and enjoy a unique opportunity to ask questions of astronomers from all corners of the globe. Please welcome them in the spirit of aloha!

The event will repeat on Wednesday, 12 August, with new groups of students. If you brought your family with you to Honolulu and would like your own school-age children to join next week's fun, please email Debbie Kovalsky, the AAS's Exhibits and Sponsorships Coordinator.

— Rick Fienberg, Kaiʻaleleiaka

Students who visited the 224th AAS meeting in Boston, Massachusetts, built millisecond pulsars and observed them spectroscopically using diffraction-grating glasses. *[AAS photo © 2014 Joson Images]*

Commissions, Divisions, and the IAU in general.
6. Encourage membership, broaden participation, and support the development of younger astronomers working or interested in radio astronomy.
7. Provide support to the Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science (IUCAF) for the protection of radio astronomy frequency bands, and to provide web information on these activities on the Commission website.
8. Develop connections and partnerships with the IAU Commissions working in the areas of communication and public outreach (C.C2) and education (C.C3).

The organizing committee of B4 includes: Gabriele Giovannini (President), Anthony Beasley (Vice-President), Wim van Driel, Xiaoyu Hong, Thijs van der Hulst, Joseph Lazio, Nicholas Seymour, and Tony H. Wong. ✿

GABRIELE GIOVANNINI is Vice-President of Division B Commission 40, Radio Astronomy, and a professor at the Institute of Radio Astronomy, Bologna, Italy. He studies the nuclear properties of nearby radio sources and nonthermal emission in clusters of galaxies.

COMMISSION B6

Astronomical Photometry and Polarimetry

By SAUL ADELMAN

Commission B6, Astronomical Photometry and Polarimetry, continues the distinguished history of Commission 25, which made profound and substantial contributions to the advance of astronomical research since 1922.

Photometric and polarimetric techniques and standardization are essential tools in the exploration and investigation of astronomical objects and quantities. A wide range of science requires calibrated photometry at or better than the 1% level: investigations of cosmology and the nature of dark energy from photometry of distant galaxies and supernovae; the formation and evolution of galaxies through the measurement of resolved stellar populations; characterizations of exoplanets around nearby stars; measuring stellar variability to map mottled stellar photospheres and to measure stellar pulsations, especially for asteroseismology; and precise luminosity calibration for stellar physics and the cosmological distance ladder. The analysis of polarization in the radiation produced by astronomical sources yields unique information on their geometric structure and the physical

Honolulu Weather Forecast 5–6 August 2015

WEDNESDAY, 5 AUGUST		High: 83°F / 28°C Low 73°F / 22°C
Morning	**Afternoon**	**Evening**
Partly cloudy	Partly cloudy	Partly cloudy
25% chance of rain	45% chance of rain	20% chance of rain
THURSDAY, 6 AUGUST		**HIGH: 84°F / 29°C Low 73°F / 23°C**
Morning	**Afternoon**	**Evening**
Partly cloudy	Mostly cloudy	Mostly cloudy
20% chance of rain	60% chance of rain	30% chance of rain

Extended forecast: Tropical Storm Guillermo is weakening and is forecast to pass north of O'ahu on Thursday. A high surf advisory with a warning of rip currents for the island's east-facing shores was issued on Sunday and will remain in effect through 12 noon on Thursday. Source: Weather Underground.

Special Guests in the Exhibit Hall

Among the programs highlighted by the IAU at Booth 329 in the Exhibit Hall are those being carried out under the Cosmic Light theme for IYL 2015. Please come by during the morning and afternoon coffee breaks to meet the leaders of these projects:

Wednesday, 5 August 10:00 am & 3:30 pm	Cosmic Light Project Coordinator **Rick Fienberg, Galileoscope**
Thursday, 6 August 10:00 am & 3:30 pm	Cosmic Light Project Coordinator **Constance Walker, Quality Lighting Teaching Kit**
Friday, 7 August 10:00 am & 3:30 pm	Cosmic Light Project Coordinator **Constance Walker, Quality Lighting Teaching Kit**
Monday, 10 August 10:00 am & 3:30 pm	Cosmic Light Project Coordinator **Rosa Doran, Cosmic Light EDU Kit**
Tuesday, 11 August 10:00 am & 3:30 pm	Cosmic Light Project Coordinator **Pedro Russo, Dark Sky Meter App**
Wednesday, 12 August 10:00 am & 3:30 pm	Cosmic Light Global Coordinator **Sze-leung Cheung, IAU Office for Astronomy Outreach**
Thursday, 13 August 10:00 am & 3:30 pm	Cosmic Light Project Coordinator **Rosa Doran, Cosmic Light EDU Kit**

processes occurring at and around the source and between the source and the observer.

Standardization is vital. Knowing that another observer measures in a standard system provides a lot of information, even if it is not clear what this information means in exact physical terms. Standardization means compatibility between different systems of measurement. It is inescapable for exchanging data or merging data from different sources. Photometry and polarimetry are extending in wavelength coverage, sky coverage, and to faint magnitudes, now and in the next decades.

Although many of the new data sets available come from major surveys that are devoting considerable effort to photometric calibrations surveys (e.g., SDSS, PAN-STARRS, DES, VISTA, GAIA, and soon, LSST), there is need for guidance and discussion of topics, such as atmospheric extinction, the standardization of photometric passbands, the transformation between photometric (and spectrophotometric) systems, and absolute calibration in physical units. Likewise the whole sky has been mapped in polarization by the WMAP (radio) and Planck (radio and sub-mm) experiments, that are soon to be followed by optical surveys, such as SOUTH POL. Understanding and minimizing calibration uncertainties are particularly crucial for polarization measurements. Being able to combine measurements made with all these (and other) major facilities, without losing the exquisite internal precision or introducing systematic errors, will be a major task for B6.

The Working Group on Infrared Photometry, formally established at the 1991 IAU GA, has been concerned with the improvement of IR photometry. The advantages of IR Working Group passbands that fit within and are not defined by the terrestrial atmospheric windows still need to be better promoted, as many IR systems do not properly transform to this system. Another important issue for infrared photometry is that there are many variations of the generally accepted systems (i.e., J, H, and K bands) from different surveys such as 2MASS and DENIS and from different telescopes throughout the world. These measurements generally do not have associated transformations between the competing systems. ✿

SAUL ADELMAN is the incoming President of the new Commission B6, Astronomical Photometry and Polarimetry. He is a professor in the physics department of The Citadel, Charleston, South Carolina, and received the 2011 Governor's Award for Excellence in Scientific Research at an Undergraduate Institution in recognition for his work on the chemical composition of stellar atmospheres.

Kai'aleleiaka — THE MILKY WAY

Issue 4 — 6 August 2015

Wally Pacholka / AstroPics.com

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INVITED DISCOURSE 2

Exploring the Young Universe

By YOSHIAKI TANIGUCHI

When was the Milky Way born? How has our galaxy evolved since its formation 10 billion years ago? These are big questions. In order to obtain the answers, we have to explore galaxies in the very young — and hence very remote — universe.

Until the early 1990s, no galaxy beyond redshift $z = 1$, corresponding to a light-travel time of about 8 billion years, was found. This posed a serious problem for our understanding of galaxy formation and evolution. Then came two big breakthroughs: the Hubble Space Telescope was launched into orbit, and a new generation of giant telescopes — including the Keck and Gemini twins, the VLT foursome, and Subaru — were constructed on the ground. By the early 2000s, various deep surveys with these new instruments opened a window on the young universe beyond redshift $z = 5$, pushing back to within a billion or so years of the Big Bang.

Now we are able to study the global star-formation history in galaxies from very early times to the present day. In my Invited Discourse I will summarize our current understanding of the formation and evolution of galaxies and offer some thoughts on the fate of the universe.

Aloha and mahalo! ✿

Invited Discourse 2: Exploring the Young Universe	
Speaker	Yoshiaki Taniguchi (Ehime University)
Date	Thursday, 6 August
Time	6:00 to 7:30 pm
Location	Ballroom B, Hawai'i Convention Center

YOSHIAKI TANIGUCHI is a Professor at Ehime University in Tokyo, Japan, where he studies star formation in high-redshift galaxies using 8- to 10-meter telescopes, including the National Astronomical Observatory of Japan's Subaru Telescope on Maunakea.

DIVISION C

Gathering Heritage, Education, and Outreach

By MARY KAY HEMENWAY

Division C, Education, Outreach and Heritage, has an extensive, multifaceted program planned for its Division meeting. Our first session begins with an invited talk by Virginia Trimble on the Impact of World War I on astronomy, a topic of broad appeal to this Division. From

Kaʻaleleiaka THE MILKY WAY

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Kaʻaleleiaka (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 is the International Year of Light, and the IAU is spearheading the Cosmic Light theme. *[IAU]*

Trimble's presentation, the session moves on to address IAU sponsored projects, including astroEDU and the Galileoscope. The next session is devoted to outreach projects and is followed by two sessions on education programs and research ranging from preschool to university level.

The Division Meeting continues on Monday, 10 August, with an invited talk by Rajesh Koschhar on the history of astronomy. This session is followed by one on cultural astronomy, which includes presentations from around the world. The Division Meeting will then move on to interdisciplinary themes that span two (or more) Commission topics, such as outreach and history.

Our final session has two invited talks by the leaders of the IAU Office of Astronomy for Development, Kevin Govender, and the IAU Office for Astronomy Outreach, Sze-leung Cheung. There will also be a talk on the IAU's Cosmic Light program for the International Year of Light 2015 and a panel discussion to allow the new officers and new Commission presidents of Division C to share their goals and agendas for the future. We are especially interested in describing potential areas of cooperation and partnership to IAU members who are not currently affiliated with a Division, Commission, or Working Group. ✿

Division Meeting — Division C: Education, Outreach and Heritage	
Start date	Friday, 7 August
End date	Monday, 10 August
Oral sessions	Room 312, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
For details on presenters, topics, and times see the online program or mobile app.	

MARY KAY HEMENWAY is the outgoing President of IAU Division C. Following her retirement in 2012 as a Senior Lecturer at the University of Texas, Austin, she is currently a Research Fellow at the University. She served six years as Education Officer of the American Astronomical Society (AAS), 11 years as Secretary to the Board of the Astronomical Society of the Pacific, and a term on the IAU Executive Committee Working Group for the International Year of Astronomy 2009.

COMMISSION F1

Small Objects, Mighty Role in Planetary Science

By JIRI BOROVICKA

They are the smallest objects in the solar system, but meteoroids, meteorites, and interplanetary dust particles are important to the planetary sciences. Researchers engaged in meteor observations, laboratory analysis of meteorites and cosmic dust, and impacts on the Moon and satellite surfaces are a separate community from astronomers observing comets and asteroids.

In recent years, several events occurred that increased the awareness of meteor and meteorite studies. They include the large Chelyabinsk meteor airburst in 2013, which caused widespread damage; the predicted impact of asteroid 2008 TC_3 in Sudan, which produced anomalous, heterogeneous Almahata Sitta meteorites; and the formation of the Carancas impact crater in Peru in 2007.

IAU Commission 22 was established in 1922 to bring together scientists working in this field. Following the restructure of the IAU, its activities will now continue under the auspices of Commission F1, Meteors, Meteorites & Interplanetary Dust:

1. Organization of the Meteoroids conference every three years. The next one will be held in 2016 in Noordwijk, the Netherlands.
2. Maintaining the IAU Meteor Data Center. The center maintains the data on meteor orbits and trajectories and the list of recognized meteor showers.
3. Creating scientific nomenclature related to meteor astronomy.
4. Assisting local researchers in the study of important meteor events and small asteroid impacts. Very bright meteor events (superbolides) are relatively rare phenomena, but if they occur in populated areas they cause wide attention, media coverage, and sometimes even panic.
5. Co-organizing meteor-related sessions in larger and more general conferences like URSI, AGU, EPSC, or EGU.
6. Continuing to encourage collaboration between professional and amateur astronomers in the field of meteor and meteorite research. ✿

The Chelyabinsk superbolide of 15 February 2013 was not only the most significant meteor event of the last triennium but also the largest impact of a cosmic body on Earth for at least several decades. *[Aleksandr Ivanov, Kamensk Uralskyi]*

JIRI BOROVICKA is the incoming President of IAU Commission F1, Meteors, Meteorites & Interplanetary Dust, and Chairman of the Council of the Astronomical Institute of the Academy of Sciences of the Czech Republic. He received the honorary Kopal Lectureship from the Czech Astronomical Society in 2014.

SPLINTER MEETING

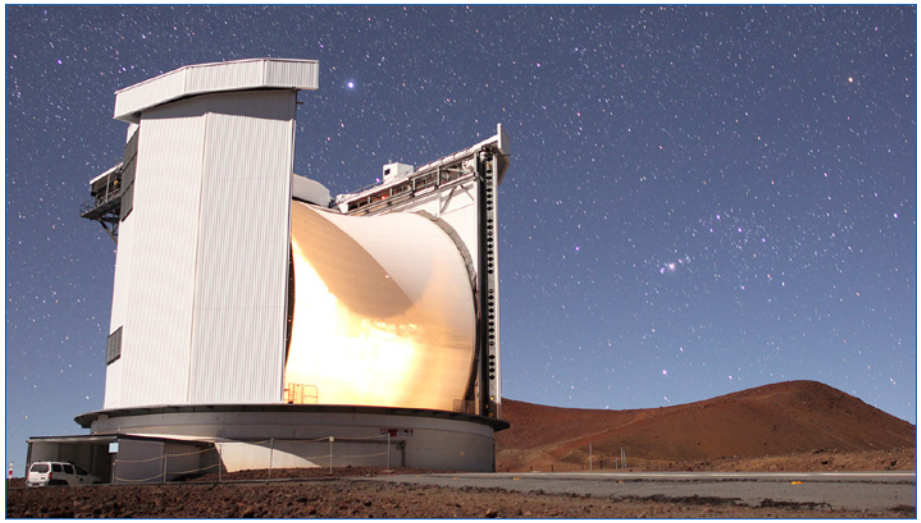
New Horizons for the James Clerk Maxwell Telescope

By HARRIET PARSONS and JESSICA DEMPSEY

The East Asian Observatory (EAO) has forged a new path for the James Clerk Maxwell Telescope (JCMT) following the successful transfer of operations from the United Kingdom's Science and Technology Facilities Council to EAO in March 2015.

Observations immediately resumed with an extremely successful VLBI run with six other telescopes across the globe to form the Event Horizon Telescope. This project aims to observe nearby supermassive black holes to better understand the Schwarzschild radius. During the initial science semester the response from the new EAO regional community, alongside partners in the U.K. and Canada, was beyond expectations — oversubscription rates were better than a factor of five.

The EAO has ambitious plans for the JCMT, starting with bringing additional elements for its SCUBA-2 instrument online as soon as possible and embarking on new long-term legacy science programs at the end of 2015. Today's Splinter Meeting will conclude with a panel discussion on future instrumentation, and we will talk about the plans that EAO and its partners have for continuing to keep the JCMT at the cutting edge of submillimeter science.



The East Asian Observatory's James Clerk Maxwell Telescope. *[EAO/Will Montgomerie]*

HARRIET PARSONS is Support Astronomer for the JCMT. Her research focuses on massive star formation, particularly in the environments within giant molecular clouds. JESSICA DEMPSEY is EAO/JCMT Operations Manager. She specializes in submillimeter site characterization and calibration and in large-scale CO surveys of the Milky Way.

Splinter Meeting — New Horizons with the East Asian Observatory: Latest Science from the James Clerk Maxwell Telescope	
Date	Thursday, 6 August
Time	6:00 to 8:00 pm
Location	Room 312, Hawai'i Convention Center

EDUCATION & PUBLIC OUTREACH EVENT

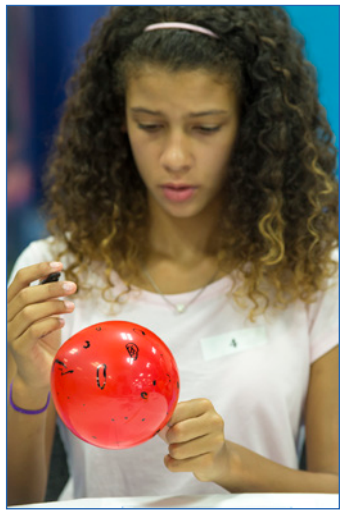
School Days at the General Assembly

Students, parents, and teachers explore astronomy in the IAU Exhibit Hall.

By GINA BRISSENDEN, *Kaiʻaleleiaka*

On Wednesday, 4 August, more than 200 local students, along with their parents, teachers, and councilors, visited the IAU Exhibit Hall to meet astronomers and explore the universe through hands-on activities. Participants came from primary and secondary schools, homeschools, and camps across Oʻahu. Some children of General Assembly attendees also participated.

During the 90-minute event, students circulated in small groups through a dozen different activity stations at exhibitors' booths. At each stop, students and grown-ups alike participated in engaging activities exploring a variety of astronomy topics, including different types of light, making pulsars, playing with polarization, and more. Students also learned about many different telescopes and observatories, as well as careers in astronomy. Importantly, students were able to talk with real scientists about the work they do.



Ana, a 7th grader, explores the expansion of the universe. *[IAU/B. Tafreshi, twanight.org]*

Ana, a 7th-grade student at St. Anthony School, was visiting with her grandmother. When asked the favorite thing she learned, she said, "I didn't understand the universe was so old!" She learned about the Big Bang during a Hubble-expansion activity conducted at the Gemini Observatory booth. Her grandmother, Jane, added, "We're getting some great ideas for Ana's science fair."

Nicole, a homeschool student, said the favorite thing she learned was that "supernovas can result in neutron stars — I just thought they exploded!" She picked up that new kernel of knowledge at the NASA Fermi/Swift booth, where she made a model of a pulsar.

Excited students show off their newly acquired Galileoscopes, which all participants were given at the end of the event. [IAU/B. Tafreshi, twanight.org]

Anderson, a parent accompanying a group of students from Kapolei and Kaiser High Schools that included his son, said he already knew quite a bit of astronomy but still learned something new at the National Optical Astronomy Observatory's "Painting with Polarized Light" activity. "I work with polarized filters," he said, "and I didn't understand how they worked till now!"

Melan Hebert-Terleckyj of Associated Universities, Inc., which sponsored the event, said that interacting with the visiting students "was the most fun part of being an exhibitor."

Look for more students in the Exhibit Hall next Wednesday! ✿

OPINION SURVEY

What Do You Think About Public Outreach in Astronomy?

By LISA DANG, MARTA ENTRADAS & PEDRO RUSSO

Throughout human history, astronomy has had significant impact on the way we view our world, and it continues to influence our everyday life today. It is therefore important to share our advancing knowledge about our universe with the general public.

There have been several studies exploring the factors that motivate or discourage scientists from taking part in public-engagement initiatives. Yet, to date, there has been no global study on astronomers' views on public engagement. This year's IAU General Assembly, gathering more than 3,000 astronomers from around the world, is an ideal opportunity to do so.

[Universe Awareness]

Leiden Observatory in the Netherlands, ISCTE–Lisbon University Institute in Portugal, and the London School of Economics in the U.K. are running an online survey to investigate different factors that influence professional astronomers in participating in public-engagement activities, the methods that they use, and the relationship between astronomers and public-information officers. Due to the importance of encouraging scientists to take part in engagement activities, this study will serve to target the main barriers that are holding people back. It will also inform actions that may need to be made by policy makers and others in authoritative positions in order to better facilitate public engagement.

In August 2012, during the IAU General Assembly in Beijing, Universe Awareness (UNAWE), in partnership with the IAU Office of Astronomy for Development (OAD), performed individual interviews with 61 delegates selected at random. The objective was to investigate when they first became interested in astronomy and their views on education and public outreach. Additional participants were solicited by email using the Canadian Astronomical Society's (CASCA) membership mailing list between December 2012 and January 2013. A total of 155 responses were collected. This explorative study revealed that the majority of the respondents first developed an interest for astronomy at primary-school age, but the decision to undertake

a career in astronomy often came during late adolescence. The study also revealed that many astronomers think there should be a larger percentage of their research funding invested into outreach activities, calling for a change in grant policies.

From this explorative study, we now wish to have an extensive study focusing on the cause of participation in public-engagement initiatives among the astronomy community, and the methods that are used and seen to be effective. Let's make public outreach an effective practice in our community. Your participation in the survey is important! ✿



LISA DANG is an undergraduate physics student at McGill University in Montreal, Canada, and an intern at Leiden University, the Netherlands. MARTA ENTRADAS is a postdoctoral researcher at ISCTE–Lisbon University Institute, Portugal, and a visiting scholar at the London School of Economics, U.K., and Cornell University, U.S. PEDRO RUSSO is International Project Manager for UNAWE at Leiden University and incoming President of IAU Commission C2, Communicating Astronomy with the Public.

GA BUSINESS MEETING I

Getting Down to Business

By PAMELA L. GAY, *Kaiʻaleleiaka*

The first Business Meeting of the IAU XXIX General Assembly took place on Tuesday, 4 August. The Union's more than 70 National Representatives were seated together and provided green paper to use when voting, while other members scattered themselves about the room. Hosted by IAU President Norio Kaifu and IAU General Secretary Thierry Montmerle, this members-only session addressed the activities of the past three years and highlighted upcoming votes that will affect the next triennium and beyond.

The only vote held during this meeting confirmed Colombia as the IAU's newest National Member. Only nations that had paid their dues in full were eligible to vote, and those that had not were encouraged to pay before the second Business Meeting on Thursday, 13 August.

Montmerle reflected on the IAU's "aloha" spirit and on how the organization dares to engage with our community's challenges, cares through its support of education and global development, and shares through its public communications. This "we dare, we care, we share" attitude is personified by the highly successful IAU Office of Astronomy for Development, the IAU Office for Astronomy Outreach, and the new Office for Young Astronomers, established by the IAU and the Norwegian Academy of Science and Letters.

The Republic of Colombia is the IAU's newest — and 74th — National Member. *[Photo-illustration: Leslie Proudfit]*

Additional activities included examining the budget, reviewing the website overhaul, and discussing Commission reform. Regarding the latter, 40 existing Commissions are being transformed into 35 dynamic new Commissions. Henceforth, members will also be able to join and leave Commissions freely.

Looking ahead to next week's second Business Meeting, National Representatives were reminded that they'll be electing new members of the Executive and Nominating Committees. They'll also select the site for the XXXI General Assembly in

2021. Candidates are Montreal, Canada; Santiago, Chile; Busan, Korea; and Cape Town, South Africa.

These votes are separate from the general membership's votes on Resolutions. For more information about those, see "General Assembly Resolutions Finalized" in *Kaiʻaleleiaka* Issue 3, page 11. To learn more about role and work of the IAU National Representatives, see "Votes, Rules & Dues: A World of Policy" in Issue 2, page 7. ✿

Business Meeting of the General Assembly II (IAU Members Only)	
Date	Thursday, 13 August
Time	4:00 to 6:00 pm
Location	Ballroom B, Hawaiʻi Convention Center

Honolulu at dusk. *[IAU/B. Tafreshi, twanight.org]*

COMMISSION A1

Coordinating the Sky

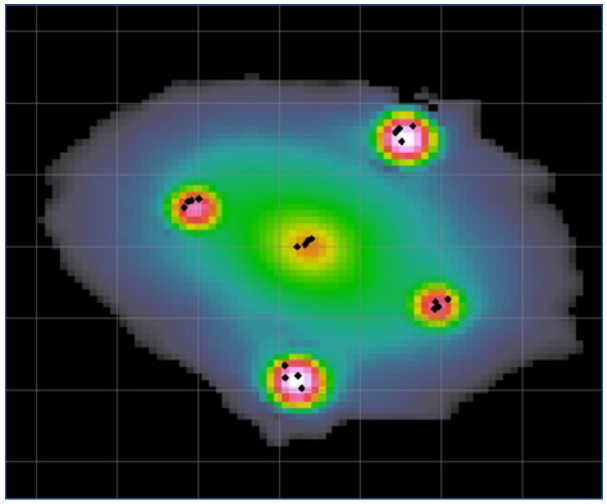
By ANTHONY G. A. BROWN

Commission A1, Astrometry, coordinates research related to the celestial coordinate system and the positions, proper motions, and parallaxes of celestial objects. The determination of accurate distances — the basis for astrophysical science — is one of the most fundamental and important tasks of astrometry.

C.A1 coordinates ground- and space-based observing programs and promotes education in astrometry. This spans a vast range of objects, from the Earth-Moon system to quasars at cosmological distances, as well as a large range of techniques with the common goal of enhancing our understanding of the motions of celestial objects and their measurement in coordinate systems.

The International Celestial Reference Frame (ICRF) defines coordinates on the sky. Currently in its second version, the ICRF2 is based on the positions of 3,414 compact extragalactic radio sources as observed with very-long-baseline interferometry (VLBI). Work on the ICRF3 is currently under way.

The European Space Agency's astrometric Gaia satellite began regular survey observations in mid-2014. The mission, which will last at least five years, will revolutionize the entire field of astronomy, providing trigonometric parallaxes to about a billion stars. Linked to galaxies and quasars, the Gaia coordinate system will be inertial, providing absolute parallaxes and proper motions. However, the Gaia coordinate system has three degrees of freedom for its orientation. A link to the current ICRF system is mandatory to maintain the continuity of celestial coordinates. A major task of the Commission A1 will be to coordinate efforts for this radio-optical coordinate-system alignment, with the goal of providing language for an IAU Resolution to define the future coordinate system on the sky.



Gravitationally lensed quasar Q2237+030, the Einstein Cross, is shown with Gaia astrometric positions placed over Hubble Space Telescope images. The grid spacing is 0.5 arcsecond, and the astrometric accuracy is around 0.1 arcsecond. *[ESA]*

C.A1 will be involved in obtaining more closely spaced, fainter objects in the celestial coordinate system, and in extending the celestial coordinate system to other wavelengths, such as infrared and X-ray.

Of particular importance is the Large Synoptic Survey Telescope (LSST). Our Commission will assist in providing the best coordinates on the sky from all astrometry-related projects

to benefit all astronomers requiring reference stars on the IAU-adopted coordinate system.

Astrometry impacts many areas of astronomy, from our solar system, to the detection and characterization of exoplanets, to the dynamics of our galaxy — especially near the supermassive black hole in the galactic center. The determination of mass — another key astrophysical property — relies on astrometric observations, e.g., by following the orbits of minor planets or multiple stars. Accurate observations today enable the detection of motions of stars within globular clusters and the motion of individual members of our Local Group of galaxies, forming the basis for related dynamical studies.

C.A1 will coordinate synergy with other areas of astronomy, such as ephemerides and dynamical astronomy, fundamental physics, and geodesy. Astrometry is a source of astrophysical information, and coordinating the synergy between primary astrometric data and applications relevant for astronomy and physics in general is a major goal of the Commission. ✿

ANTHONY BROWN, who calls another tropical paradise (Aruba) home, is a staff member at Leiden Observatory, the Netherlands. He chairs the European consortium responsible for processing and publishing data from the Gaia mission. Brown thanks Norbert Zacharias for assistance with this article.

COMMISSION D1

Gravitational Wave Astrophysics

By NEIL GEHRELS

The next 10 years will see major steps forward in the search for, and detection of, gravitational waves, as the field transitions from one dominated by instrumentation development to one focused on astrophysics.

The Laser Interferometer Gravitational-Wave Observatory (LIGO) and the VIRGO interferometer will begin operating their advanced detectors by 2017 with sensitivity to detect neutron-star binary mergers to 150 megaparsecs (Mpc) and by 2020 to 200 Mpc. At the same time, the International Pulsar Timing Array will be observing a sufficient number of millisecond pulsars with sufficient accuracy to begin detecting binary supermassive black holes in very-low-frequency gravitational waves.

The Laser Interferometer Space Antenna (LISA) Pathfinder mission will launch in 2015 and demonstrate the drag-free control and laser-interferometry technologies needed for the European Space Agency's eLISA mission, which will detect gravitational waves from a host of galactic and extragalactic objects.

Aerial view of the LIGO interferometer at Hanford, Washington, USA. *[LIGO Laboratory]*

There is great benefit in observing gravitational-wave sources in all bands of the electromagnetic spectrum with both ground- and space-based telescopes, and already astronomers are preparing for joint observations with the various gravitational-wave detectors. The process of integrating gravitational-wave observations into mainstream astronomy will require both sides to learn about the other's capabilities and needs.

New IAU Commission D1, Gravitational Wave Astrophysics, will provide a forum to bring these diverse communities together to share their expertise and to plan for future observations and interactions. Specific milestones and work plans for C.D1 include these:

1. To expand knowledge of gravitational-wave astrophysics to the broader IAU community.
2. To stimulate and support cross-disciplinary exchanges and discussions among astronomers and gravitational wave physicists, in order to share expertise and to maximize the science return of the gravitational wave detections.
3. To develop and strengthen the connection between gravitational wave detectors and electromagnetic observatories by supporting common programs of observations, and information and data sharing.
4. To support education and development of young researchers working on or interested in gravitational wave astronomy.
5. To start initiatives with the goal to increase the participation of gender and under-represented minorities in the field of gravitational wave astronomy.
6. To promote broad participation in the Commission.✿

NEIL GEHRELS is Chief of the Astroparticle Physics Laboratory at NASA's Goddard Space Flight Center in Greenbelt, Maryland; College Park Professor of Astronomy at the University of Maryland; and Adjunct Professor of Astronomy & Physics at Pennsylvania State University. *[NASA]*

Honolulu Almanac 6 August 2015

Sunrise / set	6:07 am / 7:08 pm
Twilight[1] start / end	4:47 am / 8:27 pm
Moonset	12:33 pm
Moon phase[2]	◑ Waning gibbous (55% illum.)
Evening planet[3]	Saturn (SSW)
Morning planet[3]	Mars (E)
Special event	Last-quarter Moon (exact at 4:02 pm)

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

DIVISION G

Stars and Stellar Physics

Learn how to make the most of IAU Division Days and how to get involved in Division G.

By CORINNE CHARBONNEL

I am pleased to welcome the newly elected and returning members of the 2015-2018 Steering Committee of IAU Division G, Stars and Stellar Physics, and to thank those members who are stepping down.

The involvement by IAU members in the restructuring and election process was very important, but Division G needs your participation to help make our ongoing discussions active, lively, and useful. Only then will the Division have a real impact on the scientific life of our community and be able to promote new developments in stellar physics and their far-reaching influence in all domains of astrophysics. We welcome your contribution to the activities of the Division's Commissions and Working Groups.

For example, if you identify a field that you wish to strengthen, an excellent and easy option is to propose a Working Group to undertake certain well-defined tasks for a limited time period. We also count on you to submit strong proposals for future IAU Symposia, and we will do our best to help you in making your applications successful.

To kick things off, we look forward to seeing many of you during Division Days. Our program is rich and interesting, with invited talks and contributions covering a broad range of scientific topics, such as the first stars, abundances, magnetism, binaries, and large-scale surveys including the one now under way by Gaia. And during our business session, we look forward to hearing your ideas and suggestions for the forthcoming triennium. ✿

Division Meeting — Division G: Stars and Stellar Physics	
Start date	Friday, 7 August
End date	Monday, 10 August
Oral sessions	Room 316C, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
For details on presenters, topics, and times see the online program or mobile app.	

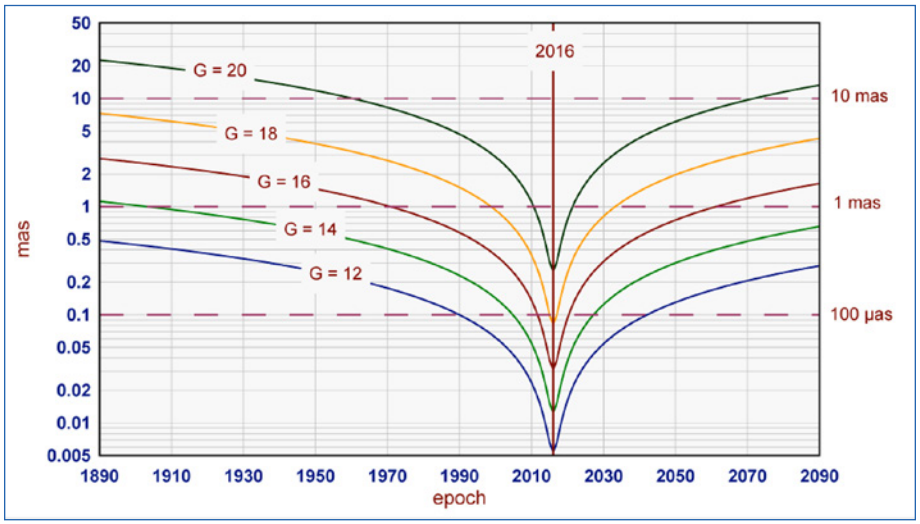
CORINNE CHARBONNEL is incoming President of IAU Division G, Stars and Stellar Systems. She has dual appointments at the University of Geneva, Switzerland, and the French National Centre for Scientific Research, Toulouse.

ANCILLARY SCIENCE

Bringing Present Astrometric Accuracy to Glass Plates of the Past

By JEAN-EUDES ARLOT

Launched in December 2013, the Gaia satellite is building astrometric all-sky maps with unprecedented angular resolution. The mission's first data release will occur in 2016, and many in the astronomical community are eagerly awaiting the chance to use Gaia data for the calibration of their own data — including photographic plate data.



This plot depicts the anticipated astrometric accuracy as a function of time for stars with various Gaia magnitudes (G), which are based on a passband of 400 to 1,000 nm. *[Jean-Eudes Arlot]*

During Gaia's 5-year mission, it will sweep across the sky roughly 14 times a year, mapping the positions of a billion stars to about 20 microarcseconds accuracy, while also capturing snapshots of the rapidly changing positions of solar-system objects. Gaia's observations are insufficient to completely describe the fast motions and complex dynamics of these local bits of rock and ice, but they will allow astronomers to better calibrate measurements from old photographic plates that serve this purpose. Modern astronomers continue to use plates made at the end of the 19th century in research, despite their low astrometric accuracy, because of the long baselines needed to fully characterize these objects.

The Gaia reference catalog will contain select stars with current-epoch positions known to 0.01 milliarcsecond (mas) and with well-defined proper motions that allow their positions to be known with 1-mas accuracy over a two-century window from 1890 to 2090. This catalog will allow a new reduction of old photographic plates that will provide modern plate scans with modern astrometric accuracies.

In tests using the USNO CCD Astrograph Catalog (UCAC), we demonstrated that we can achieve the accuracy of present catalogues for old observations within the limits of the astrometry (we could not go older than the 1960s using UCAC due to proper motions). The new Gaia catalog will allow the reduction of photographic plates made since the end of the 19th century. This will breathe new scientific life into the one million glass plates taken during that period. Finding and scanning the plates and processing the data is a huge task that is certain to provide unexpected and interesting results. ✿

JEAN-EUDES ARLOT is the Vice-President of Division A Commission 4, Ephemerides, and works at the Institute of Celestial Mechanics and Ephemeris Calculation (IMCCE) at Paris Observatory in France. His work on using Gaia data to reanalyze old photographic plates is supported by Paris Observatory; the U.S. Naval Observatory in Washington, D.C., and the Royal Observatory of Belgium in Brussels.

Honolulu Weather Forecast 6–7 August 2015

THURSDAY, 6 AUGUST		***High: 88°F / 31°C Low: 76°F / 24°C***
Morning	**Afternoon**	**Evening**
Partly cloudy	Partly cloudy	Cloudy
10% chance of rain	45% chance of rain	35% chance of rain
FRIDAY, 7 AUGUST		***High: 89°F / 32°C Low: 76°F / 24°C***
Morning	**Afternoon**	**Evening**
Partly cloudy	Clear	Clear
25% chance of rain	20% chance of rain	10% chance of rain

Extended forecast: Tropical Storm Guillermo is weakening and is forecast to pass north of O'ahu on Thursday. Trade winds will return to the islands Friday night. Typical summertime weather is expected over the weekend and into next week. Source: Weather Underground.

Getting All Wet (or Not) in Hawai‘i

By PAMELA L. GAY, *Kai‘aleleiaka*

Don’t like the weather? Move. In Hawai‘i, the interplay of geography and wind creates weather patterns that make it possible to pick your preferred climate by moving up, down, and around these volcanic mountains.

Located at roughly 20°N latitude, the Hawaiian Islands experience sustained northeasterly winds that are driven by the Hadley cell, an atmospheric circulation pattern with little variation throughout the year. As these moist winds race across the islands, the volcanoes disrupt their flow. On the volcanoes’ windward side — the northeast side — clouds form and rain falls to create the lush tropical landscapes, such as those found around Hilo, Hawai‘i Island (“the Big Island”). Just over the peaks, on the leeward side, the islands are significantly more arid. On Hawai‘i Island, rainfall amounts vary from more than 100 inches (2.5 meters) a year on the Hilo side of Maunakea to less than 20 inches (0.5 meter) of rain northwest of the volcano.

The volcanoes affect not only rainfall, but also temperature. In general, temperatures drop 3.5°F (2°C) for every increase of 1,000 feet (300 meters) in elevation. On the beaches of Hilo, summertime temperatures hover between 71°F (22°C) and 85°F (29°C), while on Maunakea’s 14,000-foot peak, daytime temperatures may only reach 60°F, while nighttime temps may plunge below freezing!

For locals, it’s possible to pick your weather by choosing to live at an elevation and orientation that tunes the rainfall and temperature to your preferred conditions. This diversity of possibilities opens up highly varied ecological niches, creating conditions suitable for myriad plants and animals. The Hawaiian Islands are a biodiversity hotspot, with more than 25,000 unique species.

The IAU General Assembly is taking place on the Island of O‘ahu. On this older island, the highest peak is the diminutive 4,025-foot (1,200-meter) Mount Ka‘ala, part of a ridge formed by the Ko‘olau volcano. With this lower ridgeline, O‘ahu’s climate is more even across the island than that of Hawai‘i Island, though you can still experience lush tropics with a quick journey northwest to Ahupua‘a ‘O Kahana State Park near Ka‘a‘awa. ✿

Astronaut Samantha Cristoforetti posted this photo of Hawai‘i, taken from the International Space Station, to Twitter on 28 February 2015. *[NASA, ESA]*

How to Say It in Hawaiian

- ‘Ae: yes
- ‘A‘ole: no
- Hōkū: star
- Kahuna: expert
- Lani: sky, the heavens
- Mahina: moon

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.

Perambulating Among the Posters

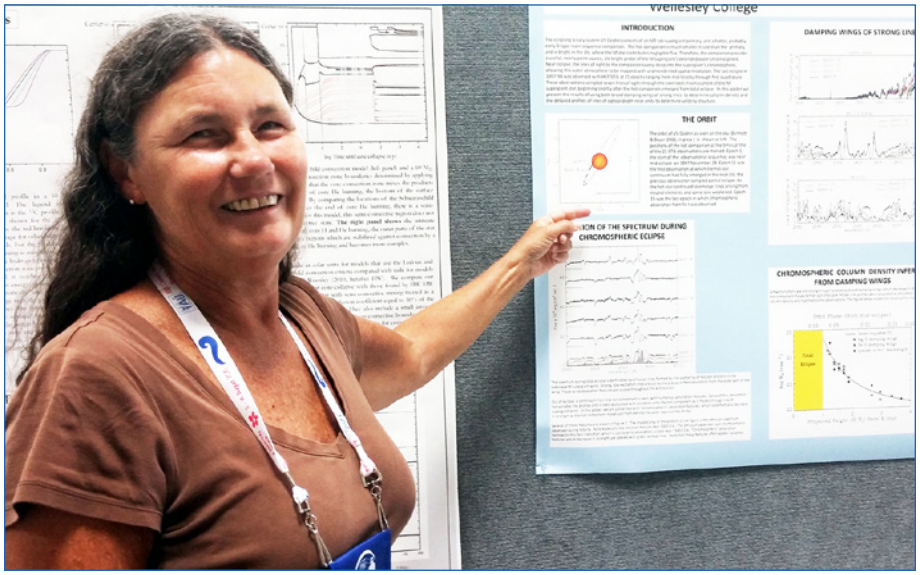
By LAURENCE A. MARSCHALL, *Kai'aleleiaka*

Very few astronomers travel to meetings expressly to *view* poster papers, but almost everyone goes to meetings to *present* them. You've probably already recognized your fellow astronomers at the airport or on your plane by the black plastic tubes they were carrying.

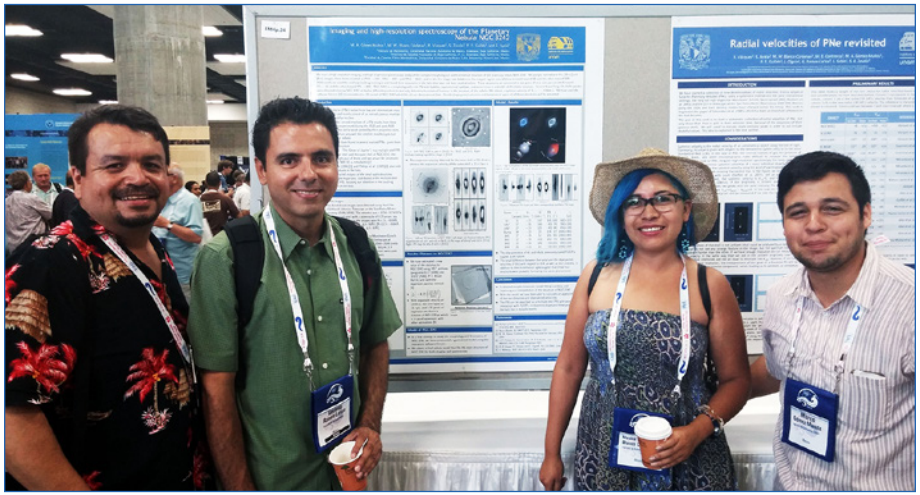
Here in Honolulu at the IAU General Assembly, long ranks of mounting boards crowd the Exhibit Hall to accommodate the roughly 1,900 scheduled posters, but most of the time the aisles are empty, with only a solitary reader here and there, or a little knot of people gathered in animated discussion. This changes, of course, during morning coffee breaks and evening happy hours, when the Exhibit Hall becomes a lively place. Wandering among the posters I noted a variety of presenters and readers, and it soon became clear that, while the poster paper is an important form of scientific communication, its function goes well beyond the mere transfer of information. Posters give notice of work in progress, provide justifications for travel, and thus serve as catalysts for the intellectual and social interactions that keep our science alive.

In one aisle Kazimierz Sliwa of McMaster University in Hamilton, Ontario, Canada, stood by a poster he'd prepared with collaborator Christine Wilson. He was discussing the analysis of molecular gas in merging galaxies with George Privon from the University of Concepción, Chile. Both are workers in the same field, and Privon, who models the mergers, was commenting on both the poster itself and on the further research it suggested. "George has already given me some ideas to explore on processes that light up the gas," noted Sliwa.

For young scientists, posters offer a first experience in academic publishing. Early Wednesday morning I met Nicholas Lopez-Canelas, a 2015 graduate of Marquette University in Milwaukee, Wisconsin. He was entering the Convention Center with a poster describing work he'd done as an undergradu-

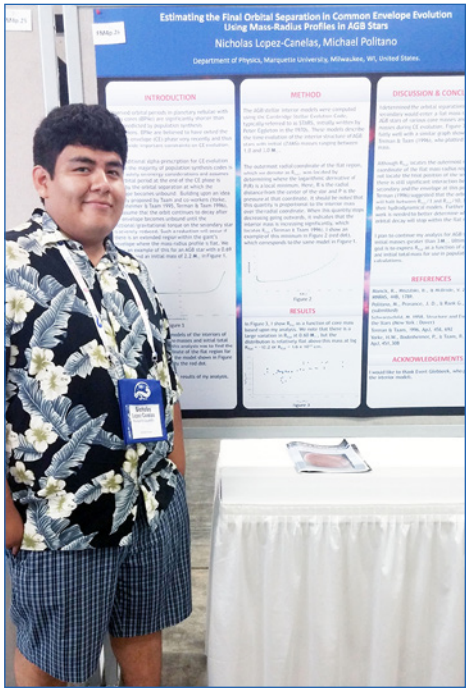


Wendy Hagen Bauer explaining her poster on an "old friend," the star VV Cephei. *[All photos: Larry Marschall, Kai'aleleiaka]*



Marco Gómez-Muñoz and some of his collaborators at his poster paper. Left to right: Roberto Vasquez, Gerardo Ramos-Larios, Monica Blanco Cárdenas, and Marco Gómez-Muñoz.

ate with Professor Michael Politano on modeling binary orbits of stars in planetary nebulae. This was his first opportunity to mingle with professional astronomers at an IAU meeting, a step on the way to a hoped-for Ph.D. in astrophysics, and, no doubt, a welcome change of climate from his native Chicago.

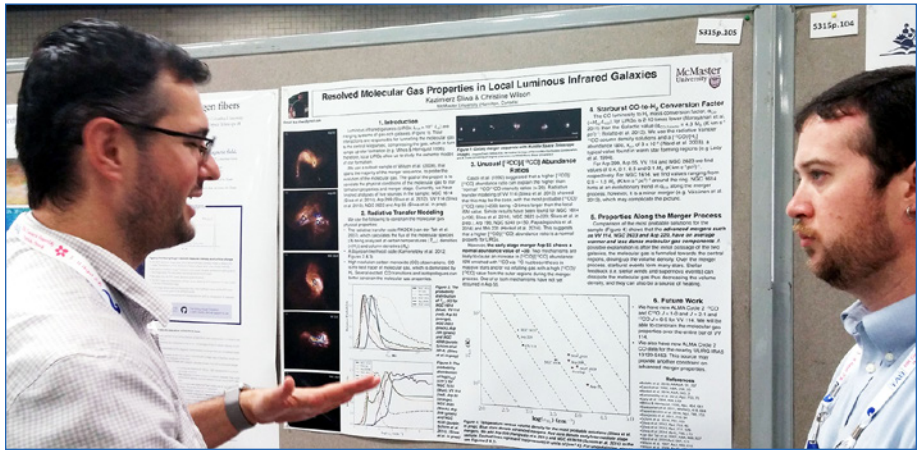


Nicholas Lopez-Canelas and a poster of his undergraduate research work at Marquette University.

At another poster later in the day, Marco Gómez-Muñoz was talking shop with his collaborators Monica Blanco Cárdenas and Roberto Vasquez, all from the National Autonomous University of Mexico, along with Gerardo Ramos-Larios of the University of Guadalajara, Mexico. Gómez' poster reports his thesis work, an analysis of the structure of a planetary nebula, and this is his first IAU General Assembly, too, though his advisor, Vasquez, has been to many AAS meetings in the past.

Phillip Reed, Associate Professor of Astronomy at Kutztown University in Pennsylvania, is further along in his career. He received his Ph.D. in 2008, and though he's at a primarily undergraduate institution he's established an active program of research and publication. Here at his first IAU GA, his two poster papers highlight work that he and his students have done using their on-campus 24-inch (60-cm) telescope, notably spectroscopy done with a newly installed fiber-fed spectrograph. "There's been a lot of response to my posters," Reed told me, "and many people are amazed that we can do such good spectroscopy using an on-campus observatory."

Phil Reed describes spectroscopy results from the Kutztown State University Observatory.



Kazimierz Sliwa discusses galaxy mergers with George Privon.

At the other extreme of a career, Wendy Hagen Bauer, Professor Emeritus at Wellesley College in Massachusetts, was returning to the island where she did her graduate studies. She was presenting a poster on a star she's gotten to know intimately over many years: the eclipsing binary VV Cephei, but that wasn't the principal draw of the IAU General Assembly. "These meetings are wonderful," she commented, "because I get to see a whole career worth of colleagues, collaborators, and friends." ✿

Kai'aleleiaka THE MILKY WAY

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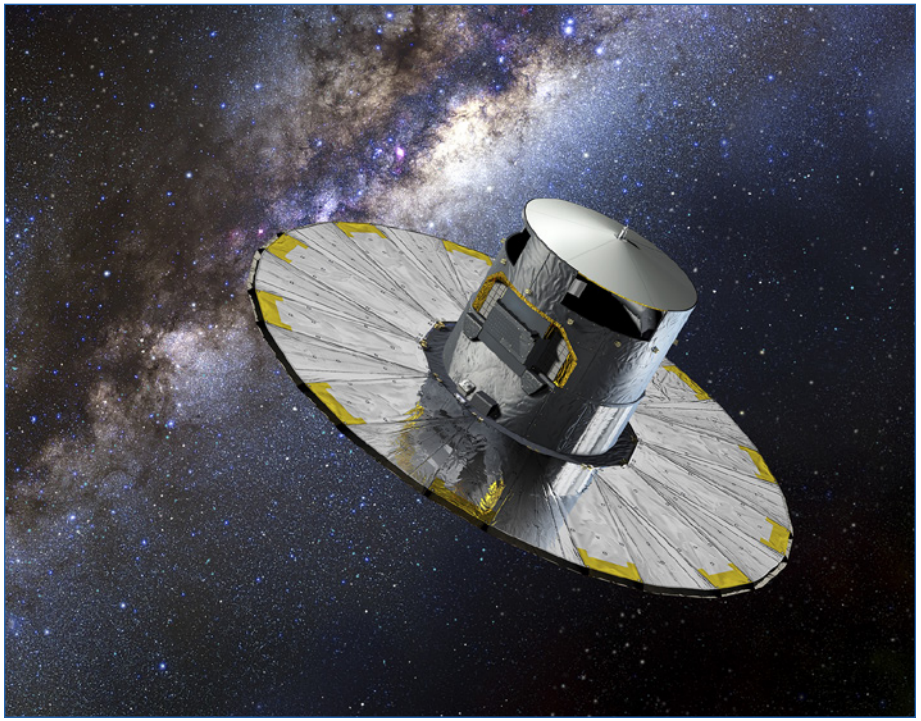
DIVISION A

The Foundations for Exploring the Universe

By SERGEI A. KLIONER

Fundamental astronomy lays the foundations for further physical and astrophysical exploration of the universe. The disciplines of astrometry, celestial mechanics and dynamical astronomy, solar-system ephemerides, Earth rotation, space and time reference frames, and fundamental astronomical standards currently form the backbone of Division A, Fundamental Astronomy.

Along with the whole of astronomy, our field has been revolutionized over the past few decades. Drastically improved observational accuracies, new observational techniques, rapidly increasing data volumes, new data-processing methods and technologies, new space-science applications — all of these aspects brought deep changes to fundamental astronomy.



An artist's impression of the European Space Agency's Gaia spacecraft. The mission aims to construct a precise 3-D map of the Milky Way. *[ESA, D. Ducros]*

Our community provides definitions and models that describe space-time reference systems and frames used in astronomy, investigates the dynamical behavior of celestial bodies, obtains physical information on celestial objects, and investigates physical laws in the universe using the methods of astrometry and celestial mechanics. Another part of our activity is represented by services that provide data and ephemerides of solar-system bodies, Earth-orientation data, timescales, astronomical constants and models, relevant software procedures, etc., for users within the astronomical community and beyond.

Our Division Meeting at the IAU General Assembly provides a great review of our research field. We will have several sessions covering particular research topics and a session devoted to the synergies with other parts of the astronomical community. As a special highlight, we prepared a four-hour session dedicated to the status and first data-

Kaiʻaleleiaka THE MILKY WAY

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Kaiʻaleleiaka (The Milky Way) is the official newspaper of the XXIX General Assembly of the International Astronomical Union, 3-14 August 2015, Honolulu, Hawaiʻi. 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.

processing results of the European Space Agency's astrometry mission, Gaia, which was launched in December 2013. Born as an astrometric project within our community, Gaia can be considered as one of the symbols of progress, innovation, and synergy across the whole field of astronomy. ✿

SERGEI KLIONER, the outgoing President of Division A, is based at the Lohrmann Observatory, Dresden University of Technology, Germany. He estimates that he spends 80% of his time working on the Gaia mission.

Division Meeting — Division A: Fundamental Astronomy	
Start date	Friday, 7 August
End date	Monday, 10 August
Oral sessions	Room 313A, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center

For details on presenters, topics, and times see the online program or mobile app.

INTERNATIONAL YEAR OF LIGHT 2015

The Galileoscope: Making Cosmic Light Accessible to All

By LINA CANAS

The Galileoscope is a high-quality, low-cost telescope kit developed by a team of astronomers, engineers, and science educators and optimized for use in both optics education and celestial observation. It was created for the 2009 International Year of Astronomy (IYA), and since then nearly 240,000 kits have been distributed in more than 100 countries — a remarkable feat for a project managed entirely by volunteers. For the 2015 International Year of Light (IYL), the Galileoscope has been named part of the Cosmic Light cornerstone project coordinated by the IAU's Office for Astronomy Outreach (OAO).

On Wednesday, 5 August, Galileoscope project leader Rick Fienberg visited the IAU/OAO booth in the Exhibit Hall during the morning and afternoon coffee breaks to answer questions about the kit and show visitors how it works. "I see lots of emails and tweets from people who got their first look at the Moon's craters or Saturn's rings through a Galileoscope," says Fienberg. "It's extremely gratifying to know that we've introduced hundreds of thousands of people to the wonders of the night sky with this very simple, but very good, little telescope."

Fienberg reported that while there has continued to be demand for the Galileoscope since the end of the IYA, sales to science educators, outreach professionals, and end users have amounted to only a few thousand units per year since 2010. That changed dramatically with the arrival of the IYL. Most of the 30,000 IYL-branded kits manufactured to date have already been claimed, including 10,000 that were donated to U.S. primary- and secondary-school teachers and students by Jean and Ric Edelman of

Virginia, USA, who expressed their deep commitment to science education with a similar donation during the IYA.

The Galileoscope assembles in minutes without tools and without tape, glue, or other adhesives. It can also be disassembled, so classroom teachers can use the same kits with different groups of students from year to year. It is supported by free standards-based optics-education and observing activities developed principally by the science-education team at the U.S. National Optical Astronomy Observatory (NOAO). These well-tested activities can be used by classroom and after-school teachers as well as informal educators to teach science and the process of science to people of all ages.

The Galileoscope has been featured in professional-development workshops for astronomy educators worldwide. Among the organizations routinely incorporating the kit into their teacher training are the NOAO, the Astronomical Society of the Pacific (ASP), and the Galileo Teacher Training Program (GTTP).

IYL-branded Galileoscopes are available at a bulk-discount price of US$150 per case of six (i.e., $25/kit), plus shipping, from the Galileoscope website. You can buy individual kits from a variety of resellers, including Amazon.com, usually at a price in the neighborhood of $50 plus shipping.

Want to learn more? Fienberg presents "The Galileoscope: From IYA 2009 to IYL 2015 & Beyond" during this morning's session of the Division C meeting in Room 312 of the Hawai'i Convention Center. Want to see a Galileoscope for yourself? Drop by Booth 329 in the Exhibit Hall, and we'll show you one. ✿

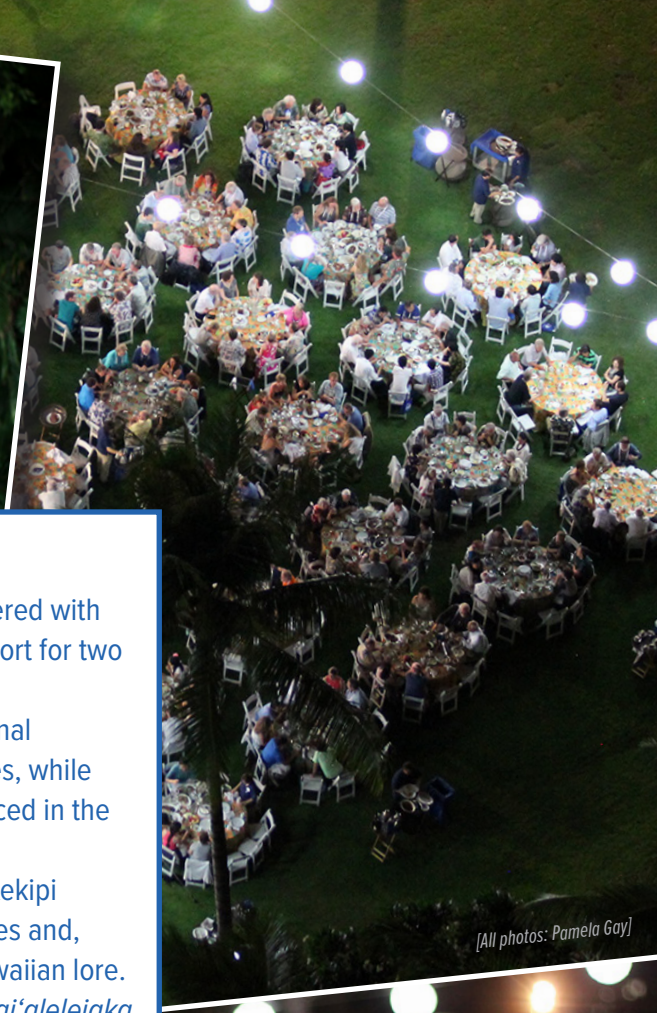
Every local student who visited the Exhibit Hall on Wednesday went home with a Galileoscope thanks to the generosity of event sponsor Associated Universities, Inc. *[Coty Tatge, University of Wyoming]*

LINA CANAS is Assistant Outreach Coordinator in the IAU Office for Astronomy Outreach (OAO) at the National Astronomical Observatory of Japan (NAOJ) in Tokyo. She is originally from Portugal.

How to Say It in Hawaiian

- E komo mai: welcome, enter
- Aloha kakahiaka: good morning
- Mahalo nui loa: thank you very much
- Pūpū: snacks, appetizers
- Moana: ocean
- Humuhumunukunukuapua'a: triggerfish (the Hawaiian state fish)

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.



[All photos: Pamela Gay]

Heavenly Hula

As the Sun set on 5 August, several hundred members of the IAU gathered with friends and family on the Great Lawn of the Hilton Hawaiian Village resort for two hours of traditional Hawaiian music and storytelling.

Attendees were greeted with a Hawaiian lei, then enjoyed a traditional Polynesian banquet. Tables were adorned with fruits, breads, and cakes, while hot meat and rice dishes were served "family style" — large plates placed in the center of each table from which everyone served themselves.

Throughout the banquet a historian and storyteller, Joseph Pekelo Kekipi Bright Recca, a descendent of King Kamehameha, told traditional stories and, along with three other dancers, used the hula to convey additional Hawaiian lore.

— Pamela L. Gay, Kai'aleleiaka

DIVISION D

A Hawaiian Cocktail of Science for Division Days

By DIANA WORRALL

The organizers of Division Days programs for Division D, High Energy Phenomena and Fundamental Physics, have selected a broad range of exciting science topics that complement the specialized Symposia and Focus Meetings of the IAU General Assembly.

On Friday morning you can hear about accretion flows, and after lunch you can find out the latest about black-hole spin. On Monday morning we will discuss phenomena ranging from fast radio bursts to cosmic rays and neutrinos. Also in the mix are talks on the growth of galaxy clusters and on the magnetic universe.

Division D's agenda features presentations from the Presidents of our two post-General Assembly Commissions: D1, Gravitational Wave Astrophysics, and the Cross-Division X1, Supermassive Black Holes, Feedback and Galaxy Evolution, which falls under Divisions D and J. The President of X1, Bill Forman, will discuss on Friday how outbursts from supermassive black holes affect the evolution of galaxies, groups, and clusters. On Monday Neil Gehrels, President of D1, will discuss multimessenger observations and opportunities for gamma-ray bursts. A new Division Working Group on Supernovae is on the horizon, and you can learn about that in Monday's talk by Paolo Mazzali.

The Division Presidents have worked as a team over the past three years. One innovation has been the introduction of these Division Days, in recognition that the primary affiliation of IAU members is now to one or more of the nine Divisions. We have high hopes that the Division Days will thrive. The incoming Division committees are keen to receive your thoughts on their future content. ✿

Division Meeting — Division D: High Energy Phenomena and Fundamental Physics	
Start date	Friday, 7 August
End date	Monday, 10 August
Oral sessions	Room 315, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Related events	FM 10: Stellar Explosions in an Ever-Changing Environment, 11-13 August FM 14: The Gravitational Wave Symphony of Structure Formation, 12 -14 August FM 18: Scale-Free Processes in the Universe, 12-14 August
For details on presenters, topics, and times see the online program or mobile app.	

DIANA WORRALL is Professor of Physics at the University of Bristol, U.K., and outgoing President of IAU Division D. Her research interests include extragalactic astrophysics and X-ray astronomy.

SPLINTER MEETING

Time-Domain Astronomy

By ELIZABETH GRIFFIN

Everything in the universe changes in some manner. For example, the gradual momentum of evolution; the measureable periodicities associated with binary systems; and the unpredictable explosions of novae or higher-energy transient events, such as supernovae and gamma-ray bursts.

The scientific success of numerous surveys and missions — the Large Synoptic Survey Telescope (LSST), Gaia, and the Laser Interferometer Gravitational-Wave Observatory (LIGO), to name just a few — depend on engagement by those projects with the international astronomical community. It needs rapid response follow-up, spectroscopic characterization, archival research, and other complementary multimessenger science. It is therefore self-evident that the IAU can and will play a critical role in galvanizing such time-domain astronomy (TDA) efforts.

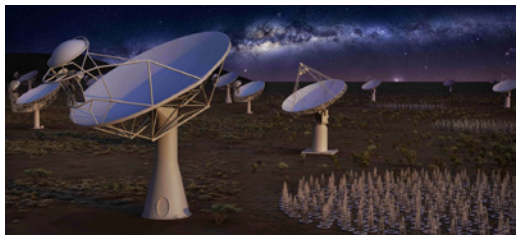
It was unexpected when several proposals for Commissions and Symposia, focusing on diverse TDA topics, were rejected in recent months. However, the IAU has created a Time Domain Astronomy Working Group (WG), currently hosted by Division B Commission 5, and will move it to the new Commission B2, Data and Documentation, after the General Assembly.

The WG will hold its initial gathering as a Splinter Meeting. If you believe that TDA has an important future, please attend this meeting and help direct or select the following:

1. A formal structure for the WG;
2. A plan to resubmit a proposal to elevate the WG to Commission status;
3. A schedule of near-term TDA activities, such as meetings, fora, and symposia;
4. Communications, e.g., circulars, newsletters, websites, and anything else to enhance what the WG will plan to undertake.

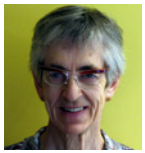
The Square Kilometre Array (SKA) project is an international effort to build the world's largest radio telescope. The SKA will conduct transformational science to improve our understanding of the Universe and the laws of fundamental physics, monitoring the sky in unprecedented detail and mapping it hundreds of times faster than any current facility. In its first phase, the SKA will be composed of hundreds of dishes in South Africa and hundreds of thousands of antennas in Australia. Currently supported by 10 countries, construction of the SKA is set to start in 2018 and early science in 2020.

Come learn about this incredible project at booth 137 and in the whole-day splinter session on Sunday 9 August.



Splinter Meeting: Working Group on Time Domain Astronomy	
Organizer	Elizabeth Griffin
Date	Friday, 7 August
Time	9:00 to 10:00 am
Location	Room 328, Hawai‘i Convention Center

We welcome suggestions for agenda items for this meeting, as well as new WG membership. We particularly encourage all those who submitted TDA proposals or work in the field to come to the Splinter Meeting. See you there! ✿



ELIZABETH GRIFFIN works at the Dominion Astrophysical Observatory of the National Research Council in Canada. She is the outgoing Vice-Chair of Division B Commission 5 Working Group “Time Domain Astronomy.”

OPEN HOUSE

Celebrate Dark Skies at the Bishop Museum

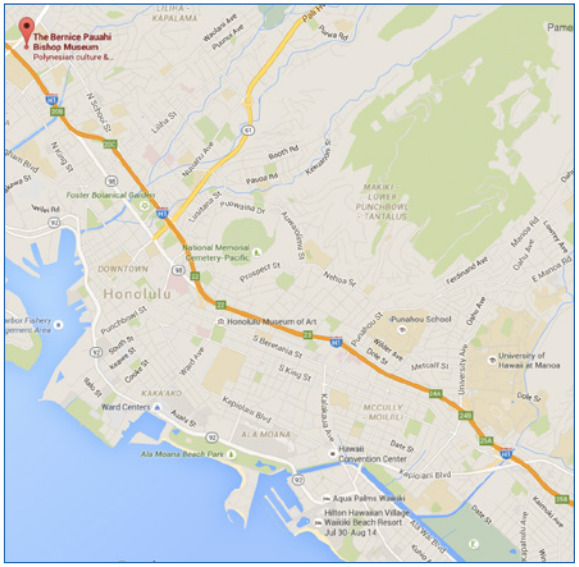
By RICHARD GREEN, CONSTANCE WALKER & CLIVE RUGGLES

We cordially invite you to join attendees of Focus Meetings 2 and 21 for a celebratory kick-off event at the Bernice Pauahi Bishop Museum, Atherton Hall, on Sunday, 9 August.

The Divisions and Commissions behind FM 2, Astronomical Heritage: Progressing the UNESCO-IAU Initiative, and FM 21, Mitigating Threats of Light Pollution & Radio Frequency Interference, are deeply engaged in the global celebration of the International Year of Light 2015 (IYL 2015), an initiative that also includes efforts to protect dark skies. Both IYL 2015 and dark-sky initiatives will be highlighted during the museum presentations. The reception will also feature the launch of an updated edition of *Nā Inoa Hōkū: Hawaiian and Pacific Star Names* by Rubellite Johnson, John Mahelona, and Clive Ruggles (see page 12 of this issue).

The reception is sponsored by C&W Energy Solutions, Ocarina Books, the Center for Astronomy & Physics Education Research (CAPER), and the International Dark-Sky Association.

This event provides an excellent opportunity for you to see the cultural collections at the Bishop Museum (separate admission required). Designated as the Hawai‘i State Museum of Natural and Cultural History, this facility is the largest museum in Hawai‘i and home to the world’s largest collection of Polynesian cultural and natural-history artifacts. The museum complex is also home to the Richard T. Mamiya Science Adventure Center.



The Bishop Museum is located at 1525 Bernice St., Honolulu. *[Google Maps]*

The IAU discounted admission fee is $16.95 for adults, with reduced rates for seniors and youth. (Please bring your IAU General Assembly badge.) Museum staff recommend that you allow about two hours to explore their collections. ✿



RICHARD GREEN is Assistant Director of the University of Arizona's Steward Observatory in Tucson, outgoing President of Commission 50, incoming President of Commission B7, Chair of the IAU Cosmic Light Working Group, and Co-Chair of FM 21. CONNIE WALKER is an astronomer at the U.S. National Optical Astronomy Observatory, outgoing Vice-President of Commission 50, incoming Vice-President of Commission B7, and Co-Chair of FM 21. CLIVE RUGGLES is at the University of Leicester, U.K. He is incoming President of Commission C4, World Heritage and Astronomy, and organizer of FM 2.

Open House at the Bishop Museum: Special Presentations and Free Reception	
Date, time	Sunday, 9 August, 5:00 pm
Address	Atherton Hall, The Bernice Pauahi Bishop Museum 1525 Bernice St. Honolulu, HI 96817
Coordinating Divisions	Division B: Facilities, Technologies and Data Science Division C: Education, Outreach and Heritage
For details on presenters, topics, and times see the event page or mobile app.	

SPLINTER MEETING

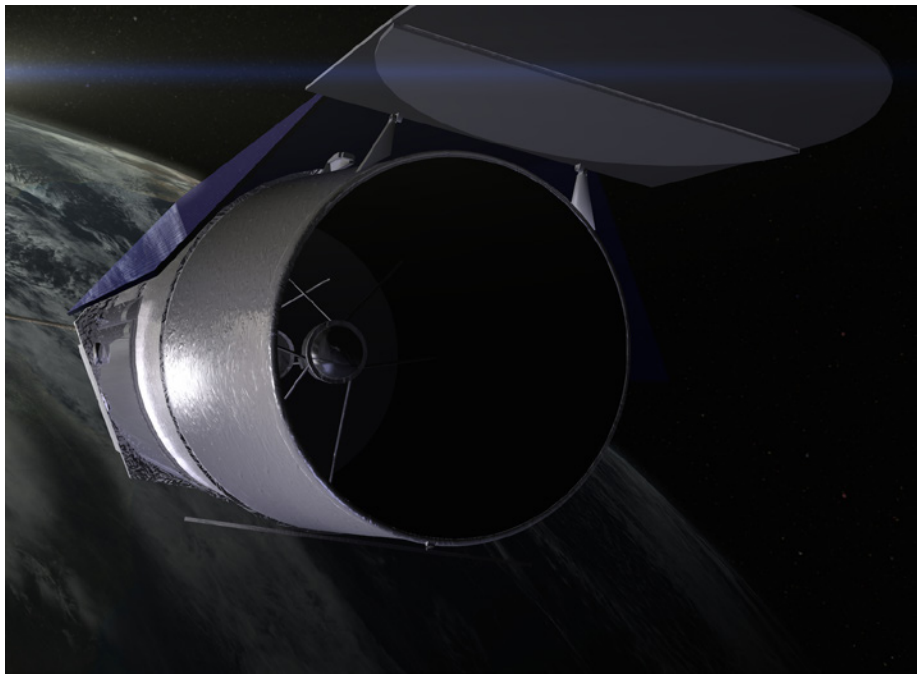
An Infrared Look at the Universe with WFIRST

By NEIL GEHRELS

NASA's Wide-Field Infrared Survey Telescope (WFIRST), a proposed infrared (IR) space observatory, is the top-ranked large space mission of the Astro2010 Decadal Survey. The planned mission has the potential to promote large advances in studies of dark energy, exoplanets, galaxy formation, and many other areas of extragalactic, galactic, and solar-system astrophysics.

In 2012 NASA acquired two Hubble-class 2.4-meter telescopes, and one of these has been designated for use as the basis for WFIRST. The predicted performance for WFIRST is impressive, with IR surveys covering thousands of square degrees to 27th magnitude. In addition to a wide-field imaging camera with an integral-field spectrograph and a grism (which allows the camera to be used simultaneously for imaging and spectroscopy), a high-contrast coronagraph will significantly advance exoplanet direct imaging — the highest-ranked Astro2010 mid-scale priority. Observing time will be available to the community through a vigorous Guest Investigator program.

The WFIRST wide-field near-IR surveys and high-contrast exo-



Artist's depiction of what NASA's WFIRST will look like once launched. *[NASA/GSFC CI Lab]*

planet imaging capabilities will be highly complementary to those of the James Webb Space Telescope (JWST), as rare targets found by WFIRST surveys across the sky can be studied in depth with JWST. In addition to dark energy and exoplanet observations, WFIRST will survey our galaxy and other nearby galaxies to answer key questions about their formation and structure. It will observe billions of galaxies to high redshift, enabling studies of their origin and evolution.

WFIRST will be a tool that astronomers can use across the IAU's broad range of subjects of interest. Sunday's Splinter Meeting will examine the scientific opportunities for the IAU community made available by the utilization of the 2.4-meter WFIRST, and it will provide an opportunity for astronomers to meet and discuss the best ways to take advantage of this powerful mission. ✿

Splinter Meeting: Science of the WFIRST Mission	
Date	Sunday, 9 August
Time	2:00 to 5:00 pm
Location	Room 327, Hawai'i Convention Center

NEIL GEHRELS is Chief of the Astroparticle Physics Laboratory at NASA's Goddard Space Flight Center in Greenbelt, Maryland; College Park Professor of Astronomy at the University of Maryland; and Adjunct Professor of Astronomy & Physics at Pennsylvania State University.

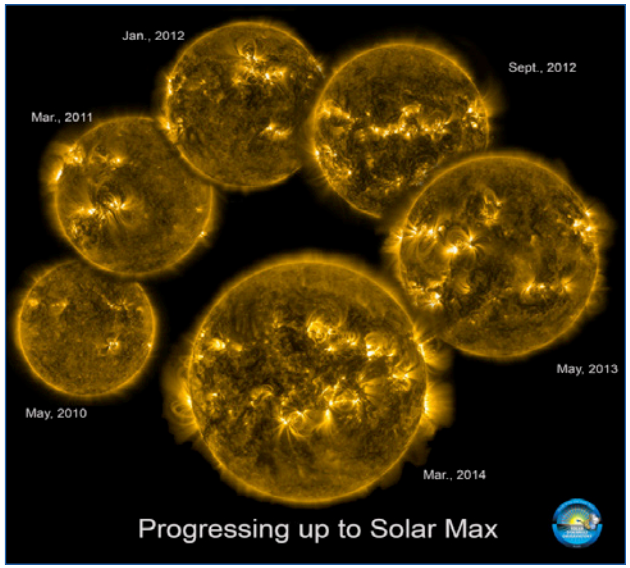
DIVISION E

Connections Within Solar and Heliospheric Studies

By LIDIA VAN DRIEL-GESZTELYI

Division E, Sun and Heliosphere, provides a forum for the exchange of ideas of astronomers — including observers, theorists, modelers, and instrumentalists — studying a wide range of phenomena related to our star and its environs. Research topics housed within this Division include the structure, radiation, and activity of the Sun; the dynamic magnetized solar wind that shapes the heliosphere; and their combined impact on the multitude of bodies within the solar system, including Earth.

The realm of Division E includes a broad span of intrinsically coupled research subjects, beginning with the uniquely detailed study of the dynamic solar interior enabled by helioseismology, and the unrivaled opportunity to study a functioning astrophysical dynamo. Studies of the solar interior, long-term irradiance changes, and the Sun's dynamic atmospheric structure are directly connected to the topic of magnetic fields and the solar cycle. Transient phenomena that result — such as flares, eruptions, coronal mass ejections, and particle acceleration — all occur within the context of a more gradually evolving background atmosphere, and together this shapes the entirety of the heliosphere.



Solar activity has increased from the longest and deepest solar minimum of the Space Age in 2009 to a modest solar-cycle maximum in 2014. These images show the increasingly active solar corona during Cycle 24 at 171 angstroms. *[NASA Solar Dynamics Observatory]*

Within the context of the heliosphere, Division E focuses on understanding the solar wind and the interplanetary magnetic field; their associated transients, shocks, and energetic particles; and the space-weather phenomena that all of these processes drive around the bodies located within the heliosphere. The long-standing Division Working Group "Solar Eclipses" reaches out to professionals, amateurs, and the public by providing information on and facilitating involvement in eclipse research.

A Note on Solar Missions from the New Division E President

The Sun is a unique star that can be investigated with high sensitivity and resolution in time, space, and across the entire electromagnetic spectrum. Current missions (such as SDO, SOHO, STEREO, Hinode, and RHESSI) continue to provide us with a wealth of data about solar and heliospheric processes, and recently built observatories such as the Chinese Spectral Radioheliograph and ALMA will provide unprecedented high-resolution imaging of the Sun and its surroundings. Planned future missions will push into new regimes. For example, Solar Probe Plus will approach the Sun in 2018 and take observations from a mere 8.5 solar radii above the photosphere.

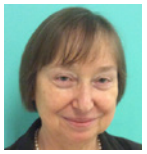
Join us at the Division E meeting to discuss the science covered by these missions and witness the exciting and thriving fields within solar and heliospheric physics.

— Yihua Yan (National Astronomical Observatories, China)

Division Meeting — Division E: Sun and Heliosphere	
Start date	Friday, 7 August
End date	Monday, 10 August
Oral sessions	Room 314, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
For details on presenters, topics, and times see the Division E meeting program (PDF)	

Division Days will feature the first-ever science meeting of Division E, which will cover everything from the deep solar interior to the fringes of the heliosphere. The 19 invited and 22 contributed talks, as well as 22 posters, will present state-of-the-art solar and heliospheric observations, theory, simulations, and instrumentation; an overview of scientific highlights of the past triennium; and projects for the next triennium and beyond.

With ground- and space-based instrumentation providing observations with ever-increasing spatial and temporal resolution, we recently passed the best observed solar maximum. One of the highlights of the Division Meeting will be the presentation of results from a years-long effort by a large group of solar-cycle experts: the re-calibration of the most-analyzed solar data sets, the sunspot number and sunspot group number series. The data will be made available to the solar community at the time of the meeting, and an invited talk on the effort will be presented by Fréderic Clette on Friday, 7 August. The program additionally includes the Business Meeting of the Division on 7 August, from 6:00 to 7:30 pm. ✿



LIDIA VAN DRIEL-GESZTELYI is the outgoing President of Division E. Her affiliations include Mullard Space Science Laboratory of UCL (University College London) in the U.K., Konkoly Observatory of the Hungarian Academy of Sciences, and the Paris Observatory, France.

New Books on Hawaiian Astronomy

By TIMOTHY F. SLATER

If you are looking for a book on Hawaiian astronomy, then look no further. Three new books on the subject, all written or coauthored by IAU members, are being released during the XXIX General Assembly.

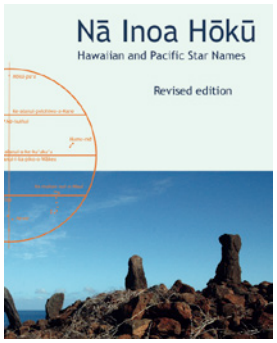
Updating a 1975 book considered to be a seminal work on Hawaiian astronomy, Rubellite Kawena Johnson, John Kaipo, and IAU member Clive Ruggles (University of Leicester, U.K.) are releasing *Nā Inoa Hōkū: Hawaiian and Pacific Star Names*, 2015 Revised Edition. Distributed through Native Books, Ocarina Books (U.K.), and the University of Hawai'i Press, this book provides a scholarly description of Hawaiian star names and their origins.

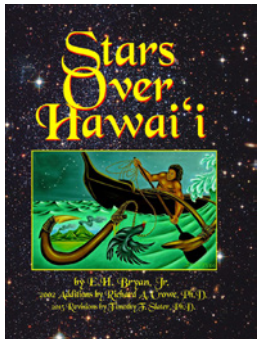
In celebration of 60 years in print, a new edition of the book *Stars Over Hawai'i* is being released this month. The original

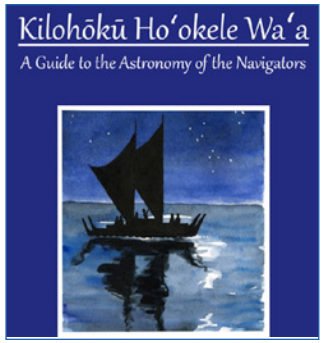
Honolulu Almanac ◓ 7 August 2015	
Sunrise / set	6:07 am / 7:07 pm
Twilight[1] start / end	4:48 am / 8:26 pm
Moonrise / set	12:18 am / 1:32 pm
Moon phase[2]	◑ Waning crescent (43% illum.)
Evening planet[3]	Saturn (SSW)
Morning planet[3]	Mars (E)
Special event	Cross-quarter day (midpoint between June solstice and September equinox)

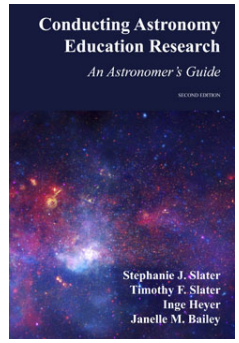
[1]Astronomical twilight (Sun 18° below horizon). [2]At meridian crossing [3]Naked-eye planets. Source: timeanddate.com

CAPER Team Book Signings: Exhibit Hall, Booth 315	
Conducting Astronomy Education Research	Friday, 7 August, 10:00 – 11:30 am
Nā Inoa Hōkū	Friday, 7 August, 1:30 – 3:30 pm
More book signings are planned for Week 2 of the General Assembly.	









book was published in 1965 by Honolulu's Bishop Museum's Edwin Bryan, Jr., who was well-respected at the time for, among other things, providing local island newspapers with monthly Hawaiian star charts. The book was significantly updated by the late Richard Crowe of the University of Hawai'i at Hilo, who added chapters on Polynesian voyaging and celestial navigation. In honor of the 60th anniversary of its original publication, I am leading the preparation of a revised version, published by Petroglyph Press. It includes updated facts with respectful sensitivity to Hawaiian culture that I have gained through working with hundreds of teachers in Hawai'i. A new chart of Hawaiian Moon phases is also included.

Pono Publishing is releasing *Kilohōkū Ho'okele Wa'a* — the astronomy of the navigators. The book is authored by Kālepa Baybayan of the Polynesian Voyaging Society, Stephanie Slater of the Center for Astronomy & Physics Education Research (CAPER), and me. This book is written from a Hawaiian perspective and provides a beginner's primer on the astronomical names used by modern Hawaiian wayfinders who navigate across the Pacific Ocean without modern instrumentation in double-hulled canoes.

Our CAPER team is also releasing a second edition of *Conducting Astronomy Education Research: An Astronomer's Guide*.

These books, among others, are being featured at a UNESCO and International Year of Light 2015 event at the Bishop Museum of Honolulu at 5:00 pm on Sunday, 9 August, organized for the IAU General Assembly. More information about the event can be found in the museum's PDF flyer. ✿

TIM SLATER is the University of Wyoming Excellence in Higher Education Endowed Professor of Science Education and serves as Editor of the *Journal of Astronomy & Earth Sciences Education.*

A Sky Wonderful with Stars

A Sky Wonderful with Stars: 50 Years of Modern Astronomy on Maunakea tells the fascinating story of how a remote mountaintop in the middle of the Pacific Ocean became home to the most powerful collection of telescopes in the world. It is a tale of triumphs, failures, and the indomitable human spirit of exploration. More than 160 photographs augment the text to bring the past and present to life and showcase the many remarkable discoveries made by the observatories atop Maunakea.

This book has just been published and is available in the Exhibit Hall of the IAU General Assembly.

— Michael West (Lowell Observatory, Flagstaff, Arizona)

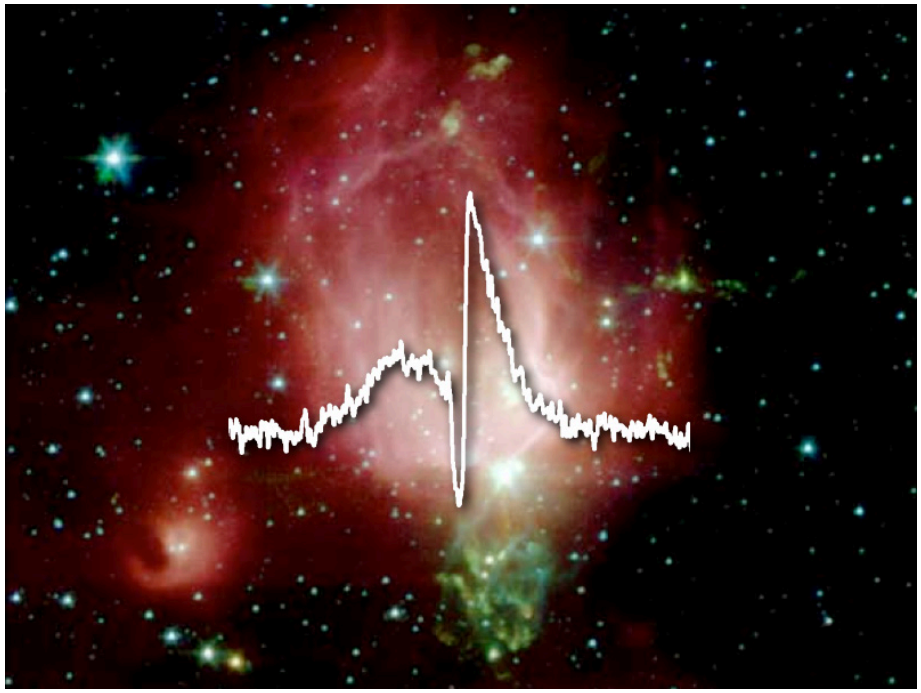
From Divisions VI and VII to Division H

By EWINE VAN DISHOECK

The invitation to become the President of the new IAU Division H, Interstellar Matter and the Local Universe, in Summer 2012 came as a big surprise. I was Vice-President of Commission 14, Atomic and Molecular Data, at that time and transitioning to become President of that Commission. Leading an entire Division was undoubtedly a bigger challenge!

I was familiar with the old Division VI, Interstellar Matter, but the "Local Universe" part of the Division H title sounded rather vague to me. Fortunately, the IAU Executive Committee had selected an excellent Vice-President, Joss Bland-Hawthorn, whose expertise is complementary to mine and who could educate me on this part. Our first joint task — together with Division J President Francoise Combes — was to draw up a definition of "Local," which is now posted on the Division H website along with many other resources for the Division.

The two parts in the title of our Division are of course closely linked: the interstellar medium (ISM) and stars, the two major visible components of a galaxy, are coupled to each other through star formation, stellar feedback, and their gravitational potential. The research in Division H therefore ranges from the physics and chemistry of different components of the ISM (ionized, neutral, molecular) — both locally and on galaxy-wide scales — to measurements of resolved stellar populations and star clusters in the local universe and the dynamics of galaxies. The formation and evolution of atoms, molecules, and dust during all phases of star formation and death are an integral part of ISM studies. The



Major advances in star formation — one highlight of Division H science — have come from infrared imaging and spectroscopy using recent space telescopes. This figure shows the Herschel-HIFI spectrum of water from the protostar NGC 7129 IRS. *[D. Johnstone, L. Kristensen] The background is a Spitzer Space Telescope image of this star-forming region. [NASA/JPL-Caltech/S.T. Megeath]*

Division Meeting — Division H: Interstellar Matter and the Local Universe	
Start date	Friday, 7 August
End date	Monday, 10 August
Oral sessions	Room 313C, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
For details on presenters, topics, and times see the Division H meeting schedule (PDF).	

structure and composition of protoplanetary disks around pre-main-sequence stars set the scene for planet formation. We were fortunate to get a strong Division Steering Committee (DSC) with expertise on all these aspects in early 2013.

The next three years were a busy time for the Division Presidents, since the new IAU structure still had to be put together at the Commission level. Steered by the IAU General Secretary, Thierry Montmerle, and stimulated by several face-to-face meetings, the transition from the old to the new Commissions (listed on the IAU Division H webpage) was made. New Working Groups are the next step in the new structure.

The DSC also evaluated and selected many excellent proposals for IAU Symposia and Focus Meetings. We are pleased to have a rich program of interest to our Division at the IAU General Assembly during the full two weeks. If you want to learn more about our science, please come and visit us at the Division Meeting! ✿

EWINE VAN DISHOECK is a professor of molecular astrophysics at Leiden University, the Netherlands, and an external scientific member of the Max Planck Institute for Extraterrestrial Physics in Garching, Germany. She was formerly Vice-President of Commission 14 and is now President of Division H, Interstellar Matter and the Local Universe.

WOMEN IN ASTRONOMY: SCATTERED TALK #1

Workplace Climate and Anti-Harassment Policies

By FRANCESCA PRIMAS

The IAU Women in Astronomy Working Group (WG) and the AAS Committee on the Status of Women in Astronomy have teamed up to present a series of three lunchtime "Scattered Talks" during the XXIX General Assembly.

The first one of these will be presented by Christina Richey, Senior Scientist at Smart Data Solutions, LLC, working for the Science Mission Directorate at NASA Headquarters, and will take place today from 12:30 to 2:00 pm in Room 318A. Please bring your own lunch.

Workplace climate can promote, or hinder, scientific productivity and innovation. The Survey on Workplace Climate sought to discover whether scientists in the astronomical community experienced a hostile work environment. We recruited 426 participants for an online questionnaire and reported the preliminary results from respondents' experiences in the last five years. Notable conclusions:

1. Scientists in the astronomical community experience and witness inappropriate language, verbal harassment, and physical assault.
2. Abuses that relate to gender are those that appear in the greatest proportion in this sample.
3. Inappropriate comments, harassment, and assault lead to a number of scientists feeling unsafe in their workplaces and

pursuing fewer scholarly opportunities as a direct result of these experiences.

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

Q1: What is the topic of your Scattered Talk?

CR: My key topic will be workplace and conference climate, with particular emphasis on the issue of harassment. I'll report preliminary results from the Survey on Workplace Climate, then define harassment and highlight the types of harassment that are frequently encountered by scientists.

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

CR: As a member of the CSWA and co-organizer (with IAU Women in Astronomy WG Chair Francesca Primas) of the Women's Lunch Events and Meet-the-Mentor sessions, I'm really looking forward to hearing top members of our community not only discuss key science topics, but also share their success stories and tips with the next generation of leaders in our field. For those programs to continue to be successful, we need to reach the next generation of scientists and excite them, and we need to improve many issues that are negatively impacting scientists and taking away from their vital work.

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

CR: Have confidence in yourself and know that there are support networks to help you as you advance your career. Meeting with leaders in the field can be intimidating, but remember that they are people too, and they were once young up-and-comers as well. Don't be afraid to network, as that's what these conferences are for. If you are nervous about this, feel free to find me, and I'll help you (just look for a woman with purple hair). ✿

Honolulu Weather Forecast 7–8 August 2015

FRIDAY, 7 AUGUST		*High: 84°F / 29°C Low: 73°F / 23°C*
Morning	**Afternoon**	**Evening**
Clear	Partly cloudy	Cloudy
20% chance of rain	40% chance of rain	10% chance of rain
SATURDAY, 8 AUGUST		*High: 83°F / 28°C Low: 73°F / 23°C*
Morning	**Afternoon**	**Evening**
Partly cloudy	Clear	Partly cloudy
20% chance of rain	0% chance of rain	5% chance of rain

Extended forecast: Tropical Storm Guillermo is expected to continue passing over the islands through Friday. East-southeast winds will build behind the system on Friday and shift to trade winds Saturday and into early next week. Sources: Weather Underground and the National Weather Service.

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.

SPLINTER MEETING

Voyage to Education with the Sloan Digital Sky Survey

By KAREN MASTERS

Engaging students with real astronomical data has a variety of positive effects. For example, it provides opportunities for "hands-on, minds-on science," offers the thrill of possible discovery, and teaches students that not everything in science has

Splinter Meeting: Voyage to Education with the Sloan Digital Sky Survey (SDSS)	
Date	Monday, 10 August
Time	8:30 am to 2:00 pm
Location	Room 327, Hawai‘i Convention Center
Agenda	Mapping the Universe: Introduction to SDSS Introduction to SDSS Voyages: History and Evolution Coffee & tea break Matching Content to Curricula Exploring the Voyage Website: Individual exploration and work time Group Discussion: What do you need Voyages to do for you? Continued work time and/or lunch

been discovered.

The Sloan Digital Sky Survey (SDSS) has a long history of making its data publicly accessible. Now available from SDSS is an educator-focused website, SDSS Voyages, that brings real data into the classroom.

SDSS education consultant Kate Meredith has led the development of SDSS Voyages in collaboration with Jordan Raddick and Britt Lundgren. The site includes example activity plans to give ideas on how to use its resources, as well as a Featured Teacher section, which is a space to recognize educators who are making innovative use of SDSS data in their classrooms.

Activities on SDSS Voyages come in three flavors that provide a variety of lengths and levels of complexity. “Launch” and “Expedition” activities are specifically designed to be student-led, inquiry-based experiences, with multiple possible stopping points and support material. “Preflight” and “Help” sections provide background and reference materials that are grounded in the SDSS surveys.

You can learn to effectively use the SDSS in your classroom with SDSS Voyages. *[SDSS]*

I invite you to join us for a half-day, hands-on workshop exploring this resource on Monday, 10 August, from 8:30 am to 2:00 pm in Room 327 of the Hawai‘i Convention Center. We welcome drop-ins, and it is OK to come and go. Participants will have the opportunity to contribute their own experiences from using data in educational settings and to suggest new content based on exploration of SDSS data. ✿

KAREN MASTERS is a reader in astronomy and astrophysics at the Institute of Cosmology and Gravitation, University of Portsmouth, U.K. She is also the Director of Outreach and Public Engagement for SDSS and Project Scientist for the Galaxy Zoo citizen-science program.

O‘ahu Beach Is Named Best in the USA

By RICK FIENBERG, *Kai‘aleleiaka*

If you ask most people to name a beach in Hawai‘i, they’ll probably say, “Waikīkī.” That’s no surprise, because Waikīkī is adjacent to the Hawai‘i Convention Center and many popular hotels and resorts, and it has been featured in countless movies and television shows. But is it the *best* beach in Hawai‘i? Not according to Stephen P. Leatherman of Florida International University’s

[DrBeach.org]

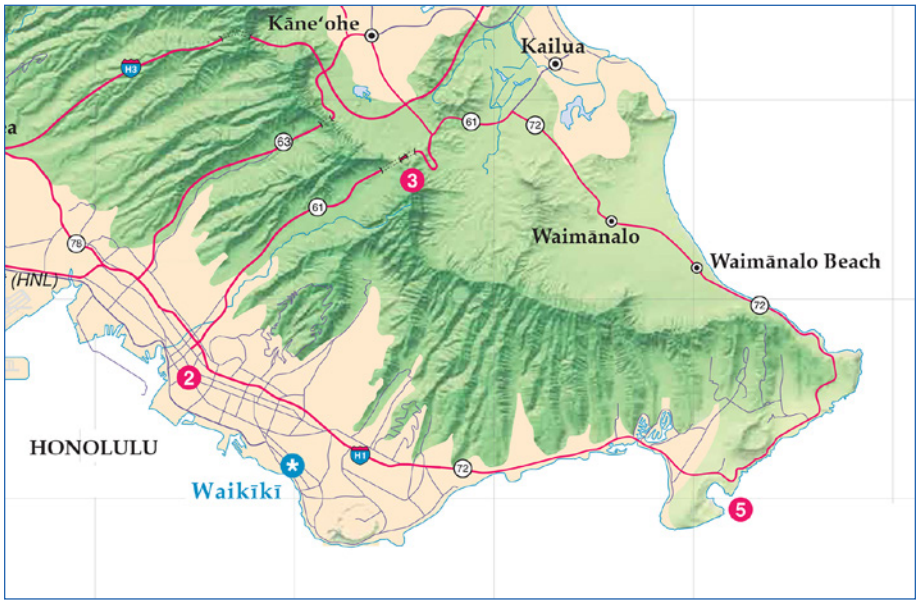
Department of Earth & Environment in Miami.

Leatherman is the author of more than a dozen books and hundreds of scientific articles about storm impacts, coastal erosion, and ways to improve beach health and safety. As "Dr. Beach" he has been publishing his Top 10 Beaches list for 25 years. His 2015 pick for the best beach not only on O'ahu, not only in Hawai'i, but in the entire United States is Waimānalo Bay Beach Park, about 18 miles (about 35 minutes by car) from Waikīkī.

Here's how Leatherman describes Waimānalo in a PDF press release issued in May: "[The beach] is located in the northeastern corner of O'ahu in the countryside and is often missed by tourists.... Waimānalo Bay is O'ahu's longest beach — extending for more than five miles; it is great for walking and beachcombing in the soft white sand. The wind is always blowing onshore because of the trade winds, making it safe for sailboats. This sandy coral beach slopes gently into the turquoise oceanic waters.... There are restrooms and showers along with shady areas courtesy of the ironwood trees.... The shallow sand bar provides for good [swimming and] body-boarding."

Dr. Beach uses 50 criteria when compiling his annual roundup, including water and sand quality as well as safety and environmental management. He awards bonus points for prohibition of smoking. O'ahu leads the way in that regard: smoking at all beaches on this Hawaiian island has been banned by law since January 2014.

To figure out how to get from your hotel to Waimānalo Bay Beach Park, see the transportation guide on the conference website. ✿



[© 2010 Hawai'i Visitors and Convention Bureau]

Congratulations to

Anamaria Maraboli-Smith!

You have won
breakfast for two at
Rainbow Lanai — Hilton Hawaiian Village
at 2005 Kalia Rd.

Prizes can be redeemed, and raffles can be entered, at Exhibit Hall Booth 336

Kai'aleleiaka — THE MILKY WAY

Issue 6 — 10 August 2015

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IAU XXIX GENERAL ASSEMBLY Hawaii

INTERNATIONAL YEAR OF LIGHT 2015 COSMIC LIGHT IAU

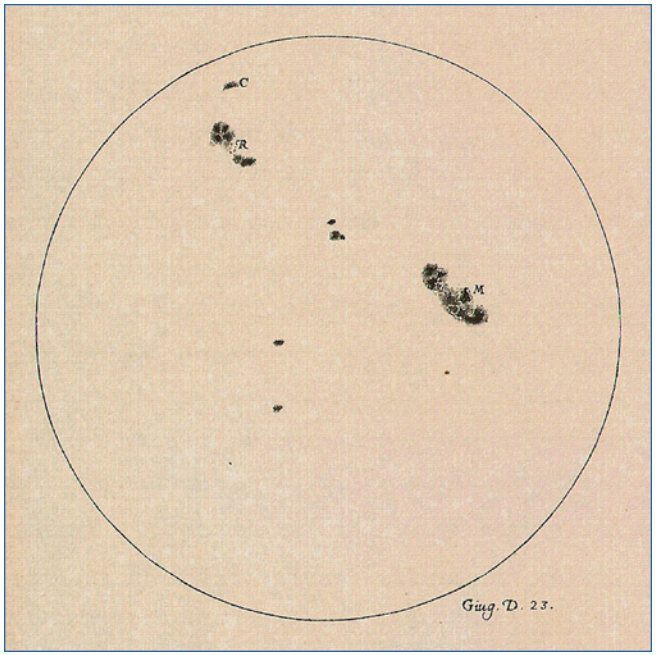
Revised Sunspot History Sets the Record Straight

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

By LAURENCE A. MARSCHALL, *Kai'aleleiaka*

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 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.



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]*

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'aleleiaka THE MILKY WAY

EDITORIAL

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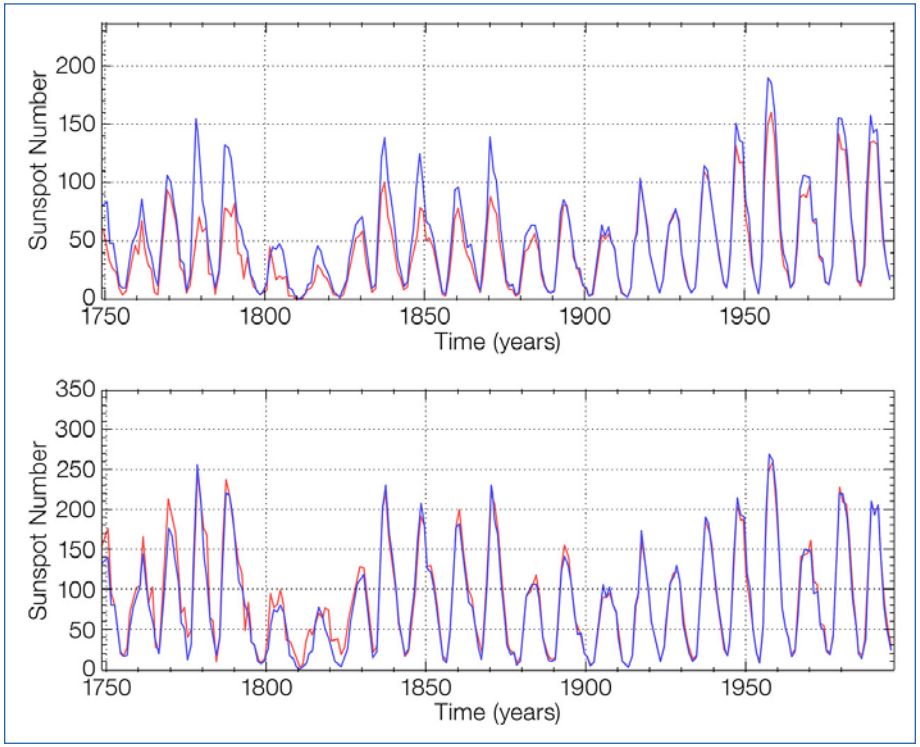
http://astronomy2015.org/newspaper.

Kai'aleleiaka (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.

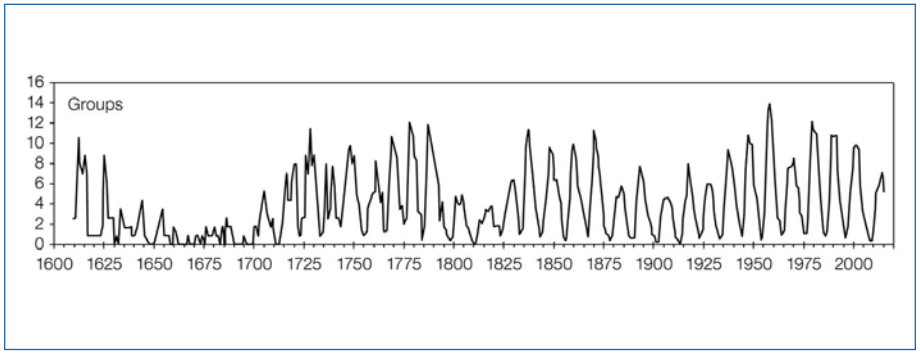
years. The creation of Sunspot Number Version 2.0 involved more than 40 astronomers examining these original sources over the past four years, unearthing additional reports and images that had not been included in the original tallies by Wolf and others, and then applying corrections to produce a homogenous 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]*

PLANETARY-SYSTEM NOMENCLATURE

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

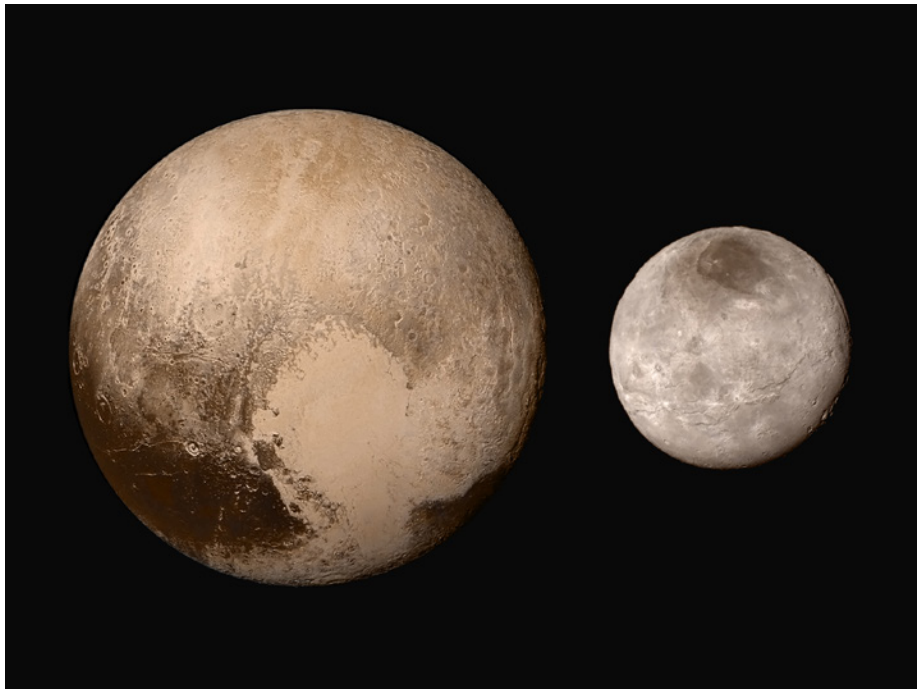
The recent spectacular success of NASA's New Horizons mission to Pluto and its moons has lifted the curtain on a fascinating and complex world on the outskirts of our planetary system.

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.

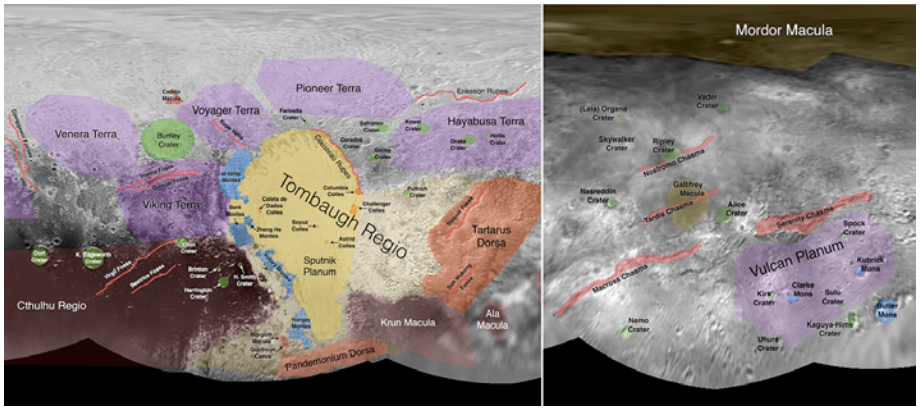
The informal names chosen by the New Horizons team have excited many members of the public, who are not aware that these names may be only temporary. Unfortunately, some of the names used for features on Pluto and Charon fall outside the naming themes accepted by the IAU. "If such use persists, it can 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 astronomical 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



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]*



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 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.

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

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).

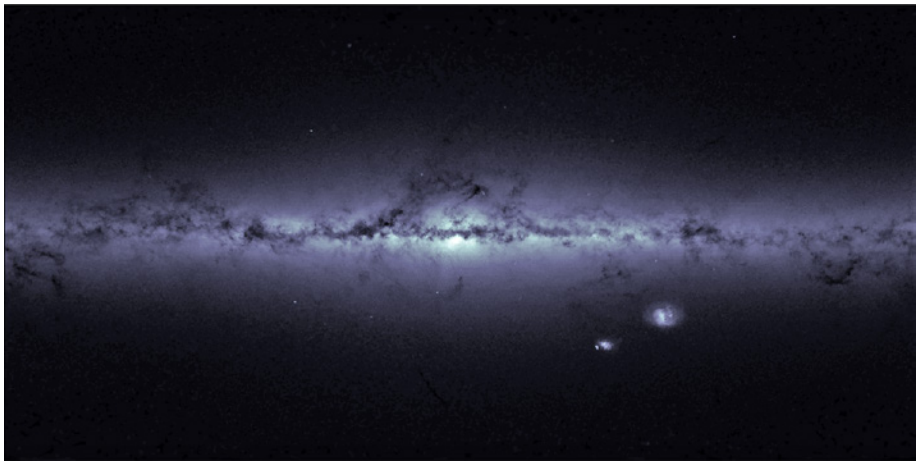
DIVISION H

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



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]*

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

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

- Hoaloha: friend
- Honu: turtle
- Kumu: teacher
- Nui: big, great, important
- ʻOno: 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 ʻokina, 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.

Speaker Christina Richey presents the results of the CSWA Survey of Workplace Climate. *[Susanna Kohler, Kaiʻaleleiaka]*

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!

— Susanna Kohler, Kaiʻaleleiaka

Swell Swag in the Exhibit Hall

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

By IRIS NIJMAN, *Kaiʻaleleiaka*

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 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**.

[Pamela Gay, Kaiʻaleleiaka]

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: Evelynn
Age: 37
Profession: Security guard

[Iris Nijman, Kaʻaleleiaka]

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 Oʻahu?

- The Polynesian Cultural Center, the north and west shores for beautiful beaches, and the Koʻolina 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 Hawaiʻi?

- 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, Kaʻaleleiaka

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 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.

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]*

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

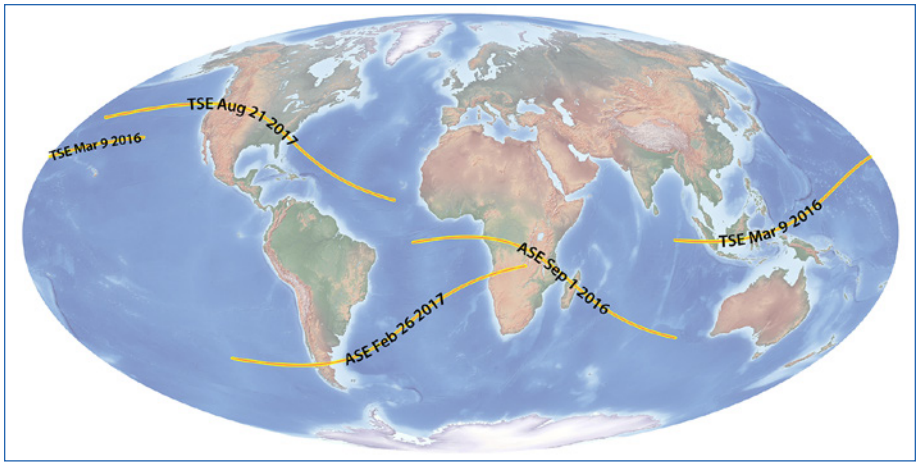
Total & Hybrid Solar Eclipses: The Past Triennium

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



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.

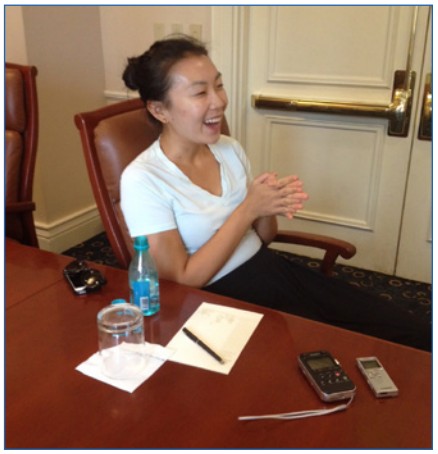
ORAL HISTORY PROJECT

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.



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

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

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)

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

Congratulations to

Gianfranco Vidali!

You have won
two Orbs of O'ahu Driving Tour tickets (value: $118) from O'ahu Ghost Tours
at (808) 524-4944.

Prizes can be redeemed, and raffles can be entered, at Exhibit Hall Booth 336

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

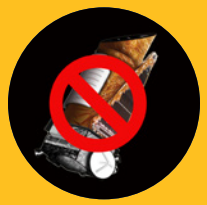
Paul Coleman

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.

Answers on page 18.

[Infographic: Leslie Proudfit, Kai'aleleiaka]

Solar and Stellar Flares and Their Effects on Planets

By KAZUNARI SHIBATA

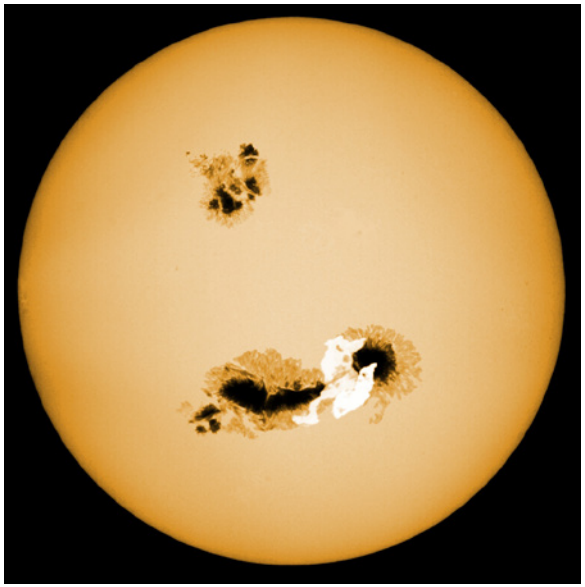
In 1859 English observer Richard Carrington saw a solar flare in white light. That event, now called the Carrington flare, was the largest observed until now and caused the biggest geomagnetic storm in the last 200 years. It is known that this magnetic storm induced several troubles in our civilization: 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

For details on presenters, topics, and times see the online program or mobile app.

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.



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

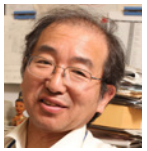
The energy source of solar flares is now established to be magnetic energy stored near sunspots. There is increasing observational evidence that solar flares are caused by magnetic reconnection, merging of anti-parallel magnetic field lines, and associated magneto-plasma dynamics.

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

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 welcoming 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]*

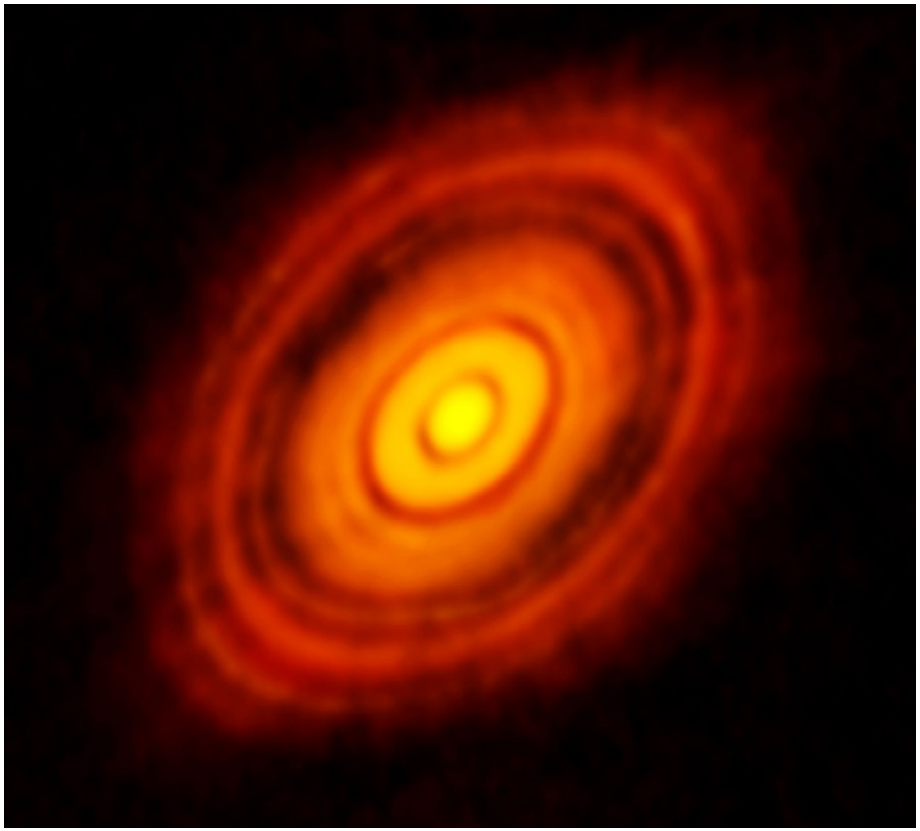
DIVISION F

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.



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)]*

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

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]*

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 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.

Honolulu Weather Forecast 10–11 August 2015

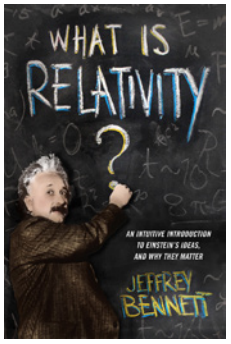
MONDAY, 10 AUGUST		***High: 87°F / 31°C Low: 76°F / 24°C***
Morning	**Afternoon**	**Evening**
Clear to partly cloudy	Partly cloudy	Clear
5% chance of rain	5% chance of rain	5% chance of rain
TUESDAY, 11 AUGUST		***High: 87°F / 31°C Low: 76°F / 24°C***
Morning	**Afternoon**	**Evening**
Clear	Partly cloudy	Partly cloudy
10% chance of rain	25% chance of rain	25% chance of rain

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.

"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'aleleiaka

Michael Hahn!

You have won a
sunrise or sunset tour for two (value: $170) from
Blue Hawai'i Photo Tours
at 3731 Kana'ina Ave.

Prizes can be redeemed, and raffles can be entered, at Exhibit Hall Booth 336

How to Contribute to the Conference Newspaper

Kai'aleleiaka 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

Kai'aleleiaka — THE MILKY WAY

Issue 7 — 11 August 2015

TABLE OF CONTENTS

IAU XXIX GENERAL ASSEMBLY Hawaii

INTERNATIONAL YEAR OF LIGHT 2015

COSMIC LIGHT IAU

World's First International Dark Sky Sanctuary in Chile

By INGE HEYER, *Kaiʻaleleiaka*

During a public event at the Bernice Pauahi Bishop Museum in Honolulu on Sunday, 9 August, the International Dark-Sky Association (IDA) announced that the site of the Associated Universities for Research in Astronomy Observatory (AURA-O), in the Elqui Valley of Northern Chile, will be designated as the world's first International Dark Sky Sanctuary. The site will be known as the Gabriela Mistral Dark Sky Sanctuary, named after the famed Chilean poet and Nobel laureate, who grew up in the Elqui Valley and whose poetry reflects a love and tenderness towards these wonderful skies.

About 200 people attended the Open House at the museum, organized as part of the public program of the IAU General Assembly — a mix of both local people and conference delegates.

International Dark Sky Places Program Manager John Barentine said, "Dark-sky sanctuaries are the rarest and most fragile dark places left on the planet. The Sanctuaries designation fills a need for the recognition and protection of examples of how the world appeared before the introduction of electric lighting."

Moonrise over the telescope domes on Cerro Tololo, with the Large and Small Magellanic Clouds visible and the galactic center rising. *[AURA]*

The new IDA designation reflects the need for special protection for the world's darkest places that are threatened. In certain cases, the public may be excluded from these sites in order to prioritize dark-sky conservation.

This new sanctuary site contains more than 90,000 acres (360 square kilometers) of mountainous terrain and hosts four major research facilities: the Cerro Tololo Inter-American Observatory (CTIO), the southern branch of the National Optical Astronomy Observatory; the Gemini South Telescope; the Southern Astrophysical Research (SOAR) telescope; and the Large Synoptic Survey Telescope (LSST), which is currently under construction.

This is the first instance in which a professional observatory has received IDA recognition for its dark-skies stewardship and provides a model for many other ground-based astronomical research facilities. Associated Universities for Research in Astronomy (AURA) has worked

Kaiʻaleleiaka THE MILKY WAY

EDITORIAL

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Kaiʻaleleiaka (The Milky Way) is the official newspaper of the XXIX General Assembly of the International Astronomical Union, 3-14 August 2015, Honolulu, Hawaiʻi. 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.

closely with the Chilean government, which has passed a number of outdoor lighting regulations designed to save energy and preserve the night skies in Northern Chile.

The IDA's Executive Director, J. Scott Feierabend, said: "The Gabriela Mistral Dark Sky Sanctuary will serve as an example of how collaboration among governmental and non-governmental stakeholders can preserve one of the most special places on the planet."

Ambassador Gabriel Rodriguez, of the Chilean Ministry of Foreign Affairs, added, "The Chilean government has prioritized the protection of the dark skies of Northern Chile through both regulation and education, but more importantly through its recognition that Chile's night skies are a natural resource to be preserved and passed on from generation to generation."

Over the past 50 years, U.S. and international partners have invested more than a billion U.S. dollars in astronomical telescopes and advanced instruments on the AURA-O site — facilities that are planned to be operational for at least another five decades. Securing the integrity of natural night at one of the most famous astronomical research sites in the world requires educating nearby communities and adopting good outdoor-lighting practices. AURA-O has committed to a long-term program preserving these dark skies through a lighting-management plan coupled with extensive education and public outreach efforts. The Chilean institution responsible for the protection of the quality of the night skies, the Oficina de Protección de Calidad de los Cielos (OPCC), is also involved.

Lift up your face, child, and receive the stars.

— Gabriela Mistral, *Carro Del Cielo*

The Dark Sky Sanctuary designation is only the beginning for the region. "If our collective efforts around the Elqui Valley are successful, we will have further protections for the incredible resource of Chile's dark skies," said R. Chris Smith, Director of the AURA observatories in Chile. "Not only will this area attract further world-class professional observatories — it is becoming a world destination for eco-tourism with its incredible array of tourist-oriented observatories and night-sky viewing sites." ✿

Honolulu Almanac 🐟 11 August 2015

Sunrise / set	6:09 am / 7:04 pm
Twilight[1] start / end	4:50 am / 8:23 pm
Moonrise / set	3:42 am / 5:04 pm
Moon phase[2]	● Waning crescent (8% illum.)
Evening planet[3]	Saturn (SSW)
Morning planet[3]	Mars (E)

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

PRESS CONFERENCE

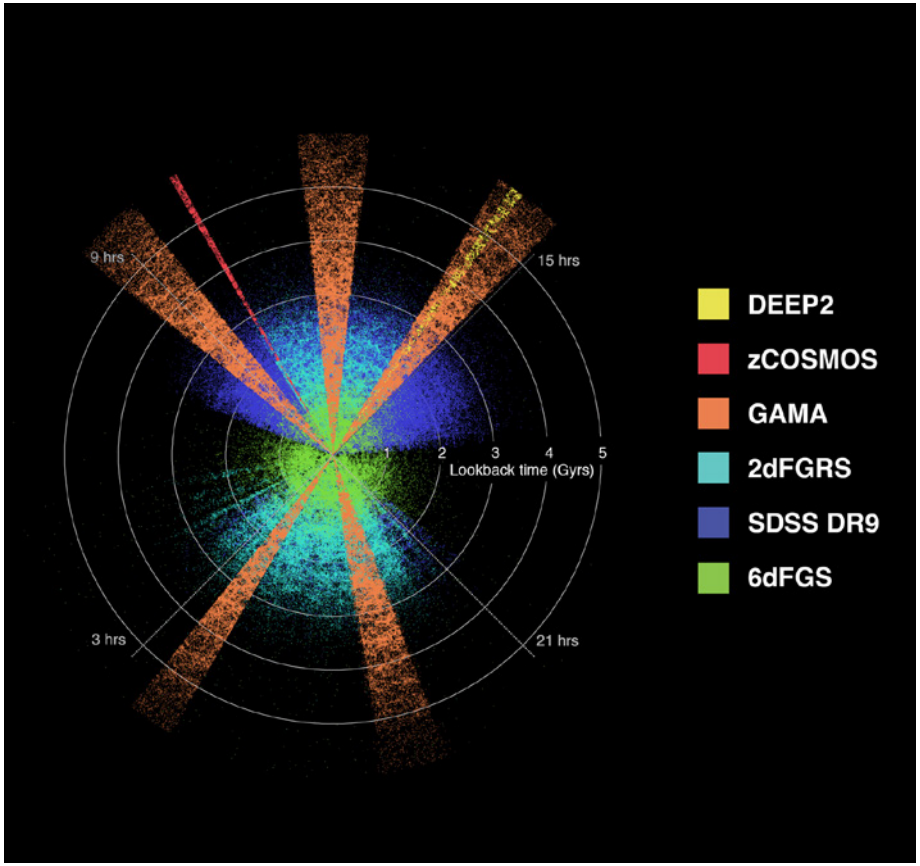
Max Star Count & the Slow Death of Everything

By PAMELA L. GAY, *Kai'aleleiaka*

Our universe has seen a lot of ups and downs during its 13.8-billion-year history. From inflation to recombination, and from reionization to today, the rate of energy production has varied while energy densities have steadily declined. While many details of this story are still only vaguely known, the Galaxy And Mass Assembly (GAMA) Survey has made great strides in elucidating the changes of the past two billion years. GAMA has studied more than 200,000 galaxies in five regions of the sky using 10 telescopes spanning 21 bandpasses from the ultraviolet to the far infrared. As a Monday-morning press conference at the IAU General Assembly, members of the GAMA team reported that we live in a universe in decline.

The GAMA Survey's five regions drill through space and time, taking "core samples" of our universe that allow us to trace cosmic evolution with new levels of detail. The 10-terabyte Panchromatic Data Release of 10 August probes to look-back times greater than 5 billion years, giving GAMA one of greatest depths among modern surveys.

In the paper associated with the data release, Simon Driver (ICRAR – University of Western Australia) and his collaborators study the cosmic spectral energy distribution across three epochs — 0.3 to 1.1 Gyr, 1.1 to 1.8 Gyr, and 1.8 to 2.4 Gyr — and find the universe is producing declining amounts of energy. The energy of the universe is tied up in various forms. Regular mass represents energy made tangible, and everything from light to motion is an expression of energy transport. Roughly 2.3 billion years ago, galaxy interactions and mergers were more prevalent, star-formation rates were higher, and energy was produced at up to twice the rate seen in the universe today. While stars continue to form in the present epoch, we are at a point in time when the maximum number of stars has been achieved. As we move past peak star number, the universe lumbers slowly toward heat death. As Driver puts it, "The universe has basically sat down on the sofa, pulled up a blanket, and is about to nod off for an eternal doze." ✿



The distribution of galaxies as mapped by various Australian, American, and European survey teams in the GAMA collaboration. *[IRCAR, GAMA]*

IAU SYMPOSIUM 316

Formation, Evolution, and Survival of Massive Star Clusters

By CORINNE CHARBONNEL & ANTONELLA NOTA

Unprecedented high-resolution observations have recently revealed the complexity of massive star clusters, young and old. This has led to an important surge of theoretical developments and numerical simulations aimed at understanding the formation and evolution of these objects not only in the local universe, but also at high redshift. Acquiring a complete understanding of these systems, and of the multiple stellar populations they host, is very challenging. It requires the exchange of ideas, and collaboration, among astrophysicists with observational, theoretical, and numerical expertise in a variety of fields: stellar evolution, interstellar matter, magnetohydrodynamics, stellar dynamics, formation and evolution of galaxies, cosmology, multidimensional numerical simulations, N-body simulations, and multiwavelength high-precision photometry, spectroscopy, and astrometry.

The scientific program of IAU Symposium 316 is built to ensure cross-fertilization and networking among specialists in all these fields. We hope the discussions will help define coordinated, innovative, and cutting-edge theoretical, numerical, and observational developments in order to tackle interrelated open issues. This Symposium is particularly timely since our community has to prepare the groundwork for future observations with the Atacama Large Millimeter/submillimeter Array (ALMA), as well as the Square Kilometre Array (SKA), the James Webb Space Telescope (JWST), and the next generation of extremely large telescopes. These facilities will soon open new windows on super star clusters, as well as on galactic and extra-galactic stellar systems and globular clusters.

The sessions of the Symposium will focus on the following:

- State-of-the-art multiwavelength observations of massive star clusters and of their progenitors, from zero to high redshift;
- Links between massive star clusters and their host galaxies, from currently forming ones to cosmological relics;
- Physics and modes of massive-star-cluster formation, from the early to the present-day universe;

IAU Symposium 316 will explore connections between the crowded hearts of old globular clusters (left) and recently formed massive star clusters in colliding galaxies (right). *[Left: ESA/Hubble, NASA; Right: ALMA (ESO, NAOJ, NRAO)]*

- Dynamical and chemical evolution, disruption, or survival of massive star clusters in different environments and at various cosmic times;
- Formation of multiple stellar populations, their impact on the dynamics of their host clusters, and their connection to the galactic stellar populations.

We invite you to attend Symposium 316 and hope to see you there! ✿


CORINNE CHARBONNEL, Co-Chair of IAU Symposium 316, is a professor at the University of Geneva, Switzerland, and a senior researcher at the French National Centre for Scientific Research in Toulouse. Additionally, she is incoming President of IAU Division G. ANTONELLA NOTA, Co-Chair of Symposium 316, is the ESA Hubble Project Scientist and Mission Manager and Associate Director of the Space Telescope Science Institute in Baltimore, Maryland.

PLANETARY-SYSTEM NOMENCLATURE

Pluto System Names: The New Horizons Team's Perspective

By S. ALAN STERN

In Issue 6 of *Kaiʻaleleiaka* the New Horizons team was criticized for "promulgating nicknames" for surface features on Pluto and Charon. We welcome this opportunity to respond.

The names on our informal Pluto system maps are being used to facilitate our ability to do and report early science results about Pluto and its moons. They were obtained via an open, international naming campaign that the IAU endorsed. This "Our Pluto" campaign was unprecedented in its scope: The website was available in 17 languages, and an illustrated children's ballot encouraged participation by the very young. We received more than 75,000 nominations and votes from all over the world. The campaign yielded a culturally diverse set of names that is rich in history, literature, and mythology. We carefully sifted through the list to enforce IAU naming standards, including conformance to a predefined set of themes and avoidance of duplication with named features elsewhere in the solar system.

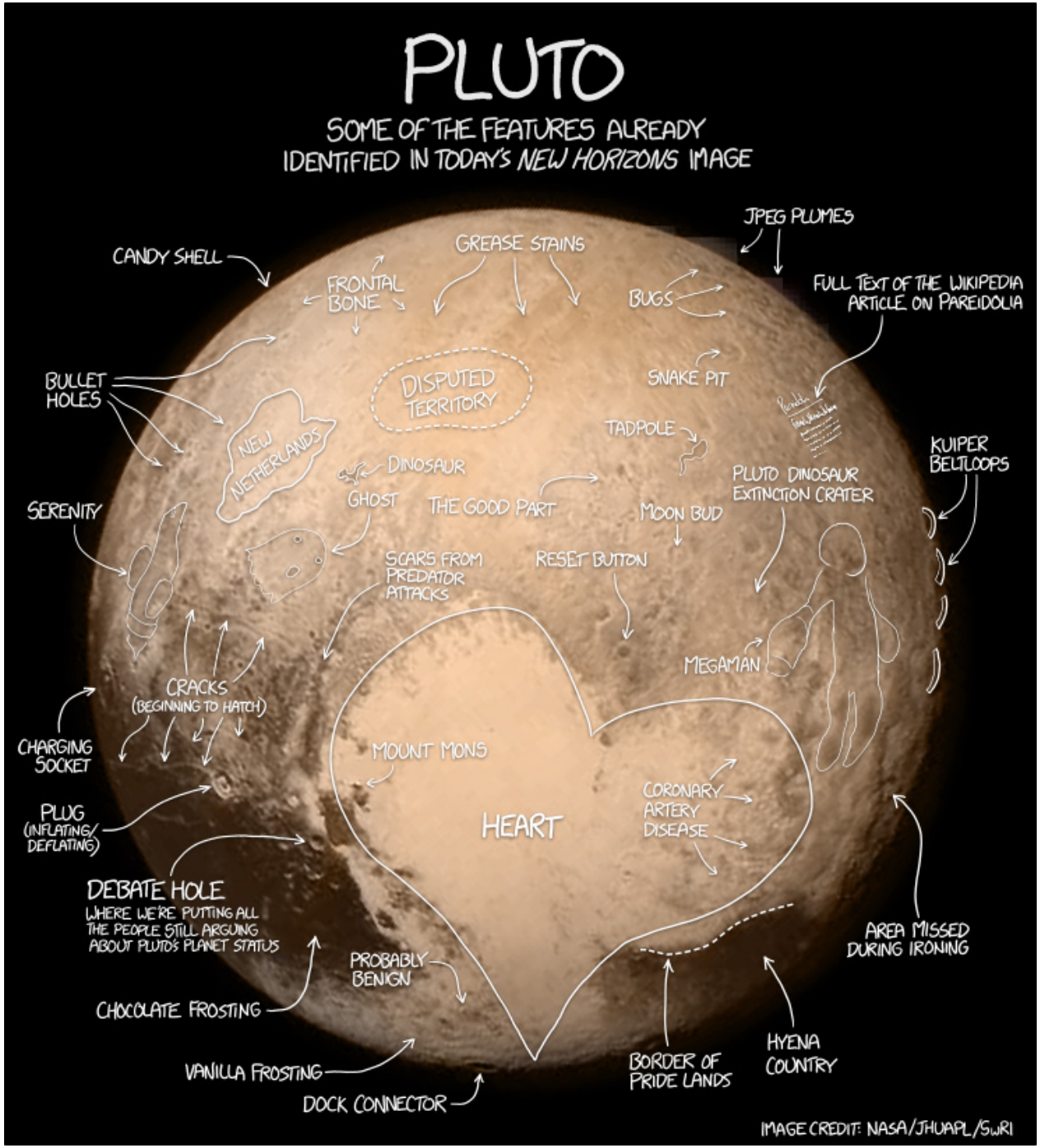
Then, just as the campaign was about to go live in March, the IAU Working Group for Planetary System Nomenclature (WGPSN) asked us to restrict feature names on Pluto to a set of themes primarily focused on death deities and the underworld. The New Horizons science team agreed unanimously that those themes were too limited, too depressing, poorly suited to a public campaign, and potentially offensive to some religious believers. Because New Horizons was about to complete the first era of planetary reconnaissance by exploring Pluto, we also agreed that it was appropriate to honor the history of exploration in general, and space exploration in particular, with feature names on Pluto.

Our team has been delighted by the many exploration-related and other ideas for feature names that the public has put forward via the Our Pluto campaign, from great explorers like Tenzing Norgay and Jacques-Yves Cousteau to pioneering space missions like Sputnik. We look forward to nominating them to the WGPSN at a later date.

People worldwide are talking about the names on our informal maps of Pluto and Charon and are genuinely excited about planetary nomenclature. The IAU should celebrate and capitalize on this accomplishment. The IAU should approve the themes and sources that the mission team has proposed and that the public loves. That would demonstrate that the IAU truly welcomes the public's participation in planetary exploration, as it has often stated but has never demonstrated on a large scale. It would recognize the major accomplishment that the explora-

tion of Pluto represents in a highly visible and positive way. We look forward to collaborating with a Working Group that operates in the open and that recognizes its accountability to both scientists and the broader public. ✿

ALAN STERN is Associate Vice-President for Research & Development at the Southwest Research Institute in Boulder, Colorado, and Principal Investigator of the New Horizons mission to Pluto and the Kuiper Belt. This response is written on behalf of the entire New Horizons Pluto System Nomenclature Working Group, which, in addition to Stern, includes Mark Showalter, Will Grundy, Jeff Moore, Cathy Olkin, Paul Schenk, and Amanda Zangari. *[SwRI]*



[xkcd]

SPLINTER MEETING

Binary and Multiple Stars

By BRIAN MASON

On Tuesday, 11 August, from 2:00 to 6:00 pm, a joint Splinter Meeting of (old) Commissions 26 and 42 and (new) Commission G1 will be held in Room 327.

Following the Business Meeting of the three commissions we will address some issues relevant to binary- or multiple-star astronomy not included in other sessions and meetings of the XXIX General Assembly. In addition to these interesting presentations there will be oral presentations of posters from the first week, Working Group reports, and presentations from two investigators on different optical interferometers. We will also include double-star work within the purview of other commissions, including Commissions 8 (Astrometry), 30 (Radial Velocities), and 54 (Optical and Infrared Interferometry) that relates to binary and multiple stars.

Current members of Commissions 26 and 42 and current or prospective members of the new Commission G1 are encouraged to attend, along with anyone interested in current research in binary and multiple star systems. ✿

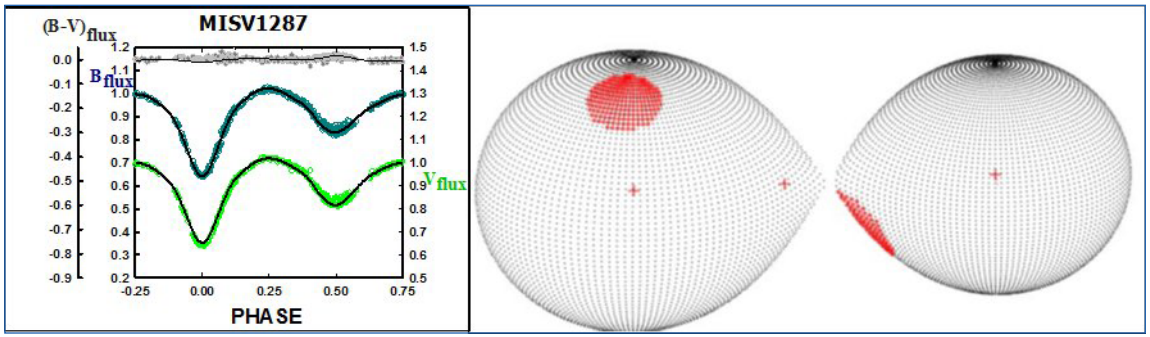
Splinter Meeting: Commissions 26, 42, and NC-14/G1	
Organizer	Brian Mason (U.S. Naval Observatory)
Date	Tuesday, 11 August
Time	2:00 to 6:00 pm
Location	Room 327, Hawai'i Convention Center
Agenda	History of Commission 42 (Virginia Trimble) The Final Kepler Eclipsing Binary Catalog (Andrej Prsa) The Visual Double Star Catalogs (Brian Mason) Coordinate System Issues in Binary Star Computations (George Kaplan) Direct Distance Estimation to Eclipsing Binaries in Star Clusters (Eugene Milone) θ^1 Ori B: a Quintuple (Sextuple?) System Less than 30,000 Years Old (Christine Allen) Two Bright Eclipsing Binaries in the Orion Trapezium (Rafael Costero) Advances in Spectroscopy and Implications for Stellar Research (David Soderblom) Recent Binary Star Science at the CHARA Array (Theo Ten Brummelaar) SB9 to Gaia (Dimitri Pourbaix) Double Star Work with the DCT, the NPOI and/or the End of Commission 54 (Gerard van Belle)
Coordinating Commissions	Commission 26: Double & Multiple Stars Commission 42: Close Binary Stars Commission G1: Binary and Multiple Star Systems

BRIAN D. MASON works in the Astrometry Department at the U.S. Naval Observatory in Washington, D.C., where he specializes in interferometric studies of binary and multiple stars.

Short-Period Eclipsing Binaries: Ideal Targets for Undergraduates

By RONALD G. SAMEC

Research in astronomy is often considered the sole domain of graduate students and Ph.D. scientists, but at the current IAU General Assembly, my undergraduate students and I are presenting four papers. Undergraduate research can be immensely rewarding for students and faculty and can provide important results for the astronomical community as well — as long as one chooses appropriate objects that enable students to complete their projects in a relatively short period of time.



B and *V* synthetic light-curve solutions overlay the normalized flux curves and Roche-lobe surfaces from a *BVRI* solution of MISV 1287. Students involved in this research were James R. Digana, Paul Smith, Travis Rehn, and Bruce M. Oliver. *[Ron Samec]*

In my 28 years working with students at undergraduate institutions, I have had great success studying short-period eclipsing binaries. We choose newly discovered systems of interest to the astronomical community and observe them through modest-sized telescopes using four or five filter bands to obtain publication-quality light-curves. Since 1987 I have worked closely with more than 30 individual students, many of whose research earned them admission into Ph.D. programs across the U.S. and Canada.

Students are not just passive observers in this research; they participate fully in observations and analysis from start to finish. Many of them accompany me on observing runs, where they have a major role in taking images. The students and I travel to a distant site (often in Arizona) and share experiences from meal time to observing time. Students take images and calibration frames, work in shifts throughout the night, and experience both the tedium and the excitement of real astronomical research. We also observe remotely using the Internet-enabled facilities of the Southeastern Association for Research in Astronomy (SARA).

A week's worth of data from a 1-meter-class telescope can yield enough information for a thorough analysis of one or two short-period binaries. Once the data have been collected, my students extract magnitudes and analyze the resulting time-series data to determine periods. Using this information, they build a preliminary model with David Bradstreet's *Binary Maker* software, then complete a detailed model using the Wilson-Devinney Program. Once they have an acceptable model, they develop a scenario for the probable evolution of the system.

Like real astronomers, the students do their work under the

Meet the Mentors

The IAU Executive Committee Working Group on Women in Astronomy and the AAS Committee on the Status of Women in Astronomy are offering early-career members a chance to meet with leaders in the field to discuss work-life balance, networking strategies, and other issues of concern. Meet-the-Mentor sessions will occur twice daily, at 10:00 am and 2:00 pm, through Wednesday, 12 August. We invite students who haven't already signed up for one to visit the Student Pavilion in the Exhibit Hall to choose an available slot. See the conference website for a PDF list of participating mentors, their areas of career expertise, and which sessions they'll attend. Questions? Contact Francesca Primas or Christina Richey.

time constraint of an upcoming meeting, such as the Meeting of Astronomers in South Carolina (MASC), followed by a trip to an American Astronomical Society meeting or IAU General Assembly. As part of their project, students produce a slide deck summarizing the analysis of their particular system and thoroughly practice an oral presentation. We then write a paper for publication in a professional journal.

This procedure is remarkably productive: Over the years my students and I have produced 250 professional publications and abstracts. I invite you to join us in our journey to determine the nature and evolution of close binaries. It's fascinating and rewarding work. ✿

RON SAMEC recently retired as Professor of Physics and Astronomy at Bob Jones University. He is a former professor and department chair in physics at Millikin University, Decatur, Illinois, and professor and observatory director at Butler University in Indianapolis, Indiana.

SPLINTER MEETING

Good-bye Commission 4, Hello Commission X2

By GEORGE KAPLAN & CATHERINE HOHENKERK

The IAU was founded in 1919, and Commission 4, Ephemerides, was among the first Commissions formed within the new organization. Its purpose was to encourage international cooperation in the computation and distribution of information on the coordinates of celestial objects, as well as related information such as rise and set times, Moon phases, and eclipse predictions. The cooperation extended to actually sharing the labor-intensive work involved. This information was needed — and still is — to facilitate astronomical observations, timekeeping, surveying, the comparison of dynamical theory with observations, and celestial navigation.

At the time, "computers" were people doing arithmetic, the most accurate clock was the rotating Earth, the only distribution mechanism for data was print, and celestial navigation was the only means of determining position at sea. None of that is true today, but the basic mission of Commission 4 is remarkably unchanged. Today we would add spacecraft navigation and attitude control to the list of applications, and software and web services as means of distribution.

There are two broad kinds of work that the Commission has supported. The first is the computation of fundamental solar-system ephemerides, that is, using gravitational theory along with observations of many types to determine the orbits of bodies in the solar system. The second uses these fundamental ephemerides to compute practical astronomical data, such as the coordinates of the Sun, Moon, planets, and stars for any given time; the prediction of times of astronomical phenomena such as eclipses, occultations, and Moon phases; the parameters that describe the apparent orientation and illumination of solar-system objects at specific times; and various quantities that allow knowledgeable users to transform quantities between standard reference systems.

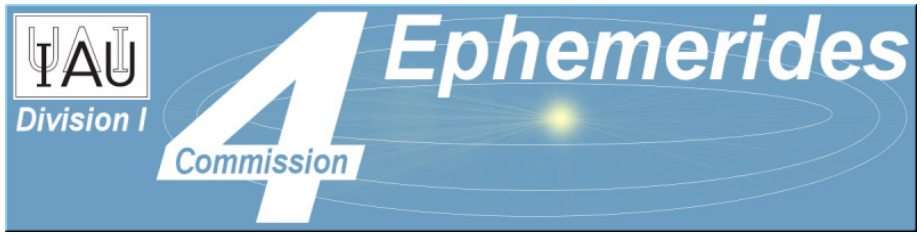
Among the most active institutions in Commission 4 are the Jet Propulsion Laboratory (JPL) in the U.S., the Institut de Mécanique Céleste et de Calcul des Éphémérides (IMCCE) in France, the Institute for Applied Astronomy (IAA) in Russia, Her Majesty's Nautical Almanac Office (HMNAO) in the U.K., the National Astronomical Observatory of Japan (NAOJ), the Spanish Naval Observatory, and the U.S. Naval Observatory (USNO).

True to the purposes of Commission 4, there has been quite a bit of cooperation and data exchange among all these institu-

Splinter Meeting: Commissions 4 and NC-85/X2	
Organizer	C4: Catherine Hohenkerk (U.K. Hydrographic Office) C.X2: Andrea Milani Comparetti (University of Pisa, Italy)
Date	Tuesday, 11 August
Time	C4: 8:00 to 9:00 am C.X2: 9:00 to 10:00 am
Location	Room 326A, Hawai'i Convention Center

tions. A working group within Commission 4 has just completed a study recommending a common data format for fundamental solar-system ephemerides so that users can easily switch among various sources. On the almanac-production side of our activities, USNO and HMNAO recently celebrated a century of cooperation.

As part of the IAU's reorganization, old Commissions 4 and 20 (Positions & Motions of Minor Planets, Comets & Satellites) are joining together to form new Commission X2, Solar System Ephemerides, which will be part of Divisions A and F. Commissions 4 and 20 were separate entities mainly because



of historical differences in observational and orbit-computation methods that are no longer relevant. There has always been a significant overlap of members and a free exchange of data, and our new organizational unity will, we are confident, benefit both our science and our services to the astronomical community. ✿

GEORGE KAPLAN was a staff astronomer at the U.S. Naval Observatory in Washington, D.C. for more than three decades. He is a former President of Commission 4. CATHERINE HOHENKERK is a Senior Analyst, H. M. Nautical Almanac Office / U.K. Hydrographic Office, Taunton, United Kingdom, and the current (outgoing) President of C4.

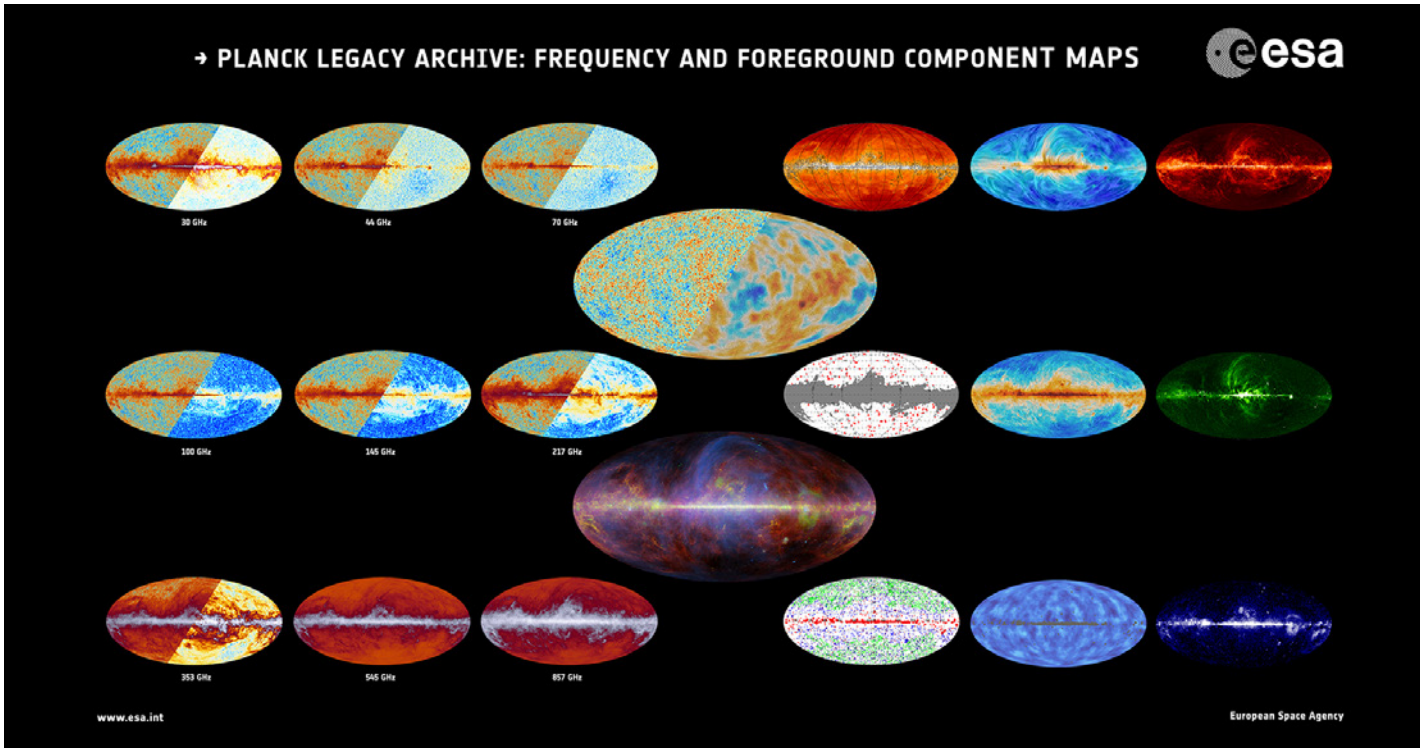
FOCUS MEETING 5

Science from Here to the Cosmic Microwave Background

By JAN TAUBER

Launched in May 2009, ESA's Planck satellite has produced our highest-quality surveys of the microwave sky. Across multiple passes, between August 2009 and Planck's deactivation in October 2013, it mapped the sky's intensity and polarization in nine channels that span radio (40 GHz) to submillimeter (857 GHz) frequencies. Captured in this survey data is a wealth of information about the cosmic microwave background (CMB) and intervening sources. During Focus Meeting 5 (FM 5), the Legacy of Planck, we will discuss the satellite's continuing influence on astronomy and cosmology.

Focus Meeting 5: The Legacy of Planck	
Start date	Tuesday, 11 August
End date	Thursday, 13 August
Oral sessions	Room 316C, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Coordinating Divisions	Division H: Interstellar Matter and Local Universe Division J: Galaxies and Cosmology
For details on presenters, topics, and times see the online program or mobile app.	



This compilation shows some of the images drawn from the 2015 Planck data release. The large image at top center shows the 2015 CMB temperature and polarization anisotropies, and the bottom center image is a composite of synchrotron, free-free, spinning dust, CO, and thermal dust components. At left are nine all-sky frequency maps, showing temperature (left half) and polarization (right half) fluctuations. At right are some of the individual physical components extracted from the Planck maps, including catalogs of cold clumps, Sunyaev-Zel'dovich sources, and compact sources (left column); visualizations of the direction of the galactic magnetic field as traced by synchrotron radiation at 30 GHz, by dust radiation at 353 GHz, and the CMB lensing potential (center column); and polarized dust emission, polarized synchrotron emission, and free-free emission (right column). *[ESA, Planck Collaboration]*

The Planck data have a wide set of applications. Within the mission's frequency coverage, the Milky Way radiates intensely in synchrotron and free-free emission, and dust radiates thermally as well as via other mechanisms (e.g., the spinning of very small grains). At least two of these sources (synchrotron and thermal dust) are significantly polarized, and Planck provides us with our first all-sky maps of this polarized dust emission from the interstellar medium. In addition to the diffuse emission from our own galaxy, thousands of extragalactic objects appear in the maps.

Additionally, Planck's channels allow us to detect galaxy clusters via the Sunyaev-Zel'dovich effect, thus providing the first unbiased view of these largest building blocks in our universe. Through decomposition, the survey can be distilled into highly accurate maps of each kind of physical source, giving a remarkably complete view of both the near and distant universe.

During the first half of 2015, all the Planck data were made publicly available. The program of FM 5 is designed to give a broad overview of the data's many scientific applications, including summaries of recent analyses and examples of future use. You are warmly invited to come to the talks and poster presentations to check out the latest science based on the Planck data. Furthermore, if you visit the European Space Agency (ESA) booth in the Exhibit Hall, you will be able to directly access the Planck Legacy Archive, download data products, and get one-on-one support from experts. Finally, we welcome your feedback on how we can further improve the Planck data products as we prepare for the final data release in 2016. ✿

JAN TAUBER is ESA's Project Scientist for the Planck mission, based in the Netherlands, and Co-Chair of FM 5. He has lived, studied, and/or worked in Indonesia, Colombia, Scotland, Ecuador, and the United States.

PUBLIC TALKS

Modern History of Astronomy in Hawai‘i

By GÜNTHER HASINGER

Polynesian voyagers were some of the best astronomers of their time and brought the ancestors of today's Hawaiians to these islands using the best technology then available.

Modern astronomy in Hawai‘i begins with King David Kalākaua, who invited an expedition of British astronomers to Hawai‘i in 1874 to observe the transit of Venus and establish the size of the solar system. In September of that year, King Kalākaua wrote, "It will afford me unfeigned satisfaction if my kingdom can add its quota toward the successful accomplishment of the most important astronomical observation of the present century and assist, however humbly, the enlightened nations of the Earth in these costly enterprises."

[John D. & Catherine T. MacArthur Foundation]

A few years later, in an 1880 letter to Captain R. S. Floyd, King Kalākaua expressed a desire to see an observatory established in Hawai‘i. A telescope was purchased for Punahou School in 1884 and later made it into the Kaimuki Observatory and finally onto the roof of the Makapu‘u Point Solar Observatory, the first such facility established by the University of Hawai‘i. This laid the foundation for the Haleakalā Observatories, which today house a precious collection of telescopes on Maui, including the Pan-STARRS telescopes and the Daniel K. Inouye Solar Telescope currently under construction.

After the devastating tsunami of 1960, the use of Maunakea for astronomy was championed, mainly for economic reasons, by Mitsuo Akiyama, the Executive Secretary of the Hilo Chamber of Commerce, and Howard Ellis, who would later become Director of the Mauna Loa Meteorological Observatory. They invited Gerard Kuiper of the University of Arizona's Lunar and Planetary Laboratory to evaluate the mountain's potential for studies of the solar system (Kuiper's main interest) and beyond.

In 1964 the administration of Governor John A. Burns built a road to the summit of Maunakea, and soon the first seeing measurements were being done there by Kuiper's assistant, Alika Herring. Herring was a native Hawaiian and a master telescope maker. His main interest was to make a map of the Moon, as accurate as possible, to help identify possible landing sites for the Apollo astronauts. When Herring used his finest telescope on Maunakea, he realized that the summit might well be the best place in the world to do astronomy. In a sense, he prepared the next bold step for humans to go where no one had set foot before, in the same spirit as his Polynesian ancestors.

Shortly thereafter the University of Hawai‘i won a competition

Public Talks: Tuesday, 11 August Ballroom B, Hawai‘i Convention Center	
Speaker	Günther Hasinger (Institute for Astronomy)
Topic	The Development of Modern Astronomy in Hawaii
Time	7:30 to 8:15 pm
Speaker	Andrea Ghez (University of California, Los Angeles)
Topic	The Black Hole in the Galactic Center
Time	8:15 to 9:00 pm

Regular registered attendees of the IAU GA will be admitted upon showing their meeting badges. Registered guests, anyone with an Exhibit Hall Only badge, and unregistered members of the public must register online.

NameExoWorlds Ceremony

At about 7:10 pm Tuesday, 11 August, right before the public talks by Günther Hasinger and Andrea Ghez in Ballroom B of the Hawai‘i Convention Center, the IAU will conduct a brief ceremony to open public voting for the NameExoWorlds contest. Announced in October 2014, the contest aims to involve the public in the selection of names for some of the most interesting planets now known to be orbiting stars other than the Sun. Candidate names have been proposed by astronomy clubs and other nonprofit organizations registered with the IAU Directory for World Astronomy. Voting will be managed by the Zooniverse citizen-science collaborative on behalf of the IAU.

— Rick Fienberg, Kai‘aleleiaka

[Jennifer Boyd]

to build the first telescope on Maunakea, with funds from NASA, in order to support solar-system exploration. This was also the foundation for the Institute for Astronomy under the leadership of its first director, John Jeffries, who will participate in a panel discussion today during the late-afternoon session of Focus Meeting 2 in Room 301.

Hawai‘i really *is* one of the best places on Earth from which to observe the heavens. Nearly every astronomical breakthrough in the last 50 years has involved telescopes in Hawai‘i in one way or another. One of these discoveries is the supermassive black hole in the center of the Milky Way, which will be described in the public talk by Andrea Ghez immediately following my own talk expanding on the history briefly related here.

Astronomers are deeply grateful to the Hawaiian people for allowing access to the precious skies over Maunakea and Haleakalā. The next challenge, the “holy grail” of astronomy, is to find a habitable world nearby, to which future generations might set sail. Maunakea may very well be the gateway to this planet. ✿

GÜNTHER HASINGER is Director of the Institute for Astronomy – University of Hawai‘i at Mānoa. Before the IAU reorganized its Divisions, he was President of Division XI, Space & High Energy Astrophysics.

Visit the IAU Exhibit Hall to meet representatives from a wide variety of astronomical institutions and to thank them for supporting the XXIX General Assembly! *[IAU/B. Tafreshi, twanight.org]*

SPLINTER MEETING

Story Time for Schools from Space

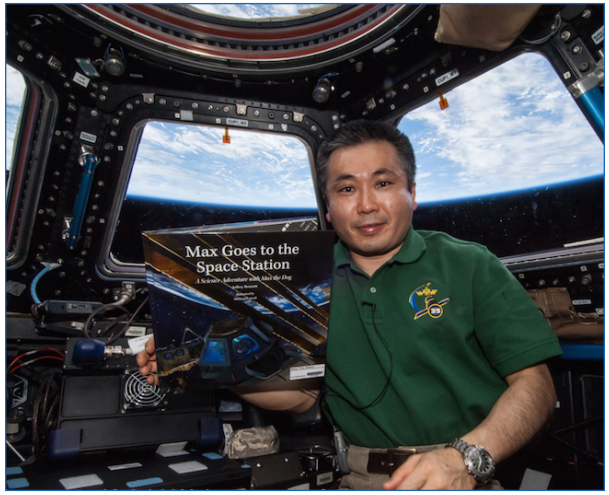
By JEFFREY BENNETT

One of the key goals of the IAU is to spread the word about astronomy to children and the public around the world. The International Space Station (ISS) offers a unique global platform for doing just that.

In a new educational program, called Story Time from Space, ISS astronauts take part in two activities: (1) reading aloud science-based stories for children that I have written, and (2) conducting specially built demonstrations designed to reinforce science lessons from the stories. Both activities are filmed, with the videos posted freely online for access by schools and individuals worldwide. While the stories are suitable for primary-school children, the demos are more sophisticated and can be used for secondary-school and college students.

The first set of five books — all of which focus on astronomy and space science — was launched to the International Space Station in January 2014. A second set of books, including one focused on how we have learned about our place in the universe, is scheduled for launch in December.

Book readings have been filmed in English for all of the books (some of the videos are already online) and in Japanese for one of them. Readings in Russian, and perhaps other languages, are being planned. The readings are done in the Cupola — an ESA-built observatory module — so that Earth is visible through the windows as the astronauts read.



Japanese astronaut Koichi Wakata reads from the ISS. *[NASA, JAXA]*

The first set of nine science demos covered topics including spectroscopy, energy transfer, orbital mechanics, center of mass, and effects of weightlessness. Unfortunately they were lost in the failed SpaceX launch of June 2015. They are currently being rebuilt and may launch again as early as this fall.

Splinter Meeting — Story Time From Space: Astronomy and Astronauts Together in the Classroom	
Organizer	Jeffrey Bennett (Big Kid Science)
Date	Tuesday, 11 August
Time	12:45 to 2:00 pm
Location	Room 318B, Hawai'i Convention Center
Presenters	Patricia Tribe & Jeffrey Bennett

Please join us for a presentation about Story Time from Space on Tuesday, 11 August. As an added incentive to attend, we will hold a prize draw for 10 copies of *Max Goes to Mars*, which is one of the five titles currently aboard the ISS. ✿

JEFFREY BENNETT is the author of several bestselling college textbooks and numerous popular-science books. He was recently honored with the American Institute of Physics Science Communication Award.

FOCUS MEETING 9

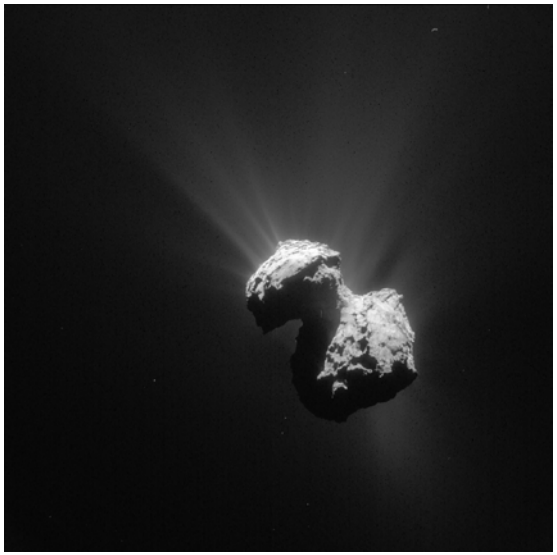
Highlights in the Exploration of Small Worlds

By DOMINIQUE BOCKELÉE-MORVAN

The IAU XXIX General Assembly is celebrating the golden year of exploring small solar system bodies. With the European Space Agency's Rosetta mission surveying comet 67P, NASA's Dawn and New Horizons missions providing our first close-up views of dwarf planets Ceres and Pluto, and the Cassini mission sending back detailed images of Saturn's satellites, this year marks an important step toward further understanding small worlds.

Focus Meeting (FM) 9 is gathering scientists from all corners of the globe to present and discuss the spectacular results obtained from these missions, as well as recent achievements obtained from past missions, comprehensive spectroscopic surveys from space (e.g., Herschel, NEOWISE, and Gaia), ground-based observations, and geochemical analyses. This meeting will be the opportunity to discuss the state of our understanding of the nature of the various populations of small bodies in the solar system, including icy satellites, from the perspectives of planetary physics and cosmochemistry.

Detailed investigations of the physical and chemical properties of asteroids, comets, trans-Neptunian objects, and dwarf planets are of tremendous importance for understanding the formation of the solar system and the overall process of star and planet formation. These bodies are the remnants — either fragments or survivors — of the swarm of planetesimals from which the planets were formed. They are thus primitive building blocks of the planet-formation process that can offer clues to the chemical mixture from which the planets formed some 4.6 billion years ago.



Comet 67P/Churyumov-Gerasimenko imaged by the Rosetta navigation camera on 7 July 2015 from a distance of 154 km (96 miles). *[ESA, Rosetta, NAVCAM]*

It is now clear that there was a general mixing of different populations of small bodies at early stages of the solar system, as a result of planetary migration. Indeed, geochemical evidence obtained from analyses of extraterrestrial samples, and the recent discovery of active and icy asteroids, shows that differences between primitive asteroids and comets are much less sharp than previously thought. During FM 9 the interrelationships between the various populations of small bodies will be investigated through a detailed comparison of their physical and chemical properties. This will be in important step toward understanding how they formed and evolved.

The interpretation of the isotopic, molecular, and mineralogi-

Focus Meeting 9: Highlights in the Exploration of Small Worlds	
Start date	Tuesday, 11 August
End date	Thursday, 13 August
Oral sessions	Room 313A, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Coordinating Divisions	Division B: Facilities, Technologies and Data Science Division F: Planetary Systems and Bioastronomy
For details on presenters, topics, and times see the online program or mobile app.	

cal properties of primitive solar-system material is complex and can only be achieved through a multidisciplinary approach. A full session of FM 9 will discuss solar-system formation in the light of protoplanetary disk models, experimental work, and recent insights on the composition of comets and protoplanetary disks. FM 9 will certainly spark the interest of those who are curious about the new worlds revealed by recent space exploration and what they reveal about our solar system and planetary systems in general. ✿

DOMINIQUE BOCKELÉE-MORVAN is the outgoing President of IAU Commission 15, Physical Study of Comets & Minor Planets, and Research Director at the Observatory of Paris, France. She is deeply involved in the European Space Agency's Rosetta mission as Co-Investigator on both the Visible InfraRed Thermal Imaging Spectrometer (VIRTIS) and Microwave Instrument for the Rosetta Orbiter (MIRO).

ASTRONOMY EDUCATION RESEARCH

Building an International Database of Astronomy Education Research

By PAULO BRETONES, STEPHANIE SLATER & TIM SLATER

Astronomers continuously debate which strategies are the most effective for teaching students. In a field with such a long history, it is probably unsurprising that many systematic studies on astronomy teaching have been conducted over the years. Unfortunately many of these studies have been lost due to a lack of easily accessible publication archives.

As part of the new IAU Commission C1, Astronomy Education and Development, a Working Group on Theory & Methods in Astronomy Education is in the first phases of mounting an international effort to gather the methods and results of astronomy education research from across the globe. The end goal of this work is to identify knowledge gaps in order to present a new international agenda for research on astronomy education.

We believe that considerable scholarly effort exists around the world, but that much of it is "hidden," therefore systematic surveys need to be conducted internationally to collect and synthesize this material to guide

Paulo Bretones (left), Stephanie Slater (center), and Tim Slater. *[Inge Heyer]*

Splinter Meeting: IAU Working Group on Theory & Methods in Astronomy Education	
Date	Tuesday, 11 August 2015
Time	10:30 am to 12:00 pm
Location	Room 318A, Hawai'i Convention Center
Coordinating Commission	C1: Astronomy Education & Development

future work. Much of the work in these venues is certainly not known by researchers in astronomy, not only because they belong to a different theoretical and methodological framework, but also because they are related to teaching physics and general sciences rather than astronomy specifically.

To improve the present situation, we are proposing to hold a series of meetings around the world to encourage surveys of already published materials, studies, and new key lines of research. The first such conference is IAU Symposium 326, "Research in Astronomy Education: Far Reaching Impacts and Future Directions," to be held 3 to 7 October 2016 in Heidelberg, Germany. We believe that this meeting and others like it will raise the visibility of authors and institutions and enable studies showing trends and gaps, allowing future developments and collaborations. ✿

PAULO BRETONES is Chair of the new C.C1 Working Group on Theory & Methods in Astronomy Education; he is also a professor at the Federal University of São Carlos, Brazil. STEPHANIE SLATER is the Director of the Center for Astronomy & Physics Education Research (CAPER). TIM SLATER is the University of Wyoming Excellence in Higher Education Endowed Professor of Science Education and Editor of the *Journal of Astronomy & Earth Sciences Education*.

Astronomy and Something More

Ricardo García wants to meet other people who do astronomy outreach.

By IRIS NIJMAN, *Kai'aleleiaka*

"Not to teach, but to motivate and excite people" — that's the goal of Ricardo García, an exhibitor at the booth of the Chilean Astronomical Society (SOCHIAS). García, who studied astronomy and audiovisual communication at the University of Chile in Santiago, loves outreach. "I want to touch and reach people, and give them a sense of wonder about the universe," he says. "If people get motivated about astronomy, they get motivated about other things as well. Then they will start to learn new things themselves, through new technologies."

As a child, García always wanted to be an astronomer, but at university he discovered he wanted to do outreach instead of research. He had been teaching astronomy classes for children at an amateur astronomical association in Santiago since he was 17 years old. "So I decided to study filmmaking, to gather new skills that I could use in outreach," García explains. In 2011, when he was working at the Andean Astronomical Observatory in Santiago, he gave an audiovisual tour about the most beautiful objects in the southern sky to Charles Bolden, NASA Administrator and former Space Shuttle commander. Bolden was so touched that he invited García to the launch of the Mars Rover Curiosity. "I realized that I was doing something right, and that outreach was my future," says García.

Ricardo García at Booth 345. *[SOCHIAS]*

This year García started to make his own online Spanish-language podcast series called *Astronomía y algo más*, which translates as "astronomy and something more." Every Thursday a new hour-long episode is uploaded, focused on one mind-blowing concept. "I have a newsletter in which I invite people to come up with questions and topics," he says. "I got a lot of positive reactions. Families with kids listen to it. I now have around 5,000 downloads per episode." García feels that there is a need

Special Guests in the Exhibit Hall

Among the programs highlighted by the IAU at Booth 329 in the Exhibit Hall are those being carried out under the Cosmic Light theme for IYL 2015. Please come by during the morning and afternoon coffee breaks to meet some of our project leaders:

Tuesday, 11 August 10:00 am & 3:30 pm	Cosmic Light Project Coordinator **Pedro Russo, Dark Sky Meter App**
Wednesday, 12 August 10:00 am & 3:30 pm	Cosmic Light Global Coordinator **Sze-leung Cheung, IAU Office for Astronomy Outreach**
Thursday, 13 August 10:00 am & 3:30 pm	Cosmic Light Project Coordinator **Rosa Doran, Cosmic Light EDU Kit**

for more outreach in Spanish, but in the future he wants to do the podcasts in English as well.

This week, García is at the SOCHIAS booth to tell everybody about the astronomical sites in Chile, the telescopes, the Ph.D. programs, and tourism in the area. He has also brought some virtual-reality glasses to the IAU General Assembly, which only need a Google Cardboard and access to his website on a smartphone. "I like to see the face of everybody who looks through the glasses and shouts out 'Wow!' That is a magic moment." García is recording new episodes for his podcasts while he is in Hawai'i. He is also recording videos about things that he likes in the Exhibit Hall for the Periscope app, a live-broadcast platform connected to Twitter that allows people who follow him to ask questions in real time.

In the future, García wants to be more involved in astronomy outreach. He wants to make a TV series, use augmented reality for kids, and other new innovations. That's why he wants to get to know everybody involved in the outreach scene. "I meet so many great people and see other outreach projects here," he says. "I would like to help out, connect to other projects and share ideas!"

If you would like to get to know Ricardo García and try out his virtual-reality glasses, come to Booth 345 in the Exhibit Hall! ✿

IAU SYMPOSIUM 319

Galaxies at High Redshift and Their Evolution Over Cosmic Time

By SUGATA KAVIRAJ

Over the last two decades, a convergence of powerful observational facilities and high-performance computing has significantly advanced our understanding of galaxy evolution. Detailed empirical studies have quantified the evolution of galaxy properties (particularly over the latter half of cosmic time), and theoretical models, within the framework of the Lambda Cold Dark Matter (ΛCDM) paradigm, have met with significant success in reproducing these properties.

While our knowledge is still dominated by work in the nearby (redshift $z < 1$) universe, an explosion of multiwavelength data at high redshift is revolutionizing our understanding of emergent galaxies at $z > 1$. Since the bulk of cosmic stellar-mass assembly and black-hole growth takes place at these redshifts (both peaking around $z = 2$), answers to basic questions at these epochs are central to a complete understanding of galaxy evolution. For example, what processes drove the growth of early stellar populations and black holes? How did interactions between galaxies and their constituent black holes shape the universe we see

This Hubble image, from the Cosmic Assembly Near-infrared Deep Extragalactic Legacy Survey (CANDELS), is a playground for astronomers studying galaxy formation and evolution. *[NASA, ESA, A. Riess, STScI, JHU, D. Jones, S. Rodney, S. Faber, UCSC, H. Ferguson, CANDELS Team]*

today? How did the morphological mix of the visible universe evolve into today's Hubble sequence? How well do our current theoretical models reproduce the properties of galaxies in the early universe?

Recent and ongoing studies are delivering a dramatic improvement in our understanding of these fundamental questions. Hubble Space Telescope (HST) surveys such as CANDELS, combined with other from Spitzer and Herschel, are now constraining galaxy parameters — such as star-formation rates, ages, metallicities, masses, and sizes — to $z = 2$ and beyond. Together with deep Chandra observations, these data are probing the co-evolution of young galaxies and their black holes, as well as the critical role of AGN-driven jets in producing negative feedback, which quenches star formation and influences the morphology of

The First and Last Face You See

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. Today I would like to introduce you to **Yugan**, 28 years old, born in Honolulu, and the happiest and most positive security guard I have ever met. He wishes everybody who comes into the Hawai'i Convention Center "a wonderful day."

[Iris Nijman, Kai'aleleiaka]

What do you like about Hawai'i?

I feel at home. If you are born here, you understand this special place — the culture and the people. There are only about 150,000 native Hawaiians left. That's why I understand the people who protest against the Thirty Meter Telescope. Somebody has to stand up and do something for our people, because we have nobody but ourselves.

What do you like about this job?

I like the interaction with people, and I want to be hospitable. You all come to visit this place, and you don't know anything about it, so I'm here to help! I like to welcome you all with the spirit of aloha.

What does the spirit of aloha mean to you?

It's all about love. To open yourself — your heart, mind, and spirit. Hawaiians will do everything they can to help you. They treat each other with aloha, and they have hope in their hearts.

Why are you always happy?

I am the first and last face you see when you come to the Convention Center, so if I don't smile, you don't have a good day. I need to smile! Also, God blesses me every day to show people in the right direction and to help them.

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

My favorite restaurant is Ono Hawaiian Foods. When you have time, learn about our culture at the Bishop Museum; it is a great place. Or go surfing on the South Shore.

— Iris Nijman, Kai'aleleiaka

galaxies at early epochs.

High-resolution near-infrared imaging from HST is quantifying the origin and evolution of the Hubble sequence in the early universe, allowing us to probe the evolving morphological mix of the visible universe over cosmic time. In parallel, near-infrared integral-field spectrographs on 10-meter-class optical telescopes, such as SINFONI and OSIRIS, together with facilities like the 30-meter telescope operated by the Institute for Radio Astronomy in the Millimeter Range (IRAM), are enabling detailed spatially resolved studies of the kinematics, star formation, and molecular gas in significant samples of early galaxies, yielding crucial insights into what drives the assembly of the stellar populations that dominate our universe today. This growing empirical literature is motivating an array of theoretical work, in particular high-resolution hydro-simulations, which are elucidating the cosmic drivers of stellar-mass buildup, black-hole growth, and morphological transformations with unprecedented accuracy.

Our current understanding of galaxy evolution will shortly be bolstered by new instruments with multiplexing capabilities — such as the K-Band Multi-Object Spectrograph (KMOS), the Multi Unit Spectroscopic Explorer (MUSE), and the Multi-Object Spectrograph For Infra-Red Exploration (MOSFIRE) — and by others that offer high-resolution imaging in the long-wavelength regime, such as ALMA and the SKA precursors. These will enable unprecedented studies of stellar and gas kinematics at high redshift and allow us to investigate the poorly understood interplay between gas and star formation in the early universe.

In addition, the depth and resolution of the eROSITA X-ray mission will offer transformational insights into large-scale structure and active galactic nuclei (AGN) across cosmic time. Looking further ahead to the turn of the decade, the field is poised for yet another revolution, both in terms of the ground-breaking depth and area offered by future imaging and spectroscopic surveys (e.g., LSST, Euclid, 4MOST), and in our ability to comprehensively probe galaxy evolution all the way up to the epoch of reionization, using instruments like the James Webb Space Telescope (JWST) and the European Extremely Large Telescopes (E-ELT).

The aim of IAU Symposium 319 is to bring together the wealth of empirical and theoretical studies that are leveraging today's instruments and to set the stage for the exploitation of new and forthcoming facilities. ✿

IAU Symposium 319: Galaxies at High Redshift and Their Evolution Over Cosmic Time	
Start date	Tuesday, 11 August
End date	Friday, 14 August
Oral sessions	Room 311, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Related event	S319 Plenary: Reinhard Genzel (Max Planck Institute for Extra-terrestrial Physics), "The Formation and Evolution of Massive Star Forming Disk Galaxies," Wednesday, 12 August, 8:30 to 10:00 am, Ballroom B, Hawai'i Convention Center
Coordinating Division	Division J: Galaxies and Cosmology

For details on presenters, topics, and times see the online program or mobile app.

SUGATA KAVIRAJ is Associate Professor at the University of Hertfordshire, U.K., Senior Research Fellow at Worcester College Oxford, and Co-Chair (with Henry Ferguson of the Space Telescope Science institute) of IAU Symposium 319.

How to Say It in Hawaiian

- Ahi: fire
- Hana: work
- Haumana: student
- Kala: money
- Mauna: mountain
- Ua: rain

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.

SPLINTER MEETING

Saving Our Window on the Universe

By RICHARD GREEN & CONSTANCE WALKER

As an international professional community we have the opportunity to put our good ideas into practice. Please come to the Business Meeting of the new Commission B7, Protection of Existing and Potential Observatory Sites.

We will address several aspects of protection of our ground-based astronomical sites against interference of glare from artificial outdoor lighting and radio-spectrum interference. Sites around the world increasingly depend on outreach and educa-

As dawn broke on Sunday, 9 August, the twin 10-meter telescopes of the W. M. Keck Observatory were wrapping up the night's observations, employing their laser-guide-star adaptive-optics systems. *[Babak Tafreshi/NAOJ]*

Splinter Meeting — From C50 to C.B7 (Protection of Existing and Potential Observatory Sites): Business Meeting to Shape Future Plans	
Organizer	Richard Green (University of Arizona)
Date	Thursday, 13 August
Time	12:30 to 2:00 pm
Location	Room 328, Hawai'i Convention Center

tion of the public and policy makers; that activity must come from our community as a whole, not just from a handful of us.

We have a more comprehensive charge from the IAU, which is to protect humankind's right to a dark night sky. We will discuss cultivation of sustainable projects that are under development for the International Year of Light 2015. Our goal is an informed public, using programs that are unique to each region, for a sustained, long-term effort on the themes of conserving energy and reducing light pollution.

Please come to our 90-minute session and lend your voice to the development of realistic plans for our community to protect its interests in line with preservation of the natural environment. ✿

A fish-eye view westward from the Gemini South Telescope at Cerro Pachón. *[Credit: Pedro Sanhueza]*


RICHARD GREEN is Assistant Director of Steward Observatory at the University of Arizona, incoming President of Commission B7, and Chair of the IAU Cosmic Light Working Group. CONNIE WALKER is the incoming Vice-President of C.B7. She works in the Science Education Department at the National Optical Astronomy Observatory in Tucson, Arizona, and serves on the Board of Directors of both the International Dark Sky Association and the Astronomical Society of the Pacific.

Honolulu Weather Forecast 11–12 August 2015

TUESDAY, 11 AUGUST		*High: 87°F / 31°C Low: 76°F / 24°C*
Morning	**Afternoon**	**Evening**
Partly cloudy	Partly cloudy	Partly cloudy
10% chance of rain	25% chance of rain	25% chance of rain
WEDNESDAY, 12 AUGUST		*High: 88°F / 31°C Low: 77°F / 25°C*
Morning	**Afternoon**	**Evening**
Partly cloudy	Partly cloudy	Partly cloudy
5% chance of rain	5% chance of rain	15% chance of rain

Extended forecast: Showers will remain focused over windward slopes. For the next few days the forecast continues to depend on the evolution of hurricane Hilda; however, regardless of Hilda's intensity, heavy rainfall will be possible later this week. Hilda, or its remnants, will most likely be clearing the state sometime during the weekend. Source: Weather Underground, National Weather Service.

Kai'aleleiaka THE MILKY WAY

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INTERNATIONAL YEAR OF LIGHT 2015

COSMIC LIGHT IAU

PRESS CONFERENCE

The First Use of ISS Images to Map Light Pollution

Astronauts looking down from space are now helping to study night-sky brightness.

By LAURENCE A. MARSCHALL, *Kaiʻaleleiaka*

During a press conference at the IAU General Assembly on Tuesday, 11 August, an international team of astronomers described a pioneering survey of terrestrial light pollution that couples images taken by astronauts on the International Space Station (ISS) with observations made by citizen scientists on the ground.

The project, called Cities at Night, is led by researchers from the Complutense University of Madrid (UCM), Spain, and the Cégep de Sherbrooke (CDS) in Canada. It aims to produce a detailed global map of diffuse night-sky brightness caused by artificial lighting.

Cities at Night entails the cataloging of the entire ISS archive of high-resolution color images of the Earth taken with a standard digital camera — more than 130,000 in all — and geo-referencing each image to its precise position on Earth. These data are then calibrated with observations of background stars above the ISS and measurements of sky brightness made by observers on the ground. Prior to this effort, maps of sky brightness could be created only by combining single-point observations from Earth — a tedious process that made it difficult to assemble comprehensive maps and even more difficult to distinguish changes in sky brightness over time. The new method makes it possible to efficiently chart sky brightness over extended areas of the Earth and to see how the sky background tracks changes in urban development.

Earth-observation satellites have been surveying our planet for many years and have easily detected the direct light from unshielded bulbs. But they had limited abilities to measure the diffuse scattered light from artificial illumination scattered by molecules and dust, which contributes most to urban sky brightness. The Defense Meteorological Satellite Program, notably, had detected this diffuse light in the past, but because of low spatial resolution it could not distinguish it from other instrumental factors. Though the ISS images were not specifically taken for the purpose of light-pollution measurement, their high spatial resolution and multicolor spectral sensitivity make it possible to draw direct connections between diffuse sky brightness and artificial lighting.

Lead scientist Alejandro Sánchez de Miguel (CDS and UCM), who reported on the work along with Jaime Zamorano (UCM) and Martin Aubé (CDS), described the many applications of the new study. A comparison of two color images of Milan, for example, clearly shows a change from soft yellow to harsh blue in the city center. This is a result of the switch from sodium and incandescent lamps to LEDs.

The environmental impacts of artificial lighting are also evident in ISS images. On a typical photograph of northwest Europe, one can easily see the cities of Belgium, with all their roadways lit by low-pressure sodium lamps. Nearby Germany, which doesn't light its roads, barely shows up.

Kaiʻaleleiaka THE MILKY WAY

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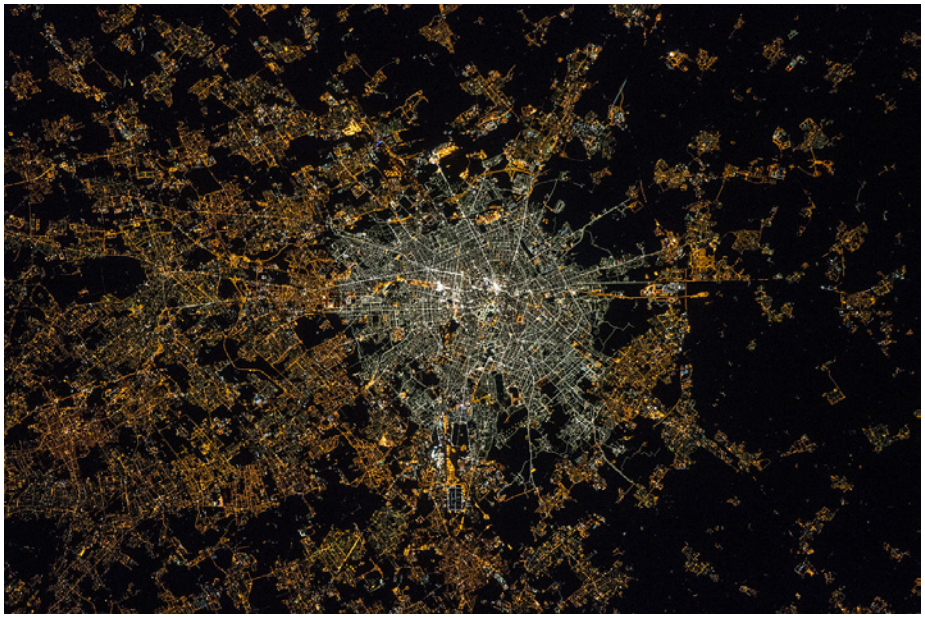
Kaiʻaleleiaka (The Milky Way) is the official newspaper of the XXIX General Assembly of the International Astronomical Union, 3-14 August 2015, Honolulu, Hawai'i. It is published for the IAU by the American Astronomical Society, which thanks the following organizations for providing staff to work on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



Milan, Italy, as seen from the ISS in 2012 *(left)* and 2015, before and after the transition to LED lighting. The amount of blue light increased dramatically in the intervening three years, and it is now more difficult for observers on the ground to see the starry sky. *[NASA, ESA]*

There are interesting economic conclusions that can be drawn as well. The Cities at Night team concludes that European countries and cities with higher public debt have higher energy consumption for street lighting per inhabitant, and that the total cost of the energy consumption for street lights is 6,300 million euros per year in the European Union.

Last, but not least, the new survey is of great importance for the protection of critical dark-sky sites. A color image of La Palma in the Canary Islands, where outdoor white lights are not permitted near the observatories, provides clear evidence of a source that violates the ban. Using ISS photos, astronomers may be able to monitor and protect observatories, dark-sky preserves, and astronomical heritage sites around the world.

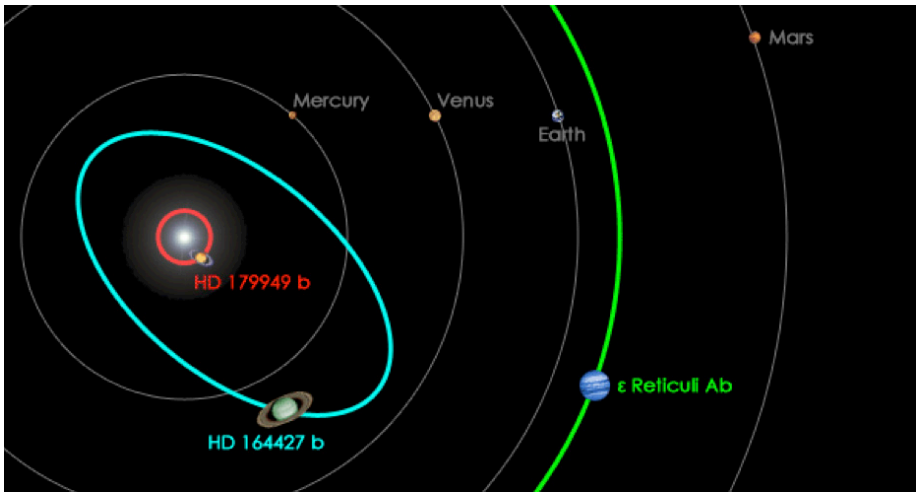
Though it draws on the resources of several space agencies and an active base of citizen scientists, Cities at Night faces an uncertain future. Its next step is to secure funding to continue the mapping and analysis of current data and to coordinate the taking of additional images so that astronomers, environmentalists, and policy-makers can benefit from an ongoing mapping of global lighting conditions. ✿

Dynamical Studies Shed Light on Exoplanets

By ALESSANDRO MORBIDELLI

The number of known extrasolar planets has increased considerably in recent years. Today we have cataloged about 2,000 confirmed planets, of which about 500 are in multiplanet systems. These discoveries have raised a number of interesting questions and topics for discussion about the formation and evolution of planetary systems:

- Resonances in multiplanet systems create complex orbital dynamics. Could tidal evolution play a role in extracting planets from resonances, as recent observations suggest?
- The origin of "hot" planets with orbital periods of a few days remains a matter of debate: Did these objects migrate through the protoplanetary disk, or did they arrive at their current positions via scattering and tidal damping?
- The cause of the surprisingly large eccentricities and/or inclinations of many extrasolar planets also remains elusive; planet instabilities, planet-disk interactions, and external perturbations from eccentric or inclined stars are all viable options.



The orbits of three extrasolar planets compared with the orbits of the planets in our solar system. This illustrates the surprising diversity of planetary orbits discovered around other stars. [Gavin Rymill 2006]

Dynamical models complement observations to provide a better characterization of extrasolar planets. Dynamical maps have been very useful to constrain the orbits of multiplanet systems, for which the uncertainties in the orbital parameters — due to observational errors — are often much wider than the range of orbital configurations permitting the long-term stability of the system. Transit time variations (TTV) are used to confirm planet candidates and allow the determination of their masses. The power and success of this technique is shown by the recent discovery and orbital determination of a non-transiting planet through the analysis of the TTV signal of a transiting companion. The TTV method brings celestial mechanics back to the glorious time when Le Verrier and Adams predicted the existence and the position of Neptune from the analysis of the anomalies of the motion of Uranus.

This nonexhaustive list of

How to Say It in Hawaiian

- ʻAhi: yellow-fin tuna
- Huamoa: (chicken) egg
- Kamano: salmon
- Laiki: rice
- Maiʻa: banana
- Niu: coconut
- Waiu: milk

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 ʻokina, signals a glottal stop. Source: Hawaiian Words.

open problems and topics for discussion highlights the importance of dynamical studies for understanding the nature of the planetary systems we observe and establishing clues on their origin. Focus Meeting 1 will cover all dynamical aspects in the field of extrasolar planetary science, review recent advances in the field, and, hopefully, announce exciting new results. ✿

ALESSANDRO MORBIDELLI is outgoing President of IAU Commission 7, Celestial Mechanics and Dynamical Astronomy, and works on planetary dynamics at the Côte d'Azur Observatory in Nice, France.

Focus Meeting 1: Dynamical Problems in Extrasolar Planets Science	
Start date	Wednesday, 12 August
End date	Friday, 14 August
Oral sessions	Room 314, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Coordinating Divisions	Division A: Fundamental Astronomy Division F: Planetary Systems and Bioastronomy
For details on presenters, topics, and times see the online program or mobile app.	

FOCUS MEETING 10

Stellar Explosions in an Ever-Changing Environment

Bringing together two astronomical research communities.

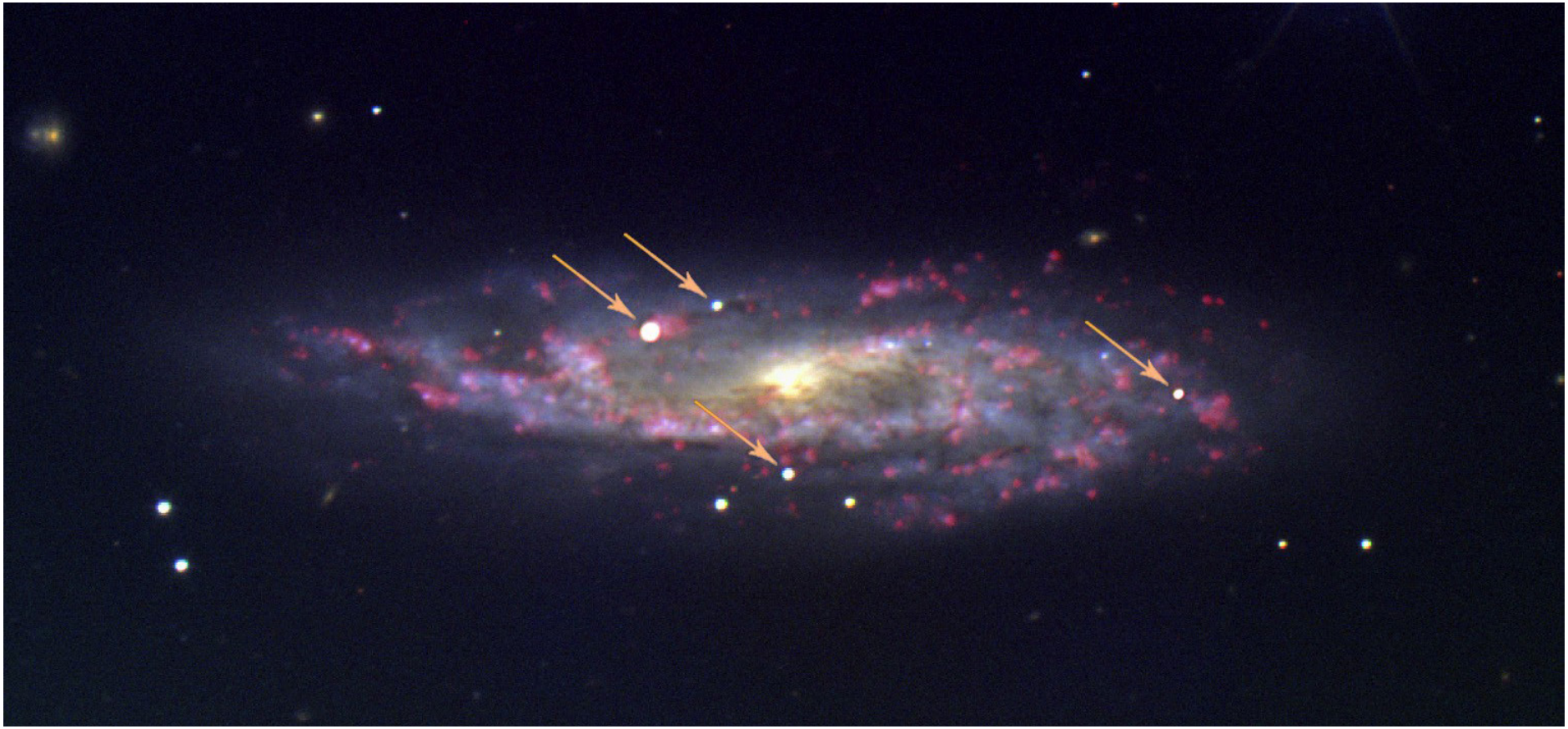
By CHRISTINA THÖNE & LISE CHRISTENSEN

Astronomers who study stellar explosions and astronomers who study starburst galaxies have a lot in common, though they usually meet and publish separately. The idea for a conference that would bring these two communities together was born as several of us traveled around China together after the IAU XXVIII General Assembly in 2012 in Beijing, China.

Explosions of massive stars as gamma-ray bursts (GRBs) and supernovae (SNe) are among the most powerful events in the universe. They release energy and heavy elements back into their environment so that each new cycle of star formation begins with different initial conditions. Stellar explosions thus play an important role in the evolution of galaxies across the entire history of the universe.

Though the explosions themselves are visible, it is difficult to study the progenitors of SNe and GRBs, partly because the events are unpredictable, but primarily because SNe and GRBs are sufficiently infrequent that they are usually discovered in distant galaxies. Only in a few cases have we been able to actually observe the progenitor of a SN (notably SN 1987A), and GRBs will probably always be out of reach due to their distances. Observing the surroundings of an explosion, however, can give us important information on the properties of the progenitor.

Focus Meeting 10: Stellar Explosions in an Ever-Changing Environment	
Start date	Tuesday, 11 August
End date	Thursday, 13 August
Oral sessions	Room 313C, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Coordinating Divisions	Division J: Galaxies and Cosmology Division D: High Energy Phenomena & Fundamental Physics
For details on presenters, topics, and times see the online program or mobile app.	



"Supernova factory" NGC 2770 as seen through broadband and narrowband hydrogen-alpha filters. It has already hosted three Type Ib SNe, as well as a luminous blue variable that probably exploded as a Type IIn SN. All are marked here, though they were not all visible at the same time.

Spatially resolved observations of stellar explosion environments outside the Local Group have only been achievable in the past few years. Observations at different wavelengths are now able to resolve individual star-forming regions, gas inflows and outflows from starburst galaxies, ionized regions, and abundances in great detail.

Massive stellar explosions have observable effects on their immediate environments and host galaxies. They can both inhibit star formation and give rise to new (massive) star formation in their neighborhood, and they can both enrich the host galaxy with metals and produce galactic winds that can affect the composition of the intergalactic medium.

Last but not least, stellar explosions allow us to trace star formation out to the very first galaxies. GRBs, for example, are good tracers of massive star formation in galaxies and are visible across vast distances. They complement high-redshift galaxy surveys, which are flux-limited and currently can only detect the most massive galaxies. As GRBs are found at any redshift, they are also excellent tools for studying the evolution and composition of star-forming galaxies over the entire history of the universe.

In short, stellar explosions, star formation, and the chemical evolution of galaxies are intimately related. Though the people

who study them are only beginning to communicate with each other, the synergy looks very promising. If you are working in, or interested in, any of these fields, just drop in at one of our sessions. Focus Meeting 10, which began yesterday but continues today and tomorrow, is socially and scientifically diverse: Both the Scientific Organizing Committee and the list of invited speakers is composed of an equal number of men and women, and we have made a particular effort to include young researchers, whose new ideas will help further our interdisciplinary efforts. ✿


CHRISTINA THÖNE is a Ramón y Cajal Fellow at the Institute of Astrophysics of Andalusia in Granada, Spain, and leader of the High Energy Transients and Their Hosts group. LISE CHRISTENSEN is Associate Professor at the Dark Cosmology Centre, Niels Bohr Institute, University of Copenhagen, Denmark.

FOCUS MEETING 18

Scale-Free Processes in the Universe

By EDITH FALGARONE & BRUCE ELMEGREEN

Focus Meeting 18, Scale-Free Processes in the Universe, brings together cosmologists, astrophysicists, and statistical physicists to exchange ideas from different perspectives on the puzzling observation that most distribution functions — such as those for mass, energy, and the structure of components like dark matter, galaxy clusters, galaxies, magnetic fields, cosmic rays, star clusters, and stars — have power-law shapes indicating a lack of physical scale in whatever processes determine their formation and organization.

These scale-free behaviors are apparently established without fine-tuning, and they raise fascinating questions about the relative roles of long-range (such as gravity) and short-range (such as collisional) interactions — questions that touch on the interaction between dark matter, baryons, cosmic rays, and magnetic fields. Equally fascinating are the scales where the power laws break down. Computer simulations now include a large enough range of scales to reproduce some of these behaviors.

FM 18 will have 14 invited reviews and 22 contributed talks by top international researchers in fields such as dark-matter profiles and galaxy formation, cosmic magnetism, numerical models, turbulence, and self-organized criticality. Everyone is welcome to listen, learn, and discuss these challenging questions. ✿


EDITH FALGARONE is CNRS Emeritus Director of Research at the Paris Observatory in France. She is a molecular astrophysicist focused on turbulence, magnetic fields, and diffuse matter in galaxies. 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.

Focus Meeting 18: Scale-Free Processes in the Universe	
Start date	Wednesday, 12 August
End date	Friday, 14 August
Oral sessions	Room 313B, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Coordinating Divisions	Division J: Galaxies and Cosmology Division D: High Energy Phenomena and Fundamental Physics Division H: Interstellar Matter and Local Universe
For details on presenters, topics, and times see the online program or mobile app.	

SPLINTER MEETING

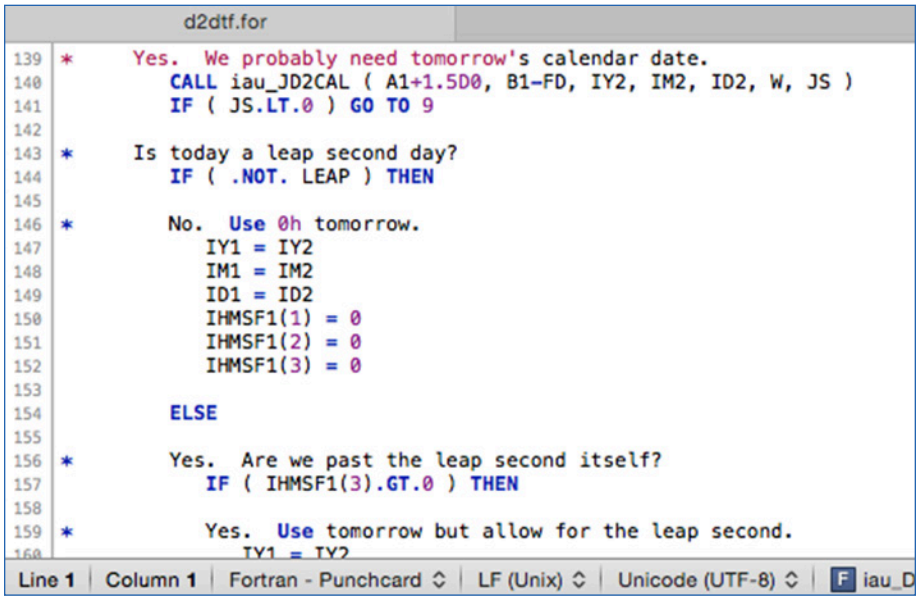
Making It All Standard

By CATHERINE HOHENKERK

IAU Division A, Fundamental Astronomy, provides astronomers with software that can be used with space-time reference systems via Standards of Fundamental Astronomy (SOFA). The SOFA service incorporates an authoritative set of algorithms and procedures for implementing standard models used in fundamental astronomy, and for supporting IAU Resolutions regarding standards usage.

The Division I Working Group on Astronomical Standards, chaired by Toshio Fukushima, formed SOFA in 1994. Today SOFA is organized by a board of international members who come from a wide range of IAU Commissions and Working Groups and who have the knowledge and skills necessary to maintain the software and website.

The SOFA software is available as source code in Fortran 77 or ANSI C and, while not open source, it is freely available to all users. The terms of use restrict users from changing the source code without re-naming affected routines (e.g., removing or replacing the characters "iau" from routine names). To some this violates the definition of "free software." However, SOFA sets an IAU standard and, as such, the routine name and its contents are bound together. A researcher using SOFA software packages needs the assurance that the particular routines being used adhere to the IAU standard.



An excerpt of code taken from subroutine iau_D2DTF. *[SOFA Project]*

The SOFA website allows individual routines to be viewed or copied. Alternatively, the whole library may be downloaded, complete with build procedures and validation tests. Documentation is available with detailed per-routine commenting, but there is also a summarizing manual and three cookbooks: *SOFA Tools for Earth Attitude*, *SOFA Time Scale and Calendar Tools*, and *SOFA Astrometry Tools*.

The current SOFA release contains 219 astronomy routines, 59 of which support IAU Resolutions concerning standards. Since

Splinter Meeting: Working Group on Standards of Fundamental Astronomy (SOFA)	
Date	Wednesday, 12 August
Time	2:00 to 3:00 pm
Location	Room 326A, Hawai'i Convention Center
Coordinating Division	Division A: Fundamental Astronomy

the last IAU General Assembly, two new categories have been added: Astrometry and Galactic Coordinates. The Astrometry category consists of 36 routines that deal with the chain of astrometric transformations linking star data from a catalog and the observed direction of the incoming radiation. Galactic Coordinates implements the transformation between the IAU system of galactic coordinates (1958) and coordinates in the International Celestial Reference System (ICRS). ✿

CATHERINE HOHENKERK is Chair of the IAU SOFA Board and President of IAU Commission 4, Ephemerides. She is also Senior Analyst at H. M. Nautical Almanac Office / U.K. Hydrographic Office.

ASTRONOMY EDUCATION RESEARCH

Peer-Reviewed Education & Public Outreach

By TIM SLATER

I think we can all agree that one hallmark of being a successful researcher is the publication of peer-reviewed papers in scientific journals. There have, however, traditionally been few choices for astronomers doing research in education and outreach.

Fortunately there are now several journals available to professional astronomy-education scholars for publishing peer-reviewed research results and materials. The longest-standing journal for astronomy-education research is the *Latin-American Journal of Astronomy Education*. Abbreviated as RELEA from its title in Portuguese, this journal has published empirical research, theoretical essays, and reviews in a variety of languages (including Portuguese, Spanish, and English) for the past 10 years.

A more recent addition to the portfolio of astronomy-education journals is targeted at people working in scientific communication with the public. The free *Communicating Astronomy with the Public Journal* features peer-reviewed articles on different programs and approaches to disseminate our knowledge of the universe to the public, as well as reviews of recent innovations and best practices.

Launched in December 2014, the *Journal of Astronomy & Earth Sciences Education* is a traditional, biannual journal focusing on publishing empirical research studies. All issues (currently two) are open access and available online, but there are both submission fees and page charges for authors that are consistent with many astronomy journal fees.

In addition to these journals for research, peer

review is also being used to vet educational materials for scientific and pedagogical accuracy. NASA Wavelength hosts materials created to support NASA missions and programs. The IAU has also entered this arena with its support of astroEDU, which is open to new submissions from the astronomy community. Both of these online, database-driven repositories provide an important service for educators seeking high-quality materials. ✿

TIM SLATER is the University of Wyoming Excellence in Higher Education Endowed Professor of Science Education and serves as the Editor of the *Journal of Astronomy & Earth Sciences Education*.

A FAN of the Perseids

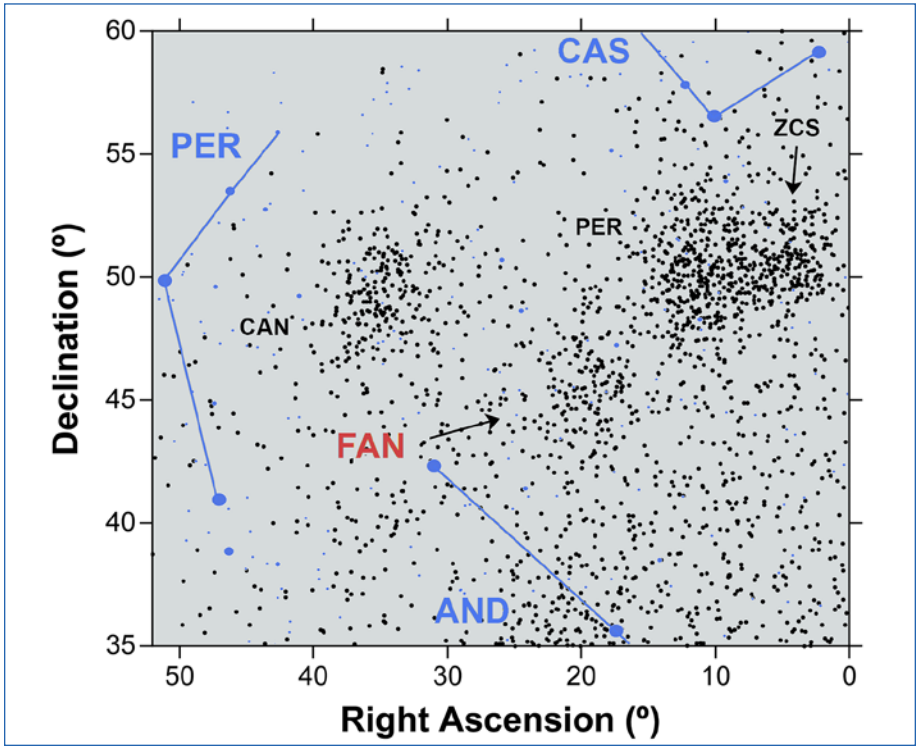
A new meteor shower joins the August lineup.

By PETER JENNISKENS

With the Moon out of the way on Wednesday night, 12 August, the Perseid meteor shower is expected to be the best in 10 years. If the skies clear over Honolulu, find a dark location away from city lights with a good view of the sky; see the companion article by Babak Tafreshi for some suggestions.

Around 11 pm the first grazing meteors will appear, streaking away from the constellation Perseus, which will then be very low in the northeast. Rates and apparent speeds will pick up around 1 am Thursday morning, when you may expect to see around 25 meteors per hour. By around 3 am, rates will double to about 50 per hour, while even higher rates — a little more than 60 per hour — are expected just before dawn, after 5 am. For expert meteor-watching tips, see *Sky & Telescope*.

If you've been following this shower since it first became conspicuous in mid-July, when the radiant was actually in Andromeda, you may have noticed that not all of the fast meteors from that direction were Perseids. During its business meeting on Monday, 10 August, old Commission 22 — in its last official act before giving way to new Commission F1 — added 18 showers to the list of established ones at the IAU Meteor Data Center and moved one back to the working list for more study, bringing the tally of well-established meteor showers to 112. One of the 18 new showers is called the 49 Andromedids, with IAU code FAN.



The newly established 49 Andromedids (FAN) appear as a cloud of radiant points, i.e., directions from which the meteoroids are approaching us, in this plot made during the period 7–28 July. Data are drift corrected for Earth's motion around the Sun. The new shower appears amidst the Perseids (PER), ζ Cassiopeiaids (ZCS), and c Andromedids (CAN). *[Peter Jenniskens]*

The shower sits amidst other streams that may, or may not, share a common origin at Comet 109P/Swift-Tuttle. How these streams came about can now become a topic of active research by any fan of the Perseids. ✿

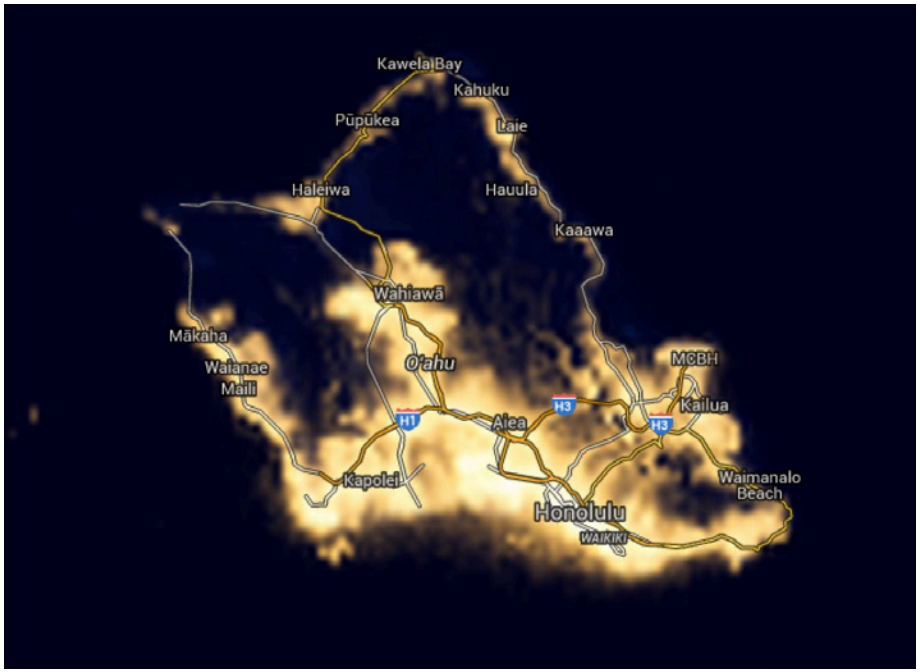
PETER JENNISKENS is the outgoing President of Commission 22, Meteors, Meteorites & Interplanetary Dust, and Senior Research Scientist at the SETI Institute in Mountain View, California.

Where to Watch Tonight's Perseid Meteor Shower

There are places on O'ahu, even near Honolulu, where you can find reasonably dark skies.

By BABAK TAFRESHI

The island of O'ahu is densely populated and light polluted, especially around downtown Honolulu and Waikīkī. If you have a car and don't mind driving an hour or so, the North Shore offers skies that are dark enough to show the Milky Way prominently. Looking at the accompanying light-pollution map, it appears that the northwest tip of the island is perhaps the darkest spot. Kaena Point, not labeled on the map, is located there at the end of State Highway 93; it's a scenic state park known for great snorkeling. Another dark spot is Kualoa Point on the island's east coast, just south of Kaaawa on the map.



[http://www.blue-marble.de/nightlights]

If you're on foot or on a bike, try Diamond Head Beach Park, a favorite spot for surfers. From there the light of Honolulu is blocked by the mountain, such that the sky in the direction of the ocean is reasonably dark. Diamond Head lighthouse is operating

next to the park, which will cause some local light pollution, but it's quite scenic, so you can just treat it as a "photo op."

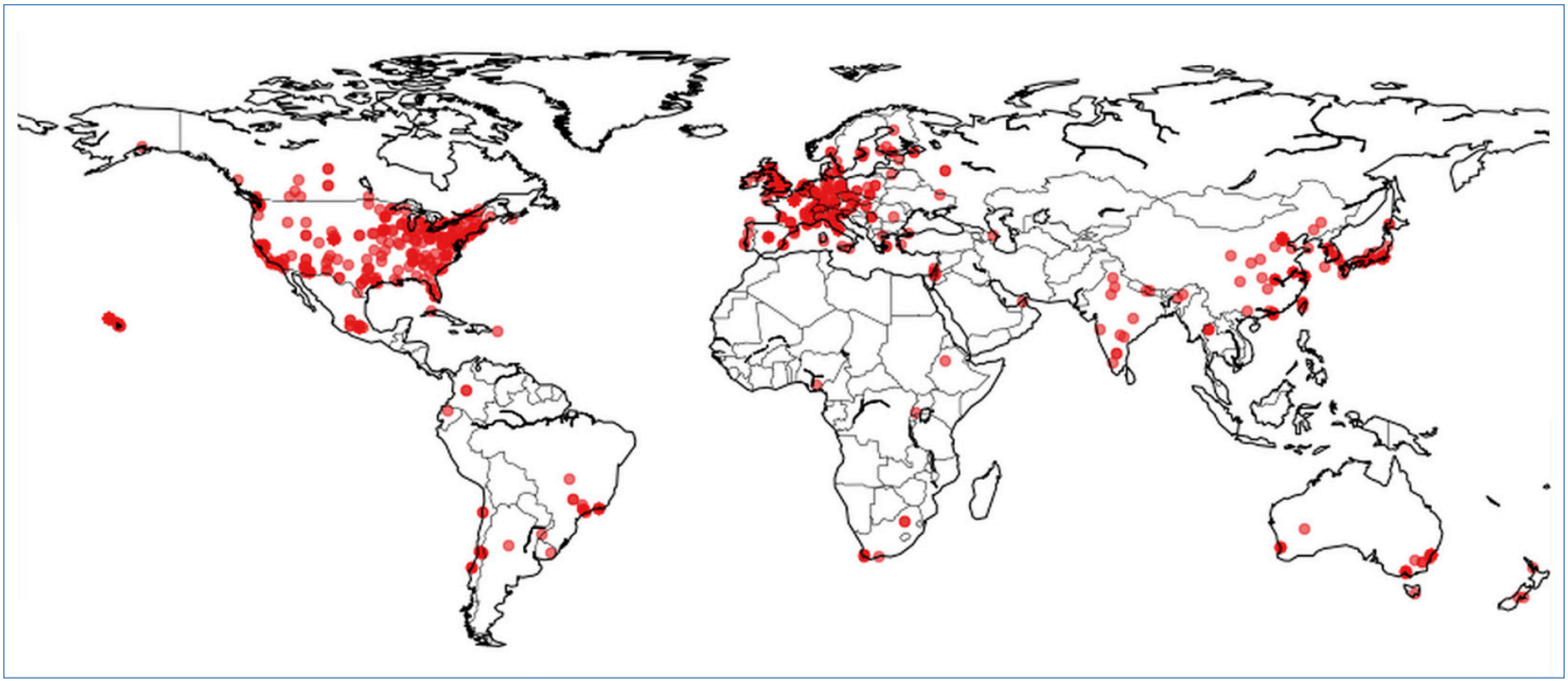
If you stay near the hotels and Convention Center, and if the weather cooperates, you can still watch for bright Perseid meteors from a less-illuminated spot along Waikīkī Beach. Meteors can appear anywhere in the sky, so the best advice is to look where it's darkest. ✿

Artist and astrophotographer BABAK TAFRESHI is founder and director of The World At Night (TWAN), an international effort to present stunning nightscape photos and time-lapse videos of the world's landmarks against celestial attractions. Originally from Iran, he now lives in Massachusetts, USA.

Honolulu Almanac 🐟 12 August 2015

Sunrise / set	6:09 am / 7:04 pm
Twilight[1] start / end	4:50 am / 8:22 pm
Moonset / rise	4:34 am / 5:49 pm
Moon phase[2]	● Waning crescent (3% illum.)
Evening planet[3]	Saturn (SSW)
Morning planet[3]	Mars (E)
Special event	Perseid meteor shower (late night)

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



Kyle Willett (University of Minnesota, USA) created this map of attendees' home institutions from the IAU XXIX General Assembly registration list.

COMMISSION E1

Solar Radiation and Structure

By GIANNA CAUZZI & NATALIE KRIVOVA

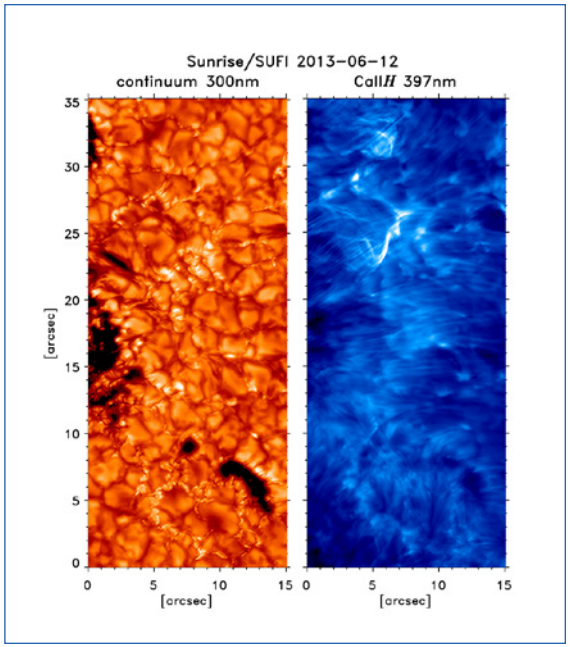
IAU Commission E1, Solar Radiation and Structure, deals with the observational and theoretical aspects of the radiation, structure, and variability of the "quiet" Sun (though there are close interconnections between the Sun's normal state and occasional outbursts).

The previous incarnation of this Commission, Commission 12, had successfully acted for several decades, coordinated international efforts to maintain long-term solar synoptic observations, and organized numerous Symposia, Special Sessions, Joint Discussions, and Focus Meetings. For example, since 2000 the Commission has proposed and co-organized seven Symposia and five other meetings, including IAU Symposium 320 and Focus Meeting 13 during the present IAU General Assembly.

Tremendous advances in solar observations from the ground and from space have marked recent years, propelling progress in data analysis, numerical simulations, and modeling. Numerous complementary telescopes equipped with multiwavelength, spectropolarimetric imaging capabilities have provided an unprecedented view of the complex structure, dynamics, and magnetism of the Sun, from the deep interior to the atmosphere and corona.

At the same time, 3-D radiative magnetohydrodynamic (MHD) models of the solar magnetoconvection and emerging magnetic flux are maturing. These are providing, for the first time, realistic descriptions of quiet-surface magnetism, sunspots, spicules, plasma eruptions, and waves in the solar atmosphere. Three-dimensional global-Sun MHD models can now reproduce the basic features of solar convection, differential rotation, meridional circulation, and magnetic field generation by the turbulent dynamo. Among the more remarkable recent advances is the growing realization that the global dynamics and variability of the Sun are coupled to small-scale processes.

The challenge for the next decade will be to address the multiscale dynamical coupling of the quiet Sun effectively in order to understand the basic mechanisms of solar magnetism and variability. Such a task requires close coordination of long-term synoptic observations and high-resolution campaigns, involving both ongoing and planned facilities, as well as international cooperation among solar observers, modelers, and theorists. Efforts must be pursued to allow community access to these data and to provide sophisticated tools for their interpretation, including spectropolarimetric inversions and 3-D non-local thermodynamic equilibrium (non-LTE) radiative-transfer techniques.



The surface of the Sun at highest resolution as seen by the balloon-borne telescope Sunrise. The image covers 1/20,000th of the visible solar surface and depicts small-scale concentrations of magnetic fields on our star. The left panel shows granulation, and the right panel shows the filamentary character of the complex magnetic field lines. *[Sunrise Team]*

The primary goal of Commission E1 will be to facilitate commu-

nication among the various actors in this complex undertaking. Several Working Groups are planned to address, in particular, the coordination of synoptic observations, helioseismology issues, high-resolution spectropolarimetric observations and analysis, and solar irradiance. Other goals include the development of connections and collaborations with the community studying magnetic and photometric variability of Sun-like stars, and promoting the most up-to-date knowledge of solar variability (past, present, and potentially future) in the terrestrial climate community. ✿


GIANNA CAUZZI is an astronomer at the Italian National Institute of Astrophysics, working on the structure of the quiet and active solar chromosphere. She is President of IAU Commission 12 and co-proposer and member of the Organizing Committee of Commission E1. NATALIE KRIVOVA is the leader of the Minerva Research Group on Solar Variability and Climate at the Max Planck Institute for Solar System Research in Germany. She is a member of the Organizing Committee of C12 (2012-15) and incoming President of C.E1.

INTERNATIONAL YEAR OF LIGHT 2015

Cosmic Light Awareness

By LINA CANAS

As part of the global celebration of the International Year of Light 2015 (IYL 2015), the IAU is coordinating the Cosmic Light program. Part of this project focuses on limiting energy waste through the reduction of light pollution and by highlighting the importance of preserving dark night skies.

The Cosmic Light Awareness cornerstone project focuses on involving schools around the globe in three programs within the framework of the IYL 2015: the Dark Sky Meter app, the Cosmic Light EDU kit, and the Quality Lighting Teaching Kit.

The Dark Sky Meter app (available only for iPhones) provides users instant information about the quality of the night sky, enabling them to contribute directly to global citizen-science programs, such as Globe at Night. So far the app has attracted 2,900 users and registered 17,100 measurements. Pedro Russo, the Dark Sky Meter app project leader, showcased the app to IAU General Assembly delegates yesterday at the IAU booth in the Exhibit Hall.

With the Cosmic Light EDU kit, teachers have access to an online collection of activities, tools, and other resources on the science of light. Project leader Rosa Doran says the Cosmic Light EDU kit aims to be a "one-stop shop" for educators. Its mission is to support the promotion of global workshops related to light and its importance as a cosmic source of information that brings us awareness about our universe. The team behind this kit has received more than 120 workshop proposals to be implemented between July 2015 and April 2016. More than 40 countries will be using the 50 free light-based educational resources and activities featured in the Cosmic Light EDU kit. Additionally, the IAU Office for Astronomy Outreach will ship 150 project-related goodie packs

A young visitor to the IAU booth learns that fighting light pollution can be fun! *[Lina Canas]*

to organizers around the world to support the initiative's success.

The Quality Lighting Teaching kit will increase student and public awareness of lighting issues through online tutorials, teaching kits, and hands-on activities. The program, along with 100 kits, will be disseminated to formal and informal education venues worldwide. Project leader Constance Walker said, "The six Quality Lighting Teaching kit activities allow middle-school students to address real light-pollution problems that relate to wildlife, the night sky, aging eyes, energy consumption, safety, and light trespass. They also allow learners to apply their solutions to their city of the future."

Want to learn more about Cosmic Light? Drop by Booth 329 in the Exhibit Hall, and we'll show you what the Cosmic Light program can offer you. ✿

LINA CANAS is Assistant Outreach Coordinator in the IAU Office for Astronomy Outreach (OAO) at the National Astronomical Observatory of Japan (NAOJ) in Tokyo. She is originally from Portugal.

Education & Outreach in the Exhibit Hall

On Wednesday, 12 August, the IAU will host about 200 local primary- and secondary-school students at an outreach event in the Exhibit Hall. With generous support from Associated Universities, Inc., these youngsters and their teachers, parents, and counselors will interact with scientists from some of the observatories, organizations, and institutions that have set up displays at the General Assembly. The students will participate in hands-on educational activities and enjoy a unique opportunity to ask questions of astronomers from all corners of the globe. Please welcome them in the spirit of aloha!

Students who visited the IAU Exhibit Hall last Wednesday used balloons to investigate Hubble's law and the expansion of the universe. *[IAU/B. Tafreshi, twanight.org]*

— Rick Fienberg, Kaʻaleleiaka

IAU SYMPOSIUM 318 PLENARY

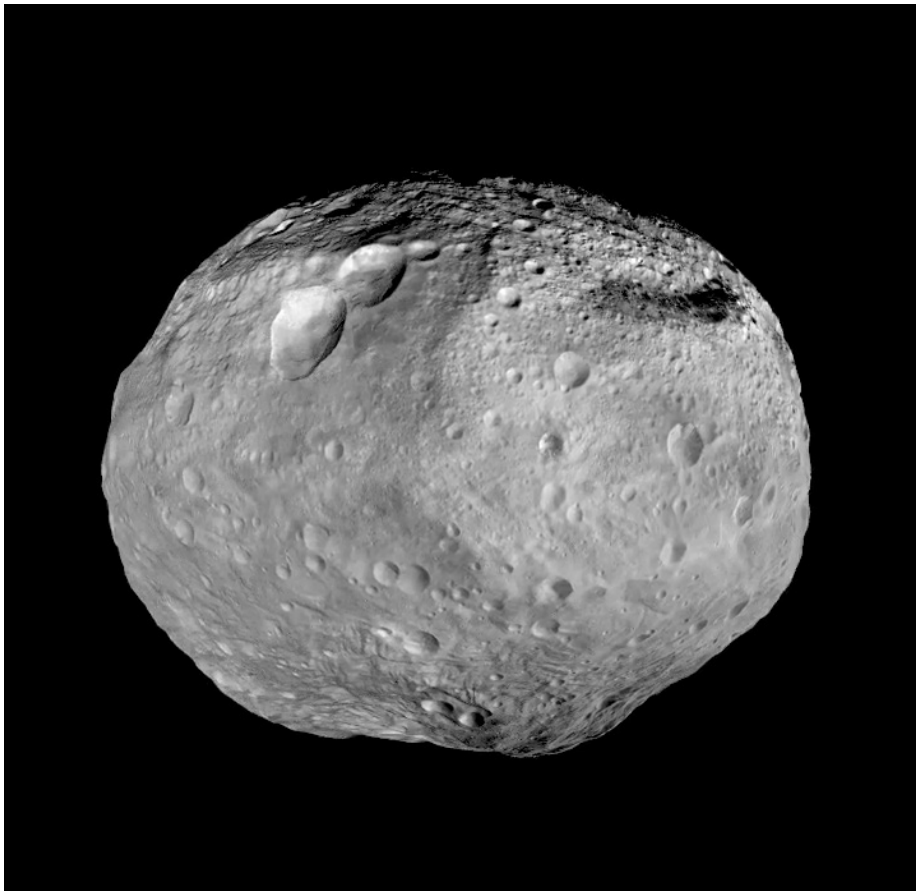
Asteroids: The Fossils of Planet Formation

By PATRICK MICHEL & WILLIAM BOTTKE

Asteroids are fascinating worlds. The largest — dwarf planet Ceres — was discovered in 1801 and is currently being explored by NASA's Dawn mission. More than 1 million asteroids larger than 1 kilometer in diameter are thought to occupy the asteroid belt between the orbits of Mars and Jupiter. So far only a fraction of these objects, several hundred thousand, have been discovered.

Asteroids are considered the building blocks of our planets. Their exploration involves ground- and space-based observations, in-situ space missions, and studies that run the gamut from theoretical modeling to laboratory work. Like fossils for paleontologists, or DNA for geneticists, asteroids allow us to construct a veritable time machine as they provide us with tantalizing glimpses of the earliest appearance of our solar system.

The story of the origin and evolution of life on our planet is also intertwined with the story of asteroids. It is thought that impacts on the primordial Earth may have delivered the basic components for life, with biology favoring attributes that could more easily survive these energetic events. In this fashion, asteroids may have banished some probable evolutionary avenues to relative obscurity. Similarly, they also may have delayed the



This mosaic of Vesta synthesizes some of the best views from NASA's Dawn spacecraft, which studied the asteroid at close range from July 2011 to September 2012. The towering mountain at the south pole — more than twice the height of Mount Everest — is visible at the bottom of the image. The set of three craters known as the "snowman" appears at top left. *[NASA, JPL-Caltech, UCAL, MPS, DLR, IDA]*

development of a more complex biosphere. The full tale of asteroid impacts on the history of our world, and how human life managed to emerge from the myriad of possibilities, has yet to be fully told.

The hazard posed by asteroid impacts to our civilization is low, but singular. The design of efficient mitigation strategies strongly relies on asteroid detection by ground- and space-based surveys, as well as knowledge of their physical properties. About 1,000 asteroids are characterized as near-Earth objects, and it's estimated that only 90% of them have been discovered. The proximity of some asteroids to Earth may allow future astronauts to harvest water and rare minerals for use in exploration. A key goal of asteroid science is therefore to learn how humans and robotic probes can interact with asteroids (and extract their materials) in an efficient way.

Asteroids, like planets, are driven by a great variety of both dynamical and physical mechanisms. Images sent back by spacecraft show a collection of small worlds whose characteristics seem designed to overthrow our preconceived notions. Given asteroids' wide range of sizes and surface compositions, it is clear that their formation occurred in different places and times within the solar nebula. A very intriguing asteroid discovery shows evidence of activity, which implies that, based solely on physical properties, asteroids and comets may be less different than originally thought — a continuum may exist between these populations.

The return of samples from these bodies, as planned by

Honolulu Weather Forecast 12–13 August 2015

WEDNESDAY, 12 AUGUST		***High: 88°F / 31°C Low: 76°F / 24°C***
Morning	**Afternoon**	**Evening**
Clear to partly cloudy	Partly cloudy	Partly cloudy
5% chance of rain	15% chance of rain	10% chance of rain
THURSDAY, 13 AUGUST		***High: 87°F / 31°C Low: 76°F / 24°C***
Morning	**Afternoon**	**Evening**
Partly cloudy	Partly cloudy	Partly cloudy
35% chance of rain	25% chance of rain	20% chance of rain

Extended forecast: Hilda has been downgraded to a tropical storm; however, it is expected to bring widespread rain across Hawai'i Island, with some rain expected for the smaller islands. The upper trough north of the state will remain nearly stationary over the next several days, causing unstable conditions across the state. Sources: Weather Underground, National Weather Service.

Japan's Hayabusa 2 mission (launch: December 2014, sample return: 2020) and NASA's OSIRIS-REx mission (launch: September 2016, sample return: 2023), will greatly help us in our quest. Other space projects, if funded, aim to extend our understanding of the geophysics and compositional diversity of asteroids. For instance, the Asteroid Impact & Deflection Assessment (AIDA) mission, an ESA-NASA collaboration, aims to test deflection of the small moon of the binary asteroid Didymos in 2022, to characterize for the first time the internal properties of a small asteroid, and to rendezvous with Trojan or main-belt asteroids.

Our understanding of asteroids is also crucial to our understanding of circumstellar environments. More than 1,800 extrasolar planets have been found orbiting other stars, along with more than 4,500 Kepler planet candidates. With time, these worlds will be joined by more and more debris-disk discoveries, though we will not be able to observe the detailed properties of these systems in the near future.

Asteroids, along with comets, are the closest analogs we have to the types of objects involved in planet formation. By exploring how asteroids formed and evolved, we glean insights into the history and properties of debris disks and planetary systems around other stars. Asteroids are therefore fascinating, not only because they tell us about our own solar system's provenance and evolution, but also because they can help us better interpret what is going on in newly discovered planetary systems. ✿


PATRICK MICHEL is the leader of the team Theories and Observations in Planetology (TOP) at the Lagrange Laboratory at Côte d'Azur Observatory in Nice, France. He leads the investigation team of the European component of AIDA and is Co-Investigator on NASA's OSIRIS-REx and JAXA's Hayabusa 2. WILLIAM BOTTKE is the Director of the Department of Space Studies at the Southwest Research Institute in Boulder, Colorado. He is also the Director of the Institute for the Science of Exploration Targets (ISET) of NASA's Solar System Exploration Research Virtual Institute (SSERVI) and Co-Investigator on NASA's OSIRIS-REx asteroid-sample-return mission.

IAU SYMPOSIUM 321

The Formation and Evolution of Galaxy Outskirts

By JOHAN KNAPEN & JIN KODA

The study of the properties, formation, and evolution of galaxy outskirts is critical to understanding the fueling and growth of galaxies. Observations of such structures present a true challenge to astronomers at the low-surface-brightness frontier. IAU Symposium 321, Formation and Evolution of Galaxy Outskirts, will review the latest results on the star, gas, and dust content of the outer regions of galaxies — from resolved stellar populations in the Local Group to high-redshift populations. The meeting, to be held in March 2016 in Toledo, Spain, will also explore the possible advances to

The city of Toledo, Spain, will host IAU Symposium 321 in March 2016.

be provided by next-generation facilities.

New large-scale imaging facilities, such as the Visible and Infrared Survey Telescope for Astronomy (VISTA) and the upcoming Large Synoptic Survey Telescope (LSST), will provide enormous gains in depth to map galaxies farther out in distance and time. The James Webb Space Telescope (JWST) will enable studies of individual stars in galaxies well beyond the Local Group. This will be complemented by emerging multi-object spectroscopy from the K-band Multi-Object Spectrograph (KMOS) at the Very Large Telescope (VLT) and, in the near future, from the European Extremely Large Telescope (E-ELT). The molecular gas phase can now be probed with The Atacama Large Millimeter/submillimeter Array (ALMA) and the Institut de Radioastronomie Millimétrique (IRAM) 30-meter telescope, while radio surveys with the Jansky Very Large Array (JVLA) and the Square Kilometre Array (SKA) precursors will revolutionize our knowledge of neutral hydrogen in galaxy outskirts.

These facilities are complemented by advancing numerical simulations that, through improvements in modeling baryon-cycle processes, now finally start to reproduce the full Hubble sequence at sufficient resolution to dynamically explore the transport of gas, stars, and metals through the outskirts of galaxies. Hence the time is right to bring together observers and theorists working on the crucial regime of galaxy outskirts to assess the current state of the field and to chart an optimal path forward.

IAU Symposium 321 is sponsored by Complutense University of Madrid; Detailed Anatomy of Galaxies (DAGAL); IAU Division J, Galaxies and Cosmology; and the Space Telescope Science Institute.

Registration and abstract submissions will open in the fall of 2015 after a second announcement. A tentative scientific program has been posted on the Symposium website. The scientific and local organizing committees look forward to welcoming many interested participants! ✿

IAU Symposium 321: Formation and Evolution of Galaxy Outskirts	
Start date	14 March 2016
End date	20 March 2016
Location	Toledo Congress Centre, Toledo, Spain
Website	http://galaxyoutskirts.org
Coordinating Division	Division J: Galaxies and Cosmology


JOHAN KNAPEN is Research Astronomer at the Astrophysical Institute of the Canary Islands. JIN KODA is Associate Professor at Stony Brook University in New York and Co-Chair of the Scientific Organizing Committee of IAU Symposium 321.

Congratulations to

Jill Lagerstrom!

You have won
two deluxe tickets (value: $180) to
Burn'n Love Waikiki – The Elvis Tribute Show
at the Holiday Inn Resort, 2300 Kalākaua Ave.

Prizes can be redeemed, and raffles can be entered, at Exhibit Hall Booth 336

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COMMISSION C2

Attributing More Value to Public Engagement

By JOSH BORROW & PEDRO RUSSO

An anti-public-engagement atmosphere is discouraging participation of researchers in science outreach at all career stages. Young researchers, in particular, are too often actively dissuaded from "wasting their time" on such activities by more senior colleagues. This is in stark contrast to the so-called third aim of research institutes around the globe, namely, to facilitate knowledge transfer to the public. This issue was discussed last week during Focus Meeting 19, Communicating Astronomy with the Public in the Big Data Era.

Widespread disparagement of public outreach is unsurprising, as most career development in research institutions is tied directly to research, and, to a lesser extent, teaching. This not only includes training opportunities, but also promotion and pay decisions. If researchers would like to engage with the public, they are disincentivized from doing so; they will have less time to devote to their research and teaching duties, which are directly connected to their salary. This is, perhaps, why one of the most often stated reasons for not engaging with the public is a lack of time.

It is important to note that we are not suggesting that each and every researcher should engage with the public. Rather, we propose that time spent performing good public-engagement work should be valued similarly with time spent producing good research.

An appraisal system, similar to the one used to determine research output and quality, could be implemented. This would allow researchers to build a public-engagement portfolio that can be presented alongside a research portfolio when career-advancement opportunities arise. Public-engagement work could then be taken into account by the institution — along with research, ser-

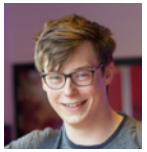
Public engagement in action: Maltese students design an alien at the National Student Travel Foundation Malta. *[Universe Awareness]*

vice, and teaching — when deciding who to hire or promote.

Such a system may be difficult to implement but could be worked into the pre-existing yearly research-appraisal system used in many institutions. To be truly successful, a staff member who is experienced in engagement should be present at meetings where the career progressions of researchers are discussed, so that their public engagement work can be evaluated sensibly.

While all of this may seem drastic, it reflects the changing role of researchers in society. No longer is it enough to produce papers and perform teaching duties; academics are now expected to engage with the public, contribute to scientific computing libraries, and deal with large amounts of administrative work. Such activities are rarely considered when career-development opportunities arise, leaving those who perform these vital duties behind in terms of pay and position. Research institutions clearly want these duties to be undertaken — so they must value them more highly.

For additional information on this topic, see "A Blueprint for Public Engagement Appraisal: Supporting Research Careers" (PDF) or contact us by email via the links in our bio. ✿




JOSH BORROW is an undergraduate student at Durham University, U.K., and host of Café Scientifique Durham City. He also works for the educational program Universe Awareness at Leiden Observatory, the Netherlands. PEDRO RUSSO is International Project Manager for Universe Awareness and incoming President of IAU Commission C2, Communicating Astronomy with the Public.

COMMISSION G1

On the Importance of Binary and Multiple Star Systems

By ANDREJ PRSA

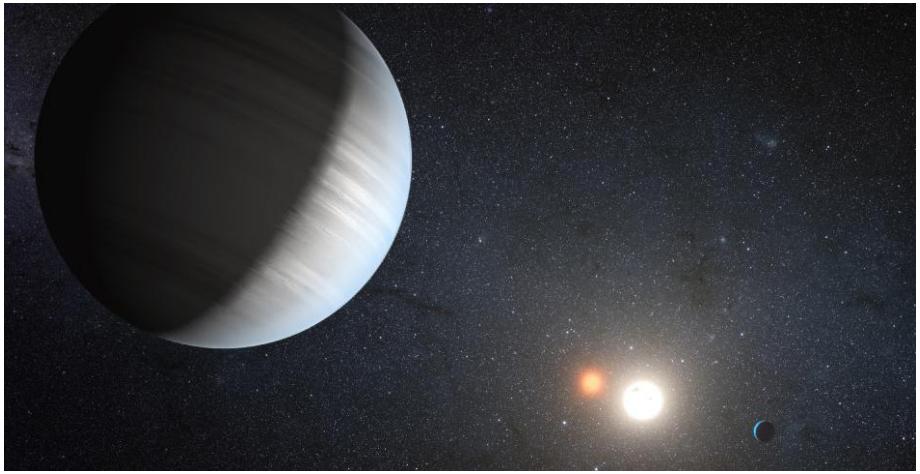
The subject of binary and multiple stars has been part of astronomy since the work of John Michell in 1767. These systems are important today, and will be for many future decades, because their formation, evolution, detection, and death are relevant to current hot topics: exoplanets, X-ray sources, black holes, and galactic evolution.

Understanding the science of these systems is an essential part of stellar physics, as single stars like the Sun are in the minority. Further, understanding the science of these systems is entwined with our understanding of the fields of planetary science, stellar structure, and evolution (as calibrators), high-energy astrophysics, supernovae, galactic chemical evolution, and cosmology.

The new Commission G1, Binary and Multiple Star Systems, extends the science that was previously covered by Commission 26, Double and Multiple Stars, and Commission 42, Close Binary Stars. The intent of our Commission is to curate all of the relevant observations of individual systems and populations, along with statistical studies (both analytical and numerical), and to provide database maintenance.

The goals of Commission G1 are to encourage additional research to identify and examine the following:

- Best possible values of fundamental stellar parameters (M, R, L, T) and surface compositions for important calibrator systems — in particular,well-detached, double-lined spectroscopic eclipsing binaries;
- Accurate statistical samples of a wide range of binary star populations;
- Degrees of co-planarity of multiple systems;
- Improved theories of star formation and spatial distribution;
- Improved theories of stellar and orbital evolution;



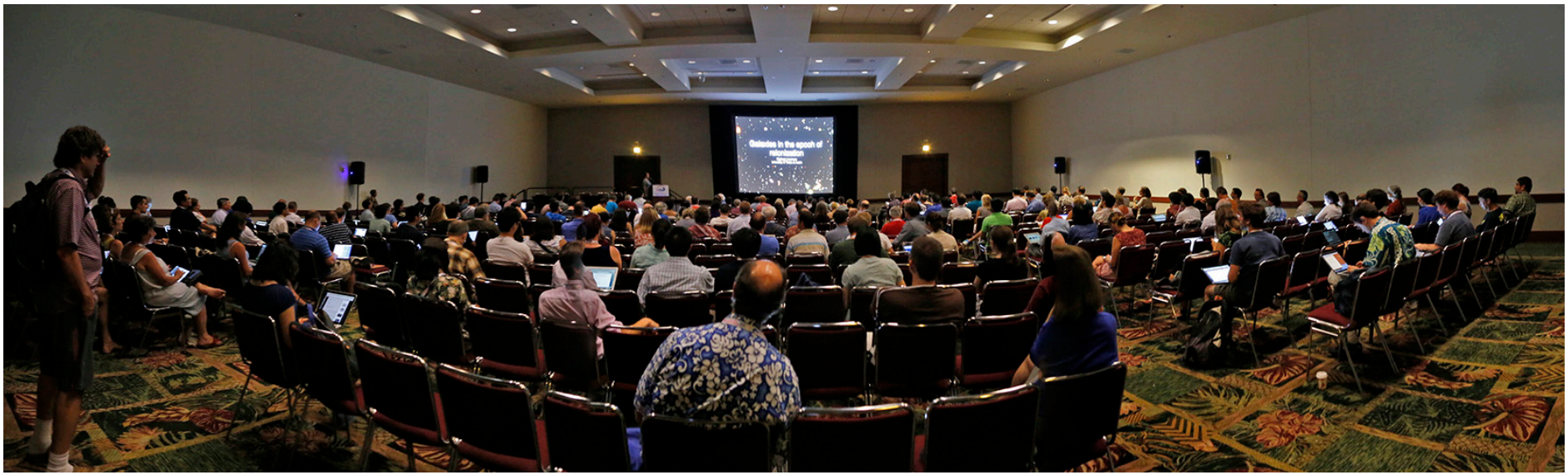
Artist's rendition of Kepler-47, the first multiplanet circumbinary system. *[NASA, JPL-Caltech, T. Pyle]*

- Implications for the habitability of exoplanets and exomoons around binary and multiple systems;
- Expected numbers of Type Ia supernovae and their inputs to galactic chemical evolution and for use as standard candles for cosmology.

We will provide long-term service to the community by maintaining several catalogs in the tradition of Commissions 26 and 42, namely the Spectroscopic Binary Catalog, the Visual Double Star Database, the Information Bulletin on Variable Stars, and the Bibliography of Close Binaries, which are all important resources used by both amateur and professional astronomers. There is currently minimal overlap in the content of these catalogs.

C.G1 will also provide education and public outreach (EPO) services to the international community. In particular, regular monitoring of eclipsing binaries with small telescopes is an excellent opportunity for students and amateur astronomers to be involved in astronomy. ✿

ANDREJ PRSA is Associate Professor of Astrophysics and Planetary Science at Villanova University, Pennsylvania, and the incoming President of Commission G1. He is past chair of the Kepler Eclipsing Binary Working Group.



This was the scene on Tuesday afternoon at a session of IAU Symposium 319, Galaxies at High Redshift and Their Evolution Over Cosmic Time. *[IAU/B. Tafreshi, twanight.org]*

COMMISSION H2

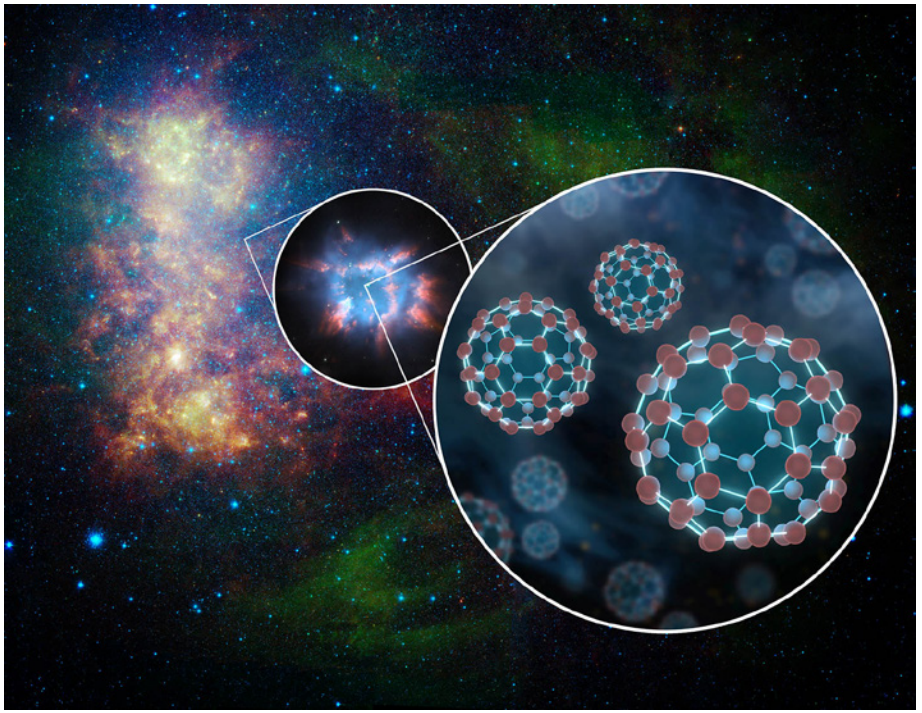
Exploring Astrochemistry Near and Far

By TOM MILLAR

Commission H2, Astrochemistry, is a new Commission and an upgrade of a long-running and successful Working Group of the same name. The topic is one of growing importance within astronomy: the use of molecular emission and absorption lines to probe objects as diverse as planetary atmospheres and comets within our solar system and distant galaxies at redshifts greater than $z = 6$.

Studying astrochemistry is not only intrinsically valuable to astronomy, but also to chemistry. The interstellar medium is an extreme environment in terms of temperature, density, size, and timescales, and these conditions are not easily accessible to terrestrial laboratories. Astrochemistry also attracts scientists from a number of other disciplines, such as planetary science, astrobiology, and the study of exoplanets and their atmospheres.

Because of this broad appeal, astrochemistry is a rich and vibrant field, with many adherents throughout the world and the potential for huge growth as new and more powerful telescopes search for molecules. Collaboration spanning several countries is now commonplace, and large-scale international cooperation occurs in the construction of expensive telescopes, such as the Herschel Space Observatory and the Atacama Large Millimeter/



Representation of fullerenes inside a planetary nebula. *[NASA, JPL-Caltech, T. Pyle]*

How to Contribute to the Conference Newspaper

Kaiʻaleleiaka 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 Hawaiʻi 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

submillimeter Array, for which the initial scientific cases were largely driven by astrochemists.

Major aims of the new Commission H2 are to develop close links with related national bodies, such as the Astrochemistry Subdivision of the American Chemical Society and the Astrophysical Chemistry Group of the Royal Chemical Society, as well as to plan for a major IAU Symposium to be held, hopefully, in Chile sometime in 2017. ✿

TOM MILLAR is Professor of Astrophysics at Queen's University Belfast, U.K., former President of IAU Division VI (Interstellar Matter), and incoming President of IAU Commission H2. He has been involved in the study of astrochemistry for more than 40 years.

FOCUS MEETING 21

Astronomers Needed to Save the World from Blinding Itself

By RICHARD GREEN & CONSTANCE WALKER

Rapidly advancing technology threatens to make the glare from powerful LEDs and the radio-frequency transmissions for control and communications ubiquitous. We therefore cannot assume that our current and next-generation telescopes will be automatically blessed with pristine dark skies and radio quiet-zone protection through only the occasional attention of observatory directors. We, as astronomers, have a responsibility to become informed and engaged to assure that our access to the cosmos from the ground is not diminished.

Focus Meeting 21 provides such an opportunity. Commissions 46, Astronomy Education and Development, and 50, Protection of Existing and Potential Observatory Sites, invite you to participate in the remaining sessions of FM 21, Mitigating Threats of Light Pollution & Radio Frequency Interference, today and tomorrow. There will be technical talks on LED technology and spectral energy output, as well as on the pressures facing the protected radio-frequency spectrum and radio-quiet zones.

A number of talks will focus on measurement of artificial sky glow, and many speakers will address efforts for protection of individual observatory sites around the world. Two of the sessions will be held jointly with Focus Meeting 2 to discuss protection of dark skies in relation to UNESCO World Heritage status, both for astronomical sites in Chile and in other World Heritage locations. There will also be sessions devoted to raising public awareness of the environmental damage of light pollution. We intend to close with a discussion to update the Commission 50 action plan on implementing the IAU Resolution on the world's right to starlight.

During this International Year of Light 2015 (IYL 2015), astronomers' voices must be heard to make the case for quality lighting and sensible radio-spectrum management to preserve our view of the cosmos. As an international community of researchers,

Focus Meeting 21:
Mitigating Threats of Light Pollution & Radio Frequency Interference

Start date	Tuesday, 11 August
End date	Thursday, 13 August
Oral sessions	Room 316B, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Coordinating Division	Division B: Facilities, Technologies and Data Science

For details on presenters, topics, and times see the online program or mobile app.

Star trails over Kitt Peak National Observatory in Arizona. *[James Lowenthal]*

we can leverage the respect and admiration of the public for our discoveries to make an impact on critical policy. We look forward to seeing you at FM 21. ✿


RICHARD GREEN is Assistant Director of Steward Observatory at the University of Arizona, incoming President of Commission B7, and Chair of the IAU Cosmic Light Working Group. He has served as Director of Kitt Peak National Observatory and the Large Binocular Telescope Observatory. CONNIE WALKER is the incoming Vice-President of Commission B7. She works in the Science Education Department at the National Optical Astronomy Observatory in Tucson, Arizona, and serves on the Board of Directors of both the International Dark Sky Association and the Astronomical Society of the Pacific. She is the Director of the GLOBE at Night citizen-science program, which measures night-sky brightness worldwide.

For Your Consideration

Adoption of Resolutions B2 and B3 will minimize confusion among stellar and planetary astronomers.

By ERIC MAMAJEK

Aloha, astronomers! The Inter-Division (A, G) Working Group on Nominal Units for Stellar & Planetary Astronomy has drafted two Resolutions, B2 and B3, for your vote tomorrow at the Business Meeting of the General Assembly II from 4:00 to 6:00 pm in Ballroom B of the Hawai'i Convention Center. The wording of the Resolutions and the adopted values of the units therein are the result of many months of discussion by astronomers from a range of backgrounds and IAU Divisions.

Resolution B2 defines exact SI values for luminosity (in watts) and irradiance (in watts/meter^2) that would set an IAU *absolute* and *apparent bolometric magnitude* scale, respectively. Astronomers have used bolometric magnitudes for at least eight decades, but there has been surprisingly little standardization of the zero points of the bolometric magnitude scales. This has led to different *bolometric correction* (BC) scales, confusion, and unnecessary systematic errors.

References over the past 50 years adopt solar M_{bol} values anywhere between 4.64 and 4.77! This long-standing problem was discussed by Bessell, Castelli & Plez (1998, *A&A* **333**, 231) and Torres (2010, *AJ* **140**, 1158). They found that adopting incompatible combinations of solar absolute bolometric magnitude and bolometric-correction scale can easily lead to systematic errors at the 0.1-magnitude level. Unfortunately, some popular references present incompatible combinations of solar M_{bol} and BC. Resolution B2 connects the stellar bolometric magnitude scale to the solar irradiance scale, which is now absolutely SI calibrated to about 0.03%, but permanently disconnects the scale from the variable Sun (variable at about the 0.1% level).

In the Gaia era, the luminosity estimates for many stars will be dominated no longer by distance uncertainties, but by uncertainties in the bolometric flux and/or apparent bolometric magnitude. Now is an opportune time for standardization of the bolometric magnitude scales so as to reduce systematic errors in the calculation of luminosities and related properties.

IAU members cast their votes on a Resolution at the XXVII General Assembly in Rio de Janeiro, Brazil, in 2009. *[IAU]*

Resolution B3 defines a set of *nominal conversion constants* for stellar and (exo)planetary astronomy. It is common for astronomers to quote stellar and planetary properties (e.g., radii) in units of that parameter for the Sun, Jupiter, or Earth. Some parameters are (or will be) measured so accurately that it may matter which value one adopts for the corresponding solar, Jovian, or terrestrial parameter. Resolution B2 defines exact constants in SI units that are close to the current best estimates to

provide useful rulers for astronomical calculations for the foreseeable future. The constants are rounded to a convenient number of significant figures based on modern uncertainties in the current best estimates. While the estimates of the actual parameters for the Sun and planets will improve and bounce around at the 1- to 2-sigma level in the future, the community will have useful nominal constants to use as rulers. A similar Resolution in 2012 set the astronomical unit to an exact SI length in meters, permanently disconnecting it from improvements in the measured GM value for the Sun.

The members of our Working Group expect that adoption of Resolutions B2 and B3 by the international astronomical community will reduce the incidence of systematic errors and avoid the necessity of recalculating values due to differences in the adopted parameters among different investigators. ✿

ERIC MAMAJEK is chair of the Inter-Division (A, G) Working Group on Nominal Units for Stellar & Planetary Astronomy, and Associate Professor of Physics & Astronomy at the University of Rochester, New York.

IAU XXIX General Assembly Resolutions

The four Resolutions to be considered at the second Business Meeting of the General Assembly on Thursday, 13 August, are available on the conference website. There you'll find brief summaries, a link to a PDF of the complete texts, and two related documents. We encourage all IAU members to review the four Resolutions carefully before coming to Ballroom B at 4:00 pm on Thursday, 13 August, to cast your votes.

— Rick Fienberg, Kaiʻaleleiaka

Revised Working Rules for IAU Divisions

By THIERRY MONTMERLE

The Statutes of the International Astronomical Union (IAU) define the goals and organizational structure of the Union, while the Bye-Laws specify the main tasks of the various bodies of the Union in implementing the provisions of the Statutes. The Working Rules are designed to assist the membership and governing bodies of the Union in carrying out these tasks in an appropriate and effective manner.

The IAU Executive Committee updates the Working Rules as necessary to reflect current procedures and to optimize the services of the IAU to its membership. In the wake of the recently enacted Division and Commission Reform, the Executive Committee has revised the Working Rules for Divisions as follows. (See page 32 for the revised Working Rules for Commissions.)

New text is in blue type. ~~Strikethrough~~ (whether ~~blue~~ or ~~black~~) indicates deleted text. *For clarity, in case of significant modifications to a paragraph, the original paragraph from the Working Rules follows in italics.*

IX. TERMS OF REFERENCE FOR DIVISIONS

The Divisions are the scientific backbone of the IAU. They have a main responsibility for monitoring the scientific and international development of astronomy within their subject areas, and for ensuring that the IAU will address the most significant issues of the time with maximum foresight, enterprising spirit, and scientific judgment. To fulfill this role IAU Divisions should maintain a balance between innovation and continuity. The following standard Terms of Reference have been drafted to facilitate that process, within the rules laid down in the Statutes § X and the Bye-Laws § V.

37. As specified in Bye-Law 18, the scientific affairs of the Division are conducted by a Division Steering Committee ~~of up to 12 members of the Division~~, headed by the Division President, Vice-President, and Secretary. In addition, the Division Steering Committee is composed of the Presidents of their affiliated Commissions or their representatives (in the case of "Cross-Division" status of the Commission) (see $ 41b), and 6 at-large members elected by the Division membership. ~~Thus,~~ All significant decisions of the Division require the approval of the Steering Committee, and the President and Vice-President are responsible for organizing the work of the Committee so that its members are consulted in a timely manner. The Division Secretary is designated among the members of the Division Steering Committee (see §39e), but cannot be a Commission President. Contact information for the members of the Steering Committee shall be maintained at the Division web site.

Unless agreed otherwise by the Executive Committee on a case-by-case basis, the President of a Division cannot be President of another Division or of a Commission, or be Chair of a Working Group.

37. As specified in Bye-Law 18, the scientific affairs of the Division are conducted by an Organizing Committee of up to 12 members

At sunset on Maunakea, Hawai'i Island, Babak Tafreshi captured this telephoto view of the neighboring island of Maui. The summit of Haleakalā, home to several astronomical observatories, reaches above the clouds. *[Babak Tafreshi/NAOJ]*

of the Division, headed by the Division President, Vice-President, and Secretary. Thus, all significant decisions of the Division require the approval of the Organizing Committee, and the President and Vice-President are responsible for organizing the work of the Committee so that its members are consulted in a timely manner. Contact information for the members of the Organizing Committee shall be maintained at the Division web site.

Unless agreed otherwise by the Executive Committee on a case by case basis, the President of a Division cannot be President of another Division or of a Commission, or be Chair of a Working Group.

38. Individual Members of the Union can freely join or leave the Division(s) of their choice, but must belong to at least one Division. If they want to change their affiliation, members of a Division must inform immediately the Division Secretary, and notify the IAU Secretariat so that the membership database is kept up to date at all times.

38. Individual Members of the Union are admitted to membership in a Division by its Organizing Committee (cf. Bye-Laws § 18). Individual Members active within the field of activity of the Division and interested in contributing to its development should contact the Division Secretary, who will consult the Organizing Committee on the admission of the candidates.

38.a. The membership of the Division is regularly updated by the IAU Secretariat, and can be exported from the IAU membership database for the purposes of communication within the Division. Alternatively, the IAU Secretariat may provide help in disseminating information among Division members (via e-newsletters, etc.).

38.a. The Division Secretary shall maintain a list of Division members for ready consultation by the community, including their Commission memberships if any. Updates to the list shall be provided to the IAU Secretariat on a running basis.

~~38.b. Members may resign from a Division by so informing the Division Secretary.~~

~~38.c. In the event of a Division being newly formed, Individual Members can themselves elect to join the Division. Before the General Assembly following that at which the new Division was created its Organising Committee shall scrutinise and confirm the Division membership.~~

39. The effectiveness of the Division relies strongly on the scientific stature and dedication of its President and Vice-President to the mission of the Division. The Executive Committee, in proposing new Division Presidents and Vice-Presidents for election by the General Assembly, will rely heavily on the recommendations of the Steering Committee of the Division. In order to prepare a strong slate of candidates for these positions, and for the succession on the Steering Committee itself, the following procedures shall normally apply:

39.a. Candidates are proposed and selected from the membership of the Division on the basis of their qualifications, experience, and stature in the fields covered by the Division. In addition, the Steering Committees should have proper gender balance and broad geographical representation.

39.b. At least six months before a General Assembly, the outgoing Steering Committee submits to the membership of the Division a list of candidates for President, Vice-President (for which there should be the names of at least two persons willing to serve), and for the incoming Steering Committee, according to the composition defined in §37 ~~and heads of Program Groups for the next triennium.~~ The outgoing Steering Committee devises the procedure by which the requisite number of candidates is elected by the membership, and

requests nominations from the entire membership in preparing this list or may call for self-nomination. It is desirable that more names are proposed than there are eligible positions to be filled on the new Steering Committee. A vote is then organized, normally electronically, among all the members for the above offices. The results of the elections are reported to the General Secretary for information at least three months before the General Assembly.

Electronic voting may be arranged by the Secretariat.

39.b. At least six months before a General Assembly, the Steering Committee submits to the membership of the Division a list of candidates for President, Vice-President (for which there should be at least two persons willing to serve), Secretary, and the Steering Committee for the next triennium. The Steering Committee requests nominations from the entire membership in preparing this list, and then conducts a vote, normally electronically, among all Division members for the above offices, the results of which are reported to the General Secretary at least three months before the General Assembly. The Vice-President

[IAU/B. Tafreshi, twanight.org]

is normally nominated to succeed the President. The outgoing President participates in the deliberations of the new Steering Committee in an advisory capacity.

39.c. The Vice-President is normally nominated to succeed the President. The outgoing President participates in the deliberations of the new Steering Committee in an advisory capacity. Members of the Steering Committee normally serve a maximum of two terms, unless elected Vice-President of the Commission. Presidents normally serve for only one term.

39.c. It is desirable that more names are proposed than there are eligible positions to be filled on the new Steering Committee. The outgoing Steering Committee devises the procedure by which the requisite number of candidates is elected by the membership. The resulting list is communicated to the General Secretary at least two months before the General Assembly. The General Secretary may allow any outstanding issues to be resolved remotely or at a business meeting of the Division during the General Assembly. If for any reason the Steering Committee has not been able to arrange for the election of new officers and a Steering Committee by two months before the GA, the EC will nominate a VP and Steering Committee at its first General Assembly meeting.

39.d. A member of the Steering Committee normally serves a maximum of two terms, unless elected Vice-President of the Division in her/his second term. ~~Presidents may serve for only one term.~~

39.e. The Steering Committee decides on the procedures for designating the Division Secretary, who is responsible for maintaining the Division web site and for providing relevant information to the IAU Secretariat, such as records of the business of the Division, and procedures for conducting its business by physical meetings or remotely.

39.e. The Organizing Committee decides on the procedures for designating the Division Secretary, who maintains the web site, records of the business and membership of the Division, and other rules for conducting its business by physical meetings or by correspondence.

39.f. In the event of a newly formed Division, paragraphs 39a — 39c do not apply. The Executive Committee shall consult the Steering Committees of the relevant predecessor Divisions on possible candidates for President and Vice-President of the new Division for the next triennium. The Executive Committee shall select the names to be proposed to the General Assembly for election.

39.g. As soon as possible after their election at a General Assembly, the President and Vice-President of the new Division shall request nominations to the Steering Committee from the membership of the Division and then conduct a vote among Division members, the results of which are reported to the General Secretary. The Steering Committee designates a Secretary from its membership.

40. A key responsibility of the Steering Committee is to maintain an internal organization of Commissions and Working Groups in the Division which is conducive to the fulfillment of its mission. The Steering Committee shall take the following steps to accomplish this task in a timely and effective manner:

40.a. Within the first year after a General Assembly — with a business meeting of the Division at the General Assembly itself as a natural starting point — the Steering Committee shall discuss with its Commissions, and within the Steering Committee itself, if changes in its Commission and Working Group structure may enable it to accomplish its mission better in the future. As a rule, Working Groups may be created (following the rules in Bye-Law 21 and Bye-Law 23) at any time for new activities that are either of a known, finite duration or are exploratory in nature. If experi-

ence, possibly from an existing Working Group, indicates that a major section of the Division's activities require a coordinating body for a longer period (a decade or more), the creation of a new Commission may be in order (Statutes, § 22), and a corresponding Call for Proposals for Commissions considered.

40.b. Whenever the Steering Committee is satisfied that the creation of a new Division Working Group or Commission is well motivated, it may take immediate action as specified in Bye-Law 21 or Bye-Law 23, independently of General Assemblies. However, in preparation for General Assemblies, the Steering Committee must submit for approval its complete proposal for the continuation, discontinuation, or merger of its Commissions and Working Groups to the General Secretary at least two months in advance of the Executive Committee meeting being held before the relevant General Assembly.

40.b. Whenever the Steering Committee is satisfied that the creation of a new Working Group or Commission is well motivated, it may take immediate action as specified in Bye-Law 21 or Bye-Law 23. In any case, the Steering Committee submits its complete proposal for the continuation, discontinuation, or merger of its Commissions and Working Groups to the General Secretary at least three months before the next General Assembly.

40.c. The President and Steering Committee maintain frequent contacts with the other IAU Divisions to ensure that any newly emerging or interdisciplinary matters are addressed appropriately and effectively. ✿

THIERRY MONTMERLE (Institut d'Astrophysique de Paris, France) is the outgoing General Secretary of the IAU. He has been actively involved in promoting interactions between astronomers and the public, in particular in the area of World Heritage and in celebration of the 2015 International Year of Light.

Revised Working Rules for IAU Commissions

By THIERRY MONTMERLE

The Statutes of the International Astronomical Union (IAU) define the goals and organizational structure of the Union, while the Bye-Laws specify the main tasks of the various bodies of the Union in implementing the provisions of the Statutes. The Working Rules are designed to assist the membership and governing bodies of the Union in carrying out these tasks in an appropriate and effective manner.

The IAU Executive Committee updates the Working Rules as necessary to reflect current procedures and to optimize the services of the IAU to its membership. In the wake of the recently enacted Division and Commission Reform, the Executive Committee has revised the Working Rules for Commissions as follows. (See page 27 for the revised Working Rules for Divisions.)

New text is in blue type. ~~Strikethrough~~ (whether ~~blue~~ or ~~black~~) indicates deleted text. *For clarity, in case of significant modifications to a paragraph, the original paragraph from the Working Rules follows in italics.*

X. TERMS OF REFERENCE FOR COMMISSIONS

The role of the Commissions is to organize the work of the Union in specialized subsets of the fields of their parent Division(s), when the corresponding activity is judged to be of considerable significance over times of a decade or more. Thus, the Executive

Committee, upon the recommendation of one or more Divisions, may decide to issue a public Call for Proposals for Commissions, when fields emerge that are clearly in sustained long-term development and where the Union may play a significant role in promoting this development at the international level (Statutes, § 22). Similarly, Commissions may be discontinued by the Executive Committee upon the recommendation of the parent Division(s) when their work can be accomplished effectively by the parent Division. In keeping with the many-sided activities of the Union, Commissions may have purely scientific as well as more organizational and/or interdisciplinary fields. They will normally belong and report to one of the IAU Divisions, but may be common to two or more Divisions (see Bye-Laws, § 23). The Commissions within a Division are not expected to cover all the scientific areas of the Division, therefore some specific areas may not be covered by Commissions for some period of time.

A Division may temporarily have no Commission.

The following rules apply if a Division has one or more Commissions.

The role of the Commissions is to organize the work of the Union in specialized subsets of the fields of their parent Division(s), when the corresponding activity is judged to be of considerable significance over times of a decade or more. Thus, new Commissions may be created by the Executive Committee with the agreement of all the Divisions when fields emerge that are clearly in sustained long-term development and where the Union may play a significant role in promoting this development at the international level. Similarly, Commissions may be discontinued by the Executive Committee upon the recommendation of the parent Division when their work can be accomplished effectively by the parent Division. In keeping with the many-sided activities of the Union, Commissions may have purely scientific as well as more organizational and/or interdisciplinary fields. They will normally belong and report to one of the IAU Divisions, but may be common to two or more Divisions. The following rules apply if

With a digital camera and wide-angle lens, Fred Bruenjes recorded a series of 30-second exposures spanning about six hours on the night of 11-12 August 2004 to produce this dramatic composite of the Perseid meteor shower. *[Fred Bruenjes, NASA]*

a Division has more than one Commission.

41. The activities of a Commission are directed by an Organizing Committee of 4-8 members of the Commission, headed by a Commission President and Vice-President (cf. Bye-Laws § 22). A member of the Organizing Committee normally serves a maximum of two terms, unless elected Vice-President of the Commission in her/his second term. Presidents normally serve for only one term. All members of the Organizing Committee are expected to be active in this task, and are to be consulted on all significant actions of the Commission. The Organizing Committee designates a Commission Secretary who maintains the records of ~~the membership and~~ activities of the Commission in co-operation with the Division Secretary and the IAU Secretariat. Contact information for the members of the Organizing Committee shall be maintained at the IAU Secretariat.

Unless agreed otherwise by the Executive Committee on a case-by-case basis, the President of a Commission cannot be President of a Division or of another Commission, or be Chair of a Working Group.

41a. Commission Presidents, or their representatives, are ex-officio members of the Steering Committees of the Divisions to which they are affiliated (Working Rules, § 37), as specified in the next section.

41b. In their relations with Divisions, Commissions fall in three categories:

(a) Regular Commissions are affiliated to one "parent" Division only. The Commission President is a member of the Steering Committee of its parent Division.

(b) Inter-Division Commissions are affiliated to more than one Division, but one is the "primary" Division. The Commission President is a member of the Steering Committee of its primary Division.

(c) Cross-Division Commissions are affiliated to more than one Division on a parity basis. The Commission Organizing Committee will send one representative as ex-officio member in each Steering Committee of its parent Divisions.

No §41a and 41b in the current Working Rules.

42. Individual Members of the Union may join or leave a Commission at any time, while belonging to no more than three Commissions. They should notify immediately the relevant Commission Secretary and the IAU Secretariat. The Commission Secretary should keep at all times an up-to-date list of the Commission members, in coordination with the IAU Secretariat. If a change in Commission affiliation implies a change of Division affiliation, this change must also be notified to the relevant Division Secretaries, and to the IAU Secretariat, to keep the membership database updated at all times.

42. Individual Members of the Union, who are active in the field of the Commission and wish to contribute to its progress, are admitted as members of the Commission by the Organizing Committee. Interested Members should contact the Commission Secretary, who will bring the request before the Organizing Committee for decision. Members may resign from the Commission by notifying the Commission Secretary. Before each General Assembly, the Organizing Committee may also decide to terminate the Commission membership of persons who have not been active in the work of the Commission; the individuals concerned shall be informed of such planned action before it is put into effect. The Commission Secretary will report all changes in the Commission membership to the Division Secretary and the IAU Secretariat.

43.a. At least six months before a General Assembly, the outgoing Organizing Committee submits to the membership of the Commission a list of candidates for President, Vice-President (for which there should be the names of at least two persons willing to serve), and for the incoming Organizing Committee, according to the composition defined in Bye-Laws §22a. The outgoing Organizing Committee devises the procedure by which the requisite number of candidates is elected by the membership, and requests nominations from the entire membership in preparing this list or may call for self-nominations. It is desirable that more names are proposed than there are eligible positions to be filled on the new Organizing Committee. A vote is then organized, normally electronically, among all the members for the above offices. The results of the elections are reported to the General Secretary for information at least three months before the General Assembly.

Electronic voting may be arranged by the Secretariat.

43.b.The Vice-President is normally nominated to succeed the President. The outgoing President participates in the deliberations of the new Organizing Committee in an advisory capacity. Members of the Organizing Committee normally serve a maximum of two terms, unless elected Vice-President of the Commission. Presidents normally serve for only one term.

43. At least six months before a General Assembly, the Organizing Committee submits to the membership of the Commission a list of candidates for President, Vice-President (for which there should be the names of two persons willing to serve), and for the Organizing Committee, and heads of Program Groups for the next triennium. The Organizing Committee requests nominations from the entire membership in preparing this list, and then conducts a vote, normally electronically, among all the members for the above offices, the results of which are reported to the General Secretary at least three months before the General Assembly. The Vice-President is normally nominated to succeed the President. The outgoing President participates in the deliberations of the new Organizing Committee in an advisory capacity. The outgoing Organizing Committee devises the procedure by which the requisite number of candidates is elected by the membership. The resulting list is submitted to the Organizing Committee of the parent Division(s) for approval before the end of the General Assembly. Members of the Organizing Committee normally serve a maximum of two terms, unless elected Vice-President of the Commission. Presidents may serve for only one term.

44. At least six months before each General Assembly, the Organizing Committee shall submit to the parent Division(s) a report on its activities during the past triennium, with its recommendation as to whether the Commission should be continued for another three years, or merged with one or more other Commissions, or discontinued. If a continuation is proposed, a plan for the activities of the next triennium should be presented, including those of any Working Groups which the Commission proposes to maintain during that period.

45. The Organizing Committee decides its own rules for the conduct of its business by physical meetings or (electronic) correspondence. Such rules require approval by the Steering Committee of the parent Division(s).

~~46. The procedural rules applying to the establishment of a new Division shall also apply to the establishment of a new Commission. Where there is no 'relevant predecessor Commission(s)' the parent Division(s) shall submit to the potential membership of the new Commission a list of candidates for President, Vice-President and Organising Committee for the next triennium.~~ ✿

THIERRY MONTMERLE (Institut d'Astrophysique de Paris, France) is the outgoing General Secretary of the IAU. He spent most of his scientific career at the Saclay Center for Nuclear Studies near Paris.

Kai'aleleiaka — THE MILKY WAY

Issue 9 — 13 August 2015

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INVITED DISCOURSE 4

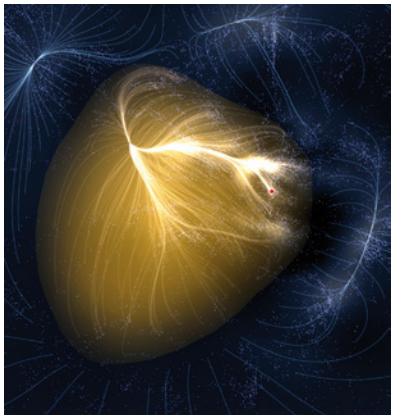
The Laniakea Supercluster of Galaxies

By BRENT TULLY

Astronomy has a special fascination for people. Our introduction of the name Laniakea Supercluster of Galaxies (published in *Nature*) for the structure that we live in, has generated a wonderful example that merits reflection.

Any professional astronomer who has spent time with the amateur astronomy community is familiar with their enthusiasm. We can be amazed at their willingness to endure cold nights to repeatedly observe familiar objects in our dark sky. This fascination for dark skies is primeval; our ancestors became acquainted with patterns in the fields of stars. Names were given to the patterns as well as to individual objects — it is part of familiarization.

People have names, and these names are an important part of how we relate to each other. Pets get names, as distinct from animals we eat. Naming is more than superficial; it is part of the process toward physical comprehension. A named entity acquires form in our minds. A named object may be categorized and distinguished. The act of naming invites an appreciation for complexity.



This visualization of a slice of the Laniakea supercluster shows individual galaxies as white dots and their movement by white threads. The region contains 100 million billion stars. *[Mark A. Garlick]*

We humans are still only taking our first baby steps in our exploration of the universe. Through remarkable efforts we have left footprints and tire tracks on other worlds. Our robots' eyes return up-close images of places throughout our solar system. Looking further, we know that other solar systems are totally common, though rich in individual complexity. We appreciate that just within our Milky Way galaxy, the planet count could reach a trillion.

How ignorant we are! What's happening in all those other galaxies? For the moment our questions are simpler. Why are galaxies big and small, old and young, organized and shredded, mostly in packs but sometimes living as hermits? Even with our provisional forays, we can identify structures at high redshift. We speak of emergent clusters, filaments, sheets, and voids. The simulations look beautiful. It is too bad that our real world renditions of cosmic structure don't look as great.

But we are doing better. We astronomers are explorers. We report back to the public what we find. That picture is not the one given by Hollywood. Our story purports to be factual, and to varying degrees we are successful at being heard on the street. People want to know

Kaiʻaleleiaka THE MILKY WAY

EDITORIAL

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Kaiʻaleleiaka (The Milky Way) is the official newspaper of the XXIX General Assembly of the International Astronomical Union, 3-14 August 2015, Honolulu, Hawaiʻi. 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.

Invited Discourse 4: The Laniakea Supercluster of Galaxies	
Speaker	Brent Tully (Institute for Astronomy, University of Hawai‘i)
Date	Thursday, 13 August
Time	6:00 to 6:45 pm
Location	Ballroom B, Hawai‘i Convention Center

where we live because it is part of the larger question of why.

The very nice video created by the people at *Nature* magazine synthesized our article on Laniakea in a way that has attracted more than three million viewers. Among the many messages afterward was one from a young boy who said that what he learned made him so happy that he cried. ✿

BRENT TULLY has worked as an astronomer at the Institute for Astronomy, University of Hawai‘i, since 1975. He specializes in observational extragalactic astronomy, or what he calls “cosmology up close.”

INVITED DISCOURSE 5

A Unique Probe of Molecular Gas in the Milky Way and Beyond

By THOMAS R. GEBALLE

Research in astronomy includes events encompassing a vast range of time intervals, from those occurring during incomprehensibly small fractions of a second to those taking billions of years and more. It also encompasses phenomena critical to the characteristics of the universe on a vast range of physical sizes, from the scale of the entire universe down to molecules, atoms, and subatomic particles.

In the field of interstellar gas phase chemistry, a critical role is played by the triatomic hydrogen ion, H_3^+ — the smallest and simplest polyatomic molecule. It is fair to say that H_3^+ (three protons and two electrons) is the starting point of reaction chains that result in the production of many of the molecular species observed in interstellar clouds.

In my talk, I will discuss the scientific history of this fascinating ion, including: a discussion of the discovery of H_3^+ in the laboratory over a century ago; our appreciation of its critical role in gas phase chemistry — which occurred long before it had been found in space and, in fact, before its spectrum had been observed in the laboratory; and its discovery in space; our realization that measurements of H_3^+ reveal crucial information about interstellar environments that cannot be easily learned in other ways.

I will also discuss key roles played by H_3^+ in interstellar clouds. For instance, it is created wherever molecular hydrogen and cosmic rays

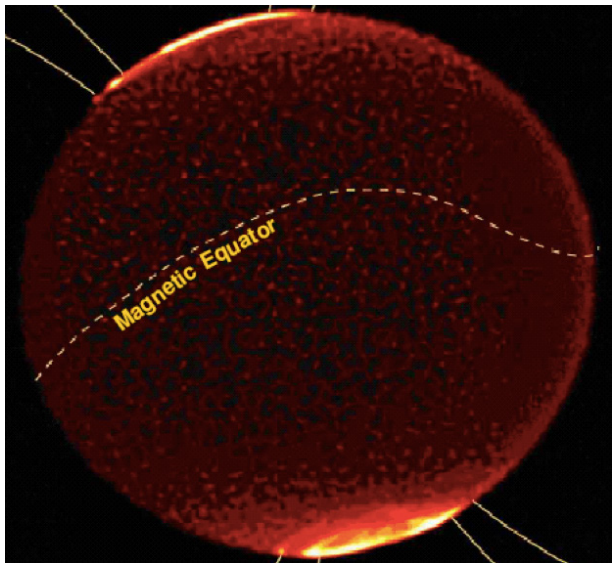


Image of Jupiter at 3.4 microns. Bright auroral line emission from H_3^+ is seen against the planetary disk, which is dark due to absorption of incident sunlight by methane. Magnetic field lines are shown. *[NASA IRTF, NSFCam]*

Invited Discourse 5 — Spectroscopy of H_3^+: A Unique Probe of Molecular Gas in the Milky Way and Beyond	
Speaker	Thomas R. Geballe (Gemini Observatory)
Date	Thursday, 13 August
Time	6:45 to 7:30 pm
Location	Ballroom B, Hawai'i Convention Center

are both present. In other words, it is created in both dense *and* diffuse clouds. it is also intrinsically stabile; H_3^+ is as tightly bound as molecular hydrogen. Further, it is extreme reactive; H_3^+ loves to give its extra proton to almost any atom or molecule it encounters. Cosmic H_3^+ also has a distinguishing ion-molecule chemistry feature: unlike here on Earth, there is no energy barrier to prevent H_3^+ from reacting with other species it encounters.

Other topics of interest related to H_3^+ that I will be discussing are that spectroscopy of H_3^+ is providing constraints on the spectrum of low energy cosmic rays in the galaxy. This has resulted in the discovery of an important, but previously unrecognized, gaseous environment at the center of the Milky Way. Spectroscopy of H_3^+ is also beginning to provide unique information on interstellar gas in external galaxies.

Additional H_3^+ topics I will discuss include findings that show H_3^+ is the dominant infrared line emitter in the aurorae of three of the four gas giant planets in the solar system. H_3^+ is also expected to produce bright line emission in the upper atmospheres of giant exoplanets located close to their stars. On a more cosmic scale, H_3^+ may be important in the formation of stars in the early, metal-free universe. Thus, future astronomical research utilizing the unique properties of this simple molecular ion is destined to contribute significantly to our knowledge in a wide range of areas. ✿

TOM GEBALLE is an astronomer at the Gemini Observatory. Before joining Gemini, he had been Astronomer-in-Charge, Associate Director, and Head of Operations at the United Kingdom Infrared Telescope.

The IAU Executive Committee for 2015–2018

By RICK FIENBERG, *Kai'aleleiaka*

The IAU Executive Committee consists of the President, President-Elect, six Vice-Presidents, the General Secretary, and the Assistant General Secretary, all of whom are elected by the General Assembly on the recommendation of the Special Nominating Committee. The Executive Committee is supported by two Advisors: the Past President and Past General Secretary.

The Officers of the Union are the President, President-Elect, General Secretary, and Assistant General Secretary. They decide short-term policy issues within the general policies of the Union as decided by the General Assembly and interpreted by the Executive Committee.

At the second Business Meeting of the XXIX General Assembly on Thursday, 13 August, representatives of the National Members will vote to elect the following slate of new Officers for the 2015–2018 triennium, as reported at the first Business Meeting last Tuesday:

- President-Elect: **Ewine F. van Dishoeck** (Netherlands)
- Assistant General Secretary: **Maria Teresa V. T. Lago** (Portugal)
- Vice-Presidents: **Debra M. Elmegreen** (USA), **Ajit K. Kembhavi** (India) & **Boris M. Shustov** (Russian Federation)

Here are the other changes that will occur on the Executive Committee:

- **Silvia Torres-Peimbert** (Mexico) will become President, suc-

ceeding **Norio Kaifu** (Japan), who will become Past President (Advisor).

- **Piero Benvenuti** (Italy) will become General Secretary, succeeding **Thierry Montmerle** (France), who will become Past General Secretary (Advisor).
- **Renée C. Kraan-Korteweg** (South Africa), **Xiaowei Liu** (China), and **Dina K. Prialnik** (Israel) will continue as Vice-Presidents.
- Current Past President **Robert Williams** (USA), current Past General Secretary **Ian F. Corbett** (United Kingdom), and current Advisor **George K. Miley** will rotate off the Executive Committee, as will current Vice-Presidents **Matthew Colless** (Australia), **Jan Palouš** (Czech Republic), and **Marta G. Rovira** (Argentina).

We owe a huge debt of gratitude to all the officers who have served the IAU during the triennium just ending as well as to those who will continue to serve, or commence their service, during the triennium upon which we now embark. Thanks, too, go to the members of the Special Nominating Committee, who have, once again, come up with a slate of extraordinarily capable and dedicated new Officers. ✿


Ewine F. van Dishoeck


Maria Teresa V. T. Lago


Debra M. Elmegreen


Ajit K. Kembhavi


Boris M. Shustov


Silvia Torres-Peimbert


Norio Kaifu


Piero Benvenuti


Thierry Montmerle


Renée C. Kraan-Korteweg


Xiaowei Liu


Dina K. Prialnik


Robert Williams


Ian F. Corbett


George K. Miley


Matthew Colless


Jan Palouš


Marta G. Rovira

The Role of the IAU in the Development of Worldwide Astronomy

Thoughts from the President-Elect.

By SILVIA TORRES-PEIMBERT

In 2019 the IAU will celebrate its 100th anniversary! The IAU is very special and different from other international scientific organizations in that it is composed primarily of individual members rather than federations of national disciplinary societies. The IAU currently has 9,251 individual members, with 11,269 members in total. This total number will increase to 12,458 by the conclusion of this IAU General Assembly.

The IAU has always contributed significantly to the overall development of astronomy worldwide: It has provided a forum to exchange ideas and to develop joint international ventures in research and instrumentation; established multiple ways for astronomers in different parts of the world to collaborate; and simplified communication within the community by adopting many astronomically-related definitions during the General Assemblies, such as boundaries of the constellations, time determinations, astronomical standards, and the naming of new

objects and features.

The backbone of the IAU is its Divisions, Commissions, and Working Groups. The recent restructuring of these bodies was necessary to keep up with advances of our science. In the following triennium we will need to adjust to the new distribution of Commissions and Working Groups to enhance the astronomical activities of our organization.

Customarily the IAU meets in General Assemblies every three years. Additionally the IAU has offered a very successful variety of meetings based on specific astronomy themes, including 320 symposia, 200 colloquia, and 41 regional meetings around the globe. The scientific organizing committees and invited speakers of these meetings have had broad international representation. Symposia sites have been widely distributed around the globe, and this practice of international inclusion will continue in the future. For example, the 2016 IAU symposia will take place in Spain, Australia, Slovenia, Italy, Germany, Colombia, China, Brazil, New Zealand, and France. The proceedings of all the IAU meetings have been seminal publications for the development of astronomy.

The IAU has triggered many multinational adventures in modern astronomical activities. For example, it provided the framework for creating the Latin American Regional IAU Meetings (LARIM), which have led to many collaborations in different areas of astronomy. Since 1978 there have been 14 LARIM, with host countries including Argentina, Brazil, Chile, Mexico, Venezuela, and Uruguay. LARIM 2016 will take place in Colombia, South America — a country that we will welcome as an IAU member at the end of this General Assembly.

Educational activities are also essential to the IAU. The IAU International Schools for Young Astronomers (ISYA) was established in 1967 and now has an office in Oslo, Norway. To date, there have been 36 ISYAs held all over the world. The

Fond Memories of Past General Assemblies

I still fondly remember the first IAU General Assembly that I attended. It was during the XIV General Assembly in Brighton, U.K., in 1970, where I met Martin Schwarzschild for the second time. He gave a very exciting lecture on stellar evolution in a session organized by Commission 35, Stellar Constitution.

Through the years, I have been very excited to attend subsequent General Assemblies in different places around the world. For each one I have a special memory that I cherish. At the XVIII General Assembly in 1982 in Patras, Greece, I recall hearing Yakov Zel'dovich deliver his invited talk, "Remarks on the Structure of the Universe." I also remember my unhappiness for trying to attend simultaneous sessions of my academic interest at the XVI General Assembly in 1976 in Grenoble, France. Since then, I have become more composed in accepting the inevitable: I cannot be present at several simultaneous sessions. In any case, on that occasion an IAU Resolution on basic principles for planetary-system nomenclature was adopted, including that "nomenclature is a tool, and the first consideration shall be to make it simple, clear, and unambiguous." At the XXI General Assembly in 1991 in Buenos Aires, Argentina, the first Resolutions were accepted regarding reference systems and time scales related to general relativity. I also recall Blair Savage presenting the first results on the unexpected (at least to me) ultraviolet absorption lines of the hot, low-density galactic corona at the XVII General Assembly in 1979 in Montreal, Canada.

A performance of the Chinese Long Ribbon Dance during the Opening Ceremony of the XXVIII IAU General Assembly in 2012 in Beijing, China. *[IAU, CNCC]*

The core of General Assembly activities are the scientific and organizational aspects; these are complemented by the interaction with old friends and new acquaintances, as well as by the beauty of the different locations. For example, attending the General Assemblies enabled me to have exciting visits to the various gardens in Nara, Japan; the Beijing Ancient Observatory in China; the Oracle at Delphi in Greece, close to Patras; and, of course, the natural beauty of O'ahu. All of these additional attractions enhance the impact of all IAU General Assemblies.

International Year of Astronomy 2009 was an important stimulus for the education activities of the IAU. Thus the IAU Astronomy for Development Strategic Plan 2010-2020 was established, and this project gave rise to the dynamic IAU Office of Astronomy for Development (OAD) in Cape Town, South Africa. The IAU OAD has sponsored many noteworthy astronomical activities. Similarly, the IAU Office for Astronomy Outreach (OAO), in Tokyo, Japan, is carrying out important work in establishing contacts throughout the community of amateur astronomers.

Throughout its rich history, the role of the IAU has been outstanding in the development of worldwide astronomy, and our goal is to continue along this path. ✿

SILVIA TORRES-PEIMBERT is President-Elect of the IAU. Additionally, she is a member and former Director of the Astronomy Institute of the National Autonomous University of Mexico (UNAM). She has received the highest honors from UNAM and from the Mexican Government, was honored with the 2011 L'Oréal-UNESCO Award for Women in Science, and received the American Physical Society's 2012 Hans A. Bethe Prize jointly with Manuel Peimbert.

FOCUS MEETING 20

Developments in the Office of Astronomy for Development

By TIBISAY SANKATSING NAVA & RAMASAMY VENUGOPAL

A lot has happened since work at the IAU Office of Astronomy for Development (OAD) first began in March 2011, and the IAU General Assembly presents a wonderful opportunity to share our highlights with the astronomy community. But before we get down to the details, it is worthwhile giving a brief overview of what the OAD is about.

Astronomy combines science and technology with inspiration and excitement. In this capacity it can play a role in facilitating education and human capital development, as is described in the IAU Strategic Plan. The skills related to the field of astronomy can also be used to further sustainable development throughout the world. As a central part of the Strategic Plan, the OAD aims to mobilize the human and financial resources necessary in order to realize the field's scientific, technological, and cultural benefits to society.

The OAD is tasked with initiating, supporting, and funding programs in three core areas: universities and research, children and schools, and public outreach. in the past three years, 68 projects have been funded by the OAD and implemented around the world. The call for proposals for this year's funding is open to submissions until 15 September.

A single international office cannot sufficiently understand the local needs in all regions of the world. It is therefore extremely important for the OAD to have regional support from representatives who understand the local situation. With this in mind, the OAD established and coordinates Regional Offices (ROADs) and Language Expertise Centers (LOADs) across the world. ROADs are established within host institutions and employ a full time coordinator with a focus on activities in a specific geographic region. LOADs have a similar structure, but with a focus on a particular language or cultural region. As of July 2015, eight ROADs (East Asia, South East Asia, East Africa, Southern Africa, West

Focus Meeting 20: Astronomy for Development	
Start date	Thursday, 13 August
End date	Friday, 14 August
Oral sessions	Room 316B, Hawai'i Convention Center
Posters	Exhibit Hall 1, Hawai'i Convention Center
Coordinating Divisions	Division C: Education, Outreach and Heritage
For details on presenters, topics, and times see the online program or mobile app.	

Africa, the Andean Region, the South-West Asian, and Arab), and three LOADs (Chinese, Portuguese, and Arabic) have been established.

The OAD has recently launched the OAD Mentorship Program to help connect mentors and mentees, either in the same country or across the world. Mentors and mentees will be able to sign up online and specify their expectations and availability. The program will also provide participants with training materials and mentoring tools.

Today and tomorrow at the IAU General Assembly, the OAD will host Focus Meeting 20, Astronomy for Development, which will focus on the global developmental impact that all aspects related to astronomy can deliver. An important part of FM 20 is the "unconference" session. We are still collecting potential topics for this session at the OAD booth (329) in the Exhibit Hall — please stop by and contribute your ideas.

The map in our booth shows the locations of all of the OAD-funded projects and ROADs, as well as the national contacts and astronomy club contacts collected by the IAU Office for Astronomy Outreach. There's also a vision board where you can share your ideas for astronomy outreach and development (and see what others find important). ✿


TIBISAY SANKATSING NAVA is a Visiting Fellow at the OAD. She is also Project Manager for the Netherlands of Universe Awareness.
RAMASAMY VENUGOPAL, a visiting fellow at the OAD, recently completed his master's degree in space studies at the International Space University in France.

Lilly Bell or Herschel? Appin or Yamatanoorochi?

Vote for your favorite names for 20 exoplanets in the NameExoWorlds contest.

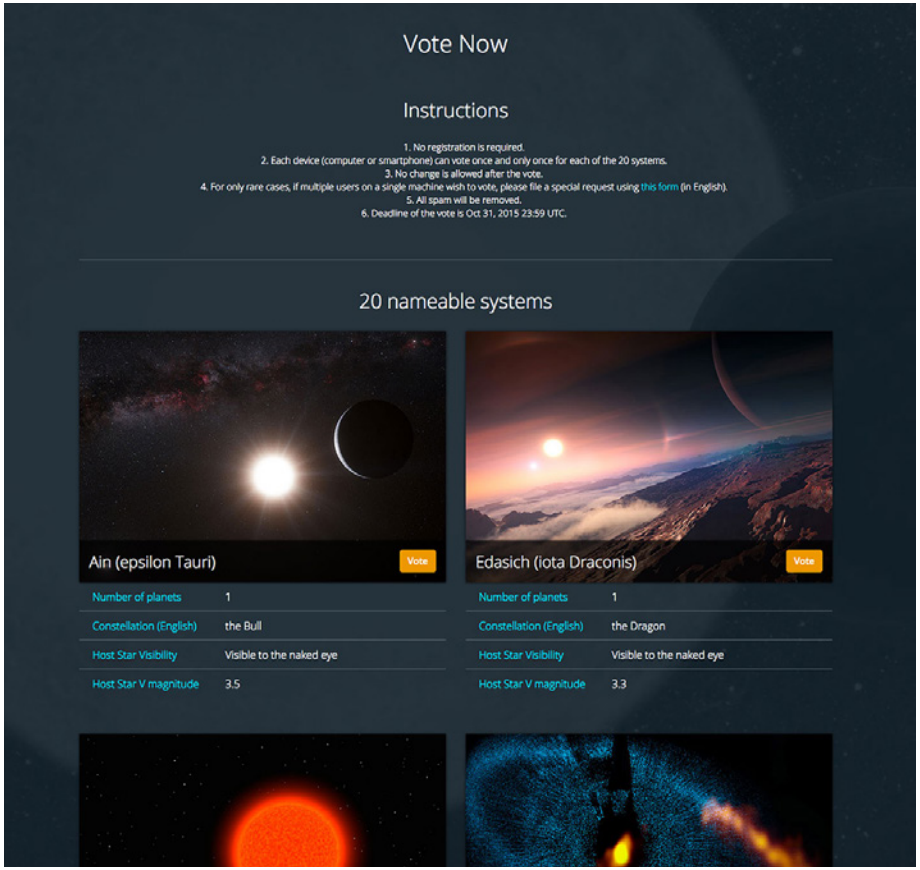
By IRIS NIJMAN, *Kai'aleleiaka*

Are you ready to make history? On Tuesday, 11 August, the IAU opened the online contest NameExoWorlds: the first-ever opportunity for the public to decide the names of planetary systems.

The IAU is the authority responsible for assigning official names to celestial bodies. The first name it assigned was back in 1919, when our natural satellite was officially named "the Moon." Hence it's special that in 2014 the IAU listed 304 well-characterized exoplanets to be selected for public naming. These exoplanets belong to 260 exoplanetary systems comprising one to five planets each.

The 20 top ExoWorlds list is published on the website and includes 15 stars and 32 planets (five of the stars already have proper names). Astronomy clubs and other nonprofit organizations sent in proposals for the names of these objects. The names had to follow IAU rules, for example, they had to be one word (if possible), pronounceable, and inoffensive.

During Tuesday evening's ceremony, led by Sze-leung Cheung (IAU International Outreach Coordinator), Lisa Kaltenegger of Cornell University cast the first vote. Culminating the event, the audience was treated to a video message from Scott Kelly, an astronaut aboard the International Space Station, wishing everybody a good conference to celebrate this special event.



Screenshot of the NameExoWorlds voting page. *[IAU]*

Everybody can now vote on the NameExoWorlds website. There's no need to register, as each device (computer, tablet, or smartphone) can vote only once for each of the 20 ExoWorlds. Complete instructions on how to vote can be viewed online. The closing date for entries is 23:59 UTC on 31 October 2015. ✿

YOUNG ASTRONOMERS LUNCHEON

Career Advice from Generation to Generation

By RICK FIENBERG, *Kai'aleleiaka*

At lunchtime on Wednesday, about 200 early-career astronomers — most of them graduate students or postdocs — converged on Room 323 of the Hawai'i Convention Center. They filed past a long table stacked with several varieties of brown-bag lunch, made their choices, then sat down at round tables, each already occupied by one or two older astronomers eager to share their wisdom with the next generation. Welcome to the Young Astronomers Luncheon!

Introduced at the 2006 General Assembly in Prague, Czech Republic, this popular event offers a unique opportunity for those just getting started in the profession to network with more senior scientists from all over the world and with vast experience in academia and industry.

Co-organizer Ed Guinan welcomes attendees to the Young Astronomers Luncheon on Wednesday. *[Rick Fienberg, Kai'aleleiaka]*

While they dined on sandwiches, chips/crisps, cookies, and fruit, participants listened to three short presentations on programs targeted at new or soon-to-be Ph.D. holders. Oddbjørn Engvold of the Norwegian Academy of Science and Letters (NASL) described the International Schools for Young Astronomers and the newly established IAU Office for Young Astronomers. Kevin Marvel, Executive Officer of the American Astronomical Society, gave an overview of AAS programs for students and recent graduates. And Kevin Govender, Director of the IAU Office of Astronomy for Development, outlined OAD programs that can provide valuable experience and contacts for those just starting out in astronomy.

Co-organizer Ed Guinan (Villanova University, Pennsylvania)

Honolulu Almanac — 13 August 2015

Sunrise / set	6:09 am / 7:03 pm
Twilight[1] start / end	4:51 am / 8:21 pm
Moonset / rise	5:26 am / 6:32 pm
Moon phase[2]	● New (<1% illum.)
Evening planet[3]	Saturn (SSW)
Morning planet[3]	Mars (E)
Special event	Perseid meteor shower (before dawn)

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

then turned everyone loose to have informal conversations at their tables. He noted that in a pre-event survey, attendees indicated that they were mainly interested in talking about three topics: jobs, jobs, and jobs! Indeed, the conversations I joined or overheard as I circulated around the room were mostly about funding, grant-writing, and employment options — with some talk about work-life balance thrown in for good measure. The younger participants seemed quite grateful to have a chance to discuss their ambitions and concerns with people who could not only empathize with them, but also offer concrete advice and suggestions drawn from their own careers.

This year's Young Astronomers Luncheon was sponsored by the NASL, the AAS, the OAD, the U.S. National Committee for the IAU, and the National Academies. ✿

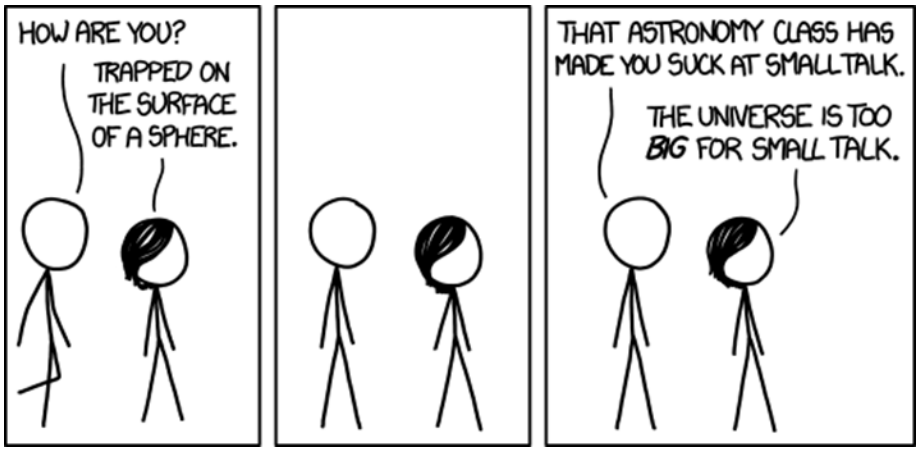
DIVISION A

It's Fundamental

By ANNE LEMAÎTRE

On Thursday I anticipate assuming the presidency of IAU Division A, Fundamental Astronomy. This division is tasked with the scientific and organizational development of fundamental astronomy and for ensuring that the most significant issues in the field are addressed with foresight, enterprising spirit, and scientific judgment. This new commission builds on the long legacy of former Division I, Fundamental Astronomy. As we move forward, we will foster new initiatives and international cooperation in fundamental astronomy, standardization of scientific results, and promoting investigations and discussions relating to the relevant topics and projects.

Looking ahead, our Division will need to address many challenges in the coming years. Within the new IAU organizational structure, we must establish efficient coordination of Division A Commissions, along with a means for constructive collaboration with other divisions. We must also participate meaningfully during the second phase of IAU's re-organization and define Working Groups that will advance our mission effectively. We must also work more effectively with the astronomical community by stimulating discussions and seeking feedback in all relevant areas, such as data, ephemerides, standard models, and fundamental constants. As part of this community dialogue, we will work to



[xkcd]

encourage initiatives and to organize events, conferences, and meetings, including those that bring fundamental astronomy to the general public.

We also recognize the need to diversify our demographics. To promote early career scientists' participation in IAU meetings, we will seek young speakers for key roles and make sure our meetings and session topics reflect the needs of the next generation. As well as bringing in a younger cohort, we will also work on diversifying our Division by increasing the participation of women in committees, and as symposium invited speakers and organiz-

ers. Through all these efforts, we will work to establish new networks of researchers from different astronomical sub-disciplines and to increase interdisciplinary and diversity of collaborations.

Put simply, I want to see Division A contribute to the establishment of more efficient relationships between disciplines, between research teams all over the world, across diverse groups, and between the general public and the professionals. ✿

ANNE LEMAÎTRE is the incoming President of Division A and a Professor in the Department of Applied Mathematics of the University of Namur, Belgium, where she studies binary asteroids and planetary-system dynamics.

PUBLIC STAR PARTY

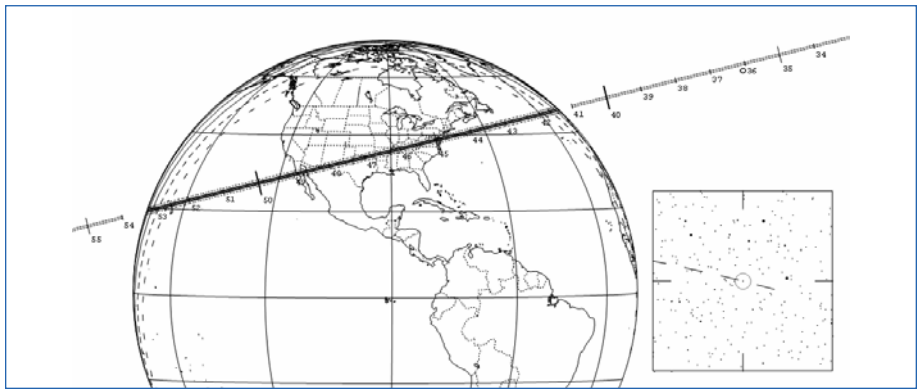
Asteroid Occultation at Ala Moana Beach Park

By DAVID W. DUNHAM

Asteroid (1197) Rhodesia, approximately 50 km (30 miles) in diameter, will occult a 9.6-magnitude star in Aquarius at 7:52 pm local time on Thursday evening, 13 August. Conveniently, this occurs during the IAU's public stargazing party planned for Ala Moana Beach Park. I'll be there with my occultation-timing equipment — weather permitting, of course.

The star, PPM 171360 = TYC 0527-01259-1, will disappear for up to 3 seconds. The nominal path passes just south of O'ahu, but with current pre-Gaia uncertainties, there's a roughly one-third chance that we'll see an occultation from Honolulu.

If Hilda doesn't spread too many clouds across our eastern sky, you're welcome to join me in my attempt to record the occultation at the star party. You can find detailed predictions and charts for the event on Steve Preston's asteroid-occultation website. ✿



On Thursday evening the shadow of asteroid Rhodesia is predicted to sweep across the continental United States from northeast to southwest and then cross the Pacific Ocean toward Hawai'i. Time is marked in minutes after 05:00 UTC (14 August) = 7:00 pm HAST (13 August). The 10th-magnitude star that will be occulted is charted at right. [asteroidoccultation.com]

DAVID DUNHAM is North American Coordinator for the *Journal of Occultation Astronomy* at the International Occultation Timing Association (IOTA) and a major force behind professional-amateur collaboration in astronomy.

Light Beyond the Bulb Visits Hawai‘i

By LINA CANAS

The glow of a candle, the rise of the Sun, and the illumination of a lamp are all things that can bring comfort and warmth to our lives. Light in all of its forms allows us to communicate, entertain, explore, and understand the universe we live in.

A new exhibition, Light: Beyond the Bulb, showcases the incredible variety of light-based science being researched today across the electromagnetic spectrum, scientific disciplines, and technology platforms. The exhibit materials and striking images were crowd-sourced and expertly curated for scientific content, high-quality printability, and stunning beauty in order to engage the public.

The exhibition is part of the Cosmic Light cornerstone project for the International Year of Light 2015 (IYL 2015), coordinated by the IAU's Office for Astronomy Outreach (OAO). It is organized by the same team that created the award-winning From Earth to the Universe project.

Images from Light: Beyond the Bulb on display at the IAU General Assembly. *[IAU/B. Tafreshi, twanight.org]*

To date about 600 exhibitions for Light: Beyond the Bulb have been registered across 30 countries. Locations include such diverse places as the National Mall, Washington, D.C.; the Galway Astronomy Festival, Ireland; the St. Ignatius College and Luqa Primary School, Malta; the Simón Bolivar Planetarium, Venezuela; Christchurch International Airport, New Zealand; and the Shanghai Nanhui Senior High School, China.

Do you want to host Light: Beyond the Bulb in your country? Drop by Booth 329 in the Exhibit Hall, and we'll answer all your questions. Or head to the first floor of the Hawai‘i Convention Center and enjoy some of the images from the exhibition, if you haven't already. ✿

LINA CANAS is Assistant Outreach Coordinator in the IAU Office for Astronomy Outreach (OAO), based at the National Astronomical Observatory of Japan (NAOJ) in Tokyo.

How to Say It in Hawaiian

- Hōkūlele: meteor, moving star
- Hōkūnaʻi: asteroid, small star
- Hōkū puhipaka: comet (literally: tobacco-smoking star)
- Hōkūpaʻa: North Star (literally: immovable star)
- Makulu: Saturn
- Hōkūʻulapīnaʻau: Mars
- ʻIlioki: Pluto

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 ʻokina, signals a glottal stop. Source: Hawaiian Words.

Unconscious Bias

By FRANCESCA PRIMAS

The IAU Executive Committee Working Group on Women in Astronomy 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 last of these talks, on the topic of unconscious bias, will be presented by Patricia Knezek of the National Science Foundation (NSF). Knezek has previously held positions at the National Optical Astronomy Observatory (NOAO), Space Telescope Science Institute (STScI), Johns Hopkins University, the Carnegie Institution of Washington, and the University of Michigan. She served as the Chair of CSWA from 2003 to 2007. Her talk will take place today from 12:30 to 2:00 pm in Room 318A. Please bring your own lunch.

Everyone has unconscious biases. They reflect expectations or stereotypes that influence our judgments of others, which can positively or negatively impact the long-term career success of individuals, depending on which biases they are subject to. Being aware of these unconscious biases is particularly important when making important decisions, such as during recruitment, selecting the speakers for a conference, and reviewing papers submitted for publication.

Each of our three presenters were asked to answer three questions. Knezek's answers follow here.

Q1: What is the topic of your Scattered Talk?

PK: I will be talking about unconscious bias. I'll cover what it is, how we know it exists, what its impact can be, and how to work to address it.

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

PK: I'm excited to hear about all of the amazing science that is being accomplished! I'm also looking forward to seeing many friends.

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

PK: I think the most important piece of advice I could give is to take a course on negotiating. I wish I had! And then, whether it is a new position or a promotion, don't be afraid to ask for what is reasonable and what you deserve. ✿

FRANCESCA PRIMAS is the Chair of the IAU Women in Astronomy Working Group. She is a Senior Astronomer at the European Southern Observatory, based in Garching, Germany.

Honolulu Weather Forecast 13–14 August 2015

THURSDAY, 13 AUGUST		High: 88°F / 31°C Low: 77°F / 25°C
Morning	**Afternoon**	**Evening**
Partly cloudy	Partly cloudy	Partly cloudy
20% chance of rain	5% chance of rain	5% chance of rain
FRIDAY, 14 AUGUST		**High: 88°F / 31°C Low: 77°F / 25°C**
Morning	**Afternoon**	**Evening**
Mostly to partly cloudy	Partly to mostly cloudy	Mostly to partly cloudy
25% chance of rain	25% chance of rain	20% chance of rain

Extended forecast: Moderate trade winds are expected as tropical storm Hilda slowly advances toward Hawai'i Island during the next two or three days. Hilda is expected to bring widespread rain across Hawai'i Island, and some rain may eventually spread to the smaller islands. Sources: Weather Underground, National Weather Service.

Ocean Lover Serving Food

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. Today I'd like to introduce you to **Rudy Salcedo**, a catering services manager who was born and raised in Honolulu. I spoke to him yesterday, which he informed me was his 42nd birthday.

Rudy Salcedo poses with the traditional Hawaiian shaka (or "hang loose") hand gesture. *[Iris Nijman]*

Happy birthday! Any plans for today?

I have to work the whole day, including the networking reception tonight. But I might go for some drinks afterwards.

What do you like about this work?

I like meeting new people and making them happy. If they're happy, I'm happy! But I have done a lot of different things in my life, including being a nuclear submarine painter at the Department of Defense at Pearl Harbor. But I like the job I have now — I'm an expert at serving guests.

What's the best food we can get around here?

At the concession stand we have hot bowls with local island-made food every day. The people on this island have a lot of different ethnic backgrounds, so the food is mixed oriental, like chicken battered in sweet mochiko. My favorite restaurants are Sam Choy's and Hy's Steak House in Waikiki.

What do you like most about Hawai'i?

The Ocean! I like surfing with my GoPro camera. A good spot is Kaneohe, where you can see Honus (green sea turtles).

— Iris Nijman, Kai'aleleiaka

Studying Gender in Talks at the IAU General Assembly

By JAMES R. A. DAVENPORT

If you've been watching closely at the Honolulu General Assembly, you may have noticed that audience members are not just paying attention to *what* is being asked during question-and-answer (Q&A) periods, but also to *who* is doing the asking. Meeting participants are collecting data on the demographics of speakers and question-askers in as many talks as possible. Anyone can contribute to this effort using a simple online form that works on laptops, tablets, and smartphones.

Do men and women ask the same numbers of questions in talks?

This project was inspired by a seemingly simple question that was posed to me: "Do men and women ask the same numbers of questions in talks?" Answering this query requires carefully studying astronomers in their native meeting habitat. I have been conducting and coordinating data gathering for this study for two years now, and I need help from as many volunteers as I can get.

This year's IAU 2015 project is a continuation of studies done at past AAS and NAM meetings in the U.S. and U.K., which analyzed how frequently men and women asked questions in a wide range of conference talks. The original study from the 223rd AAS meeting (Davenport et al. 2014) found that women were underrepresented among question-askers in talks and that the gender of the session chair influenced the ratio. A follow-up study (Pritchard et al. 2014) of NAM 2014 found that when Q&A sessions reached at least four questions, the gender ratio approached unity.

The goals of this ongoing study are to understand the behaviors of meeting participants and to develop "best practice" suggestions for promoting an inclusive and accessible meeting environment. The IAU XXIX General Assembly provides a unique opportunity to study how a large international group of scientists interact.

So far we've seen a great volunteer turnout, with surveys received from nearly every talk. Please consider helping us during the final days of the General Assembly by reporting your own observations using our webform. ✿

JAMES R. A. DAVENPORT is a recent graduate of the University of Washington in Seattle and an NSF Postdoctoral Fellow at Western Washington University in Bellingham. He is also the author of the data-analysis blog If We Assume.

FOCUS MEETING 11

Coordination of Ground & Space Astrophysics & Heliophysics

By DAVID SPERGEL

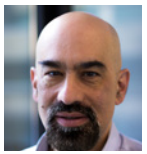
From the transit expeditions of 1761 to JWST, ALMA, and SKA, international projects have played an important role in driving astronomy and heliophysics. Over the past two decades, the increasing complexity and cost of new facilities, the constrained amount of funding available from individual sources, and the rapidly increasing volume of data produced by newer facilities have made international collaboration on large ground- and space-based facilities essential to moving the fields forward. As international cooperation becomes commonplace, data-sharing policies have become ever more important. All IAU members have a stake in the policy decisions made by nations and various scientific consortiums concerning data access and international collaborations. This focus meeting provided a forum to discuss how to improve coordination of global strategic planning in astronomy, astrophysics, and heliophysics in order to maximize the scientific return from research facilities.

There are many open questions driving our work: How do we coordinate these international planning efforts? How do we balance national prioritizations with the increasing multi-national structures of our projects? How can and should we share the

The ALMA telescopes at night. *[ESO, B. Tafreshi]*

data produced both by these international collaborations and by other projects? How should we provide access to these facilities? Furthermore, the huge volume of data produced by current and future observation systems necessitates modes of research that have not heretofore figured prominently in astronomical and heliophysical research enterprises. The Daniel K. Inouye Solar Telescope (DKIST) will collect 3.65 petabytes in its first year of science operations, while the Large Synoptic Survey Telescope (LSST) will produce 30 terabytes of data per night, equaling DKIST's output roughly every 4 months.

The potential benefit of enhanced international coordination is high. Much can be learned in astrophysics by adopting a broad-scoped approach in which ground- and space-based facilities look at the same target with different wavelengths, time-scales, and technologies. Such an approach requires more resources than a single nation could maintain. Heliophysics has the added issue of coordinating truly global ground-based systems and space missions in various regions of the Sun-Earth system. In this context, Earth is an additional spacecraft embedded in its own space plasma environment. For the first time in history, we are capable of looking at a complicated, coupled, space system in its entirety. Today we can explore from the Sun through the heliosphere, magnetosphere, ionosphere, and atmosphere down to the biosphere in which we try to survive climate change. To study and understand the system around us is the ultimate benchmark to be able to understand other star-planet systems. ✿



DAVID SPERGEL is Chair of the Princeton University Dept. of Astrophysical Sciences and Chair of the Space Studies Board of the U.S. National Academy of Sciences. He also chaired the Organizing Committee for last week's Focus Meeting 11 on coordinating ground- and space-based studies.

COMMISSION B5

A New Home for Laboratory Astrophysics

By FARID SALAMA

We are witnessing a rapid growth in quantity and quality of astronomical measurements, both from ground- and space-based facilities. This advance is driven by a combination of new and larger telescopes equipped with more sensitive detectors, and with capabilities to acquire high spectral- and spatial-resolution data over a broad range of wavelengths. Interpreting these superb observations requires an understanding of the fundamental properties and processes of atoms and particles, molecules, ions, and solids to an unprecedented precision. This need has attracted the attention and the interest of laboratory and theoretical scientists from different disciplines who, for years, have brought new or improved laboratory techniques, and large-scale theoretical calculations or simulations to astronomy and planetary science.

The goal of the newly formed Laboratory Astrophysics Commission, B5, is to advance our understanding of the universe through the promotion of fundamental theoretical and experimental research into the underlying processes that drive the cosmos.

To achieve this goal, the Commission will facilitate interactions between the international community of astronomical, planetary and solar physicists, and the experimentalists and theorists who provide this community with necessary physical and chemical data. C.B5 naturally evolves from the previous Commission 14, Atomic & Molecular Data, and will naturally draw and expand on its experience in serving the broader astronomical community in the coming years. In addition, the C.B5 will adopt a strategy

to promote, in liaison with relevant international parties, the field of laboratory astrophysics, particularly with reference to ground-based and space-born astronomy and planetary science missions. The Commission also plans to work closely with other Commissions drawn from Divisions across the IAU.

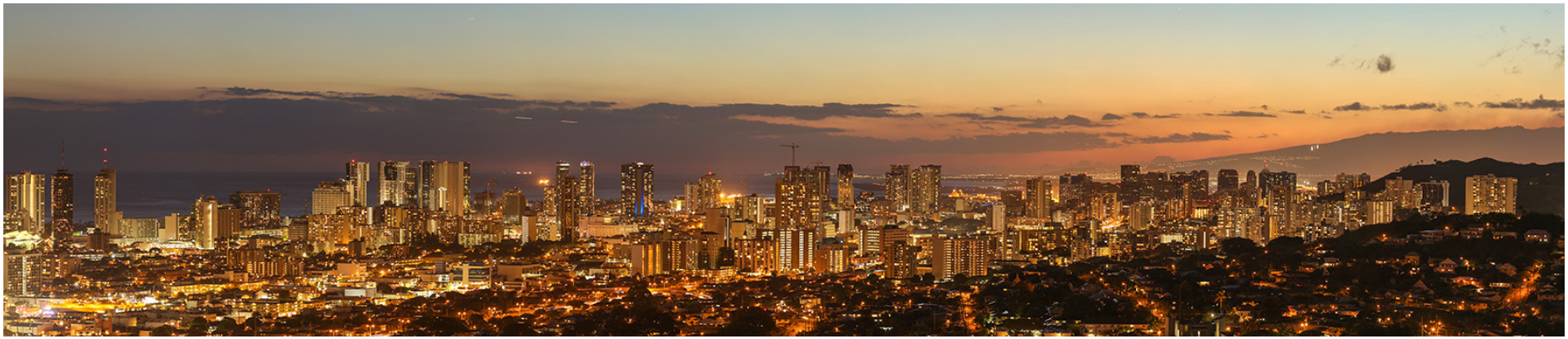
C.B5 will encompass the four fundamental research areas that generate astrophysical data needs: atomic and molecular astrophysics, physics and chemistry of solid materials and condensed matter (dust and ices), plasma astrophysics, and nuclear and particle astrophysics. The Commission will embrace interdisciplinary studies crossing physical, chemical, biological, and geological sciences of relevance to astronomy — including experiment, theory, and modeling, from the nuclear and atomic/molecular level to application on astronomical scales.

The new Commission is designed to address the future multidisciplinary needs and requirements of modern astronomy and planetary science and will solicit observer seats on the OCs of those bodies where strong crossover exists. Reciprocally, to increase cross-fertilization, the Commission will offer observer seats to interested parties from other commissions and divisions of the IAU, to discuss special needs in their particular domains and co-develop joint working groups and/or joint IAU symposia to address such needs. We hope that this IAU GA will be an opportunity to explore and initiate these crossover interactions. The Commission also plans to create working groups along themes that are mission-driven, data-driven, and development-driven, or based on emergent new scientific directions.

Debra Elmegreen, then President of the AAS, formally recognized the AAS Laboratory Astrophysics Division upon its creation in June 2012. *[Bill Andrews]*

In summary, the Laboratory Astrophysics Commission is a cross-disciplinary commission aiming to promote laboratory astrophysics and assist all IAU members by providing the data needed to interpret and understand astronomical observations. ✿

FARID SALAMA of NASA's Ames Research Center in Moffett Field, California, is founding President of the new IAU Commission B5 and the incoming Chair of the Laboratory Astrophysics Division of the AAS.



[IAU/B. Tafreshi, twanight.org]

COMMISSION G2

Massive Stars

By ARTEMIO HERRERO DAVO

I would like to present the new IAU Commission G2, Massive Stars, which is the direct successor of the IAU Massive Stars Working Group that has been active since 1995. I extend my gratitude to everyone who contributed during all these years to the success of the Working Group.

New developments in the field of massive stars will require strong research efforts for at least a decade, and new avenues into the future will be opened by new telescopes and instruments that will become a reality at the end of that decade. Massive stars will remain one of the main research foci of the astronomical community for at least the next two decades. This IAU Commission will promote the development of the field and provide a well-defined forum for discussion and results dissemination. As stated in the proposal submitted to the IAU, the Massive Stars Commission for the next years will concentrate on the following tasks:

1. Maintain the Massive Stars Newsletter, the 24-hour announcement service that distributes new massive-star submissions to subscribers within 24 hours, and promote dissemination of these services.
2. Continue promoting international conferences and workshops. The next IAU Symposium on massive stars, IAUS 329, The Lives and Death-throes of Massive Stars, will be held in Auckland, New Zealand. Proposed dates are 28 November to 2 December 2016.
3. Increase our efforts to strengthen links with other research communities and make our results easily accessible to them. Toward this aim, we will promote the Massive Stars Newsletter among those communities and look for common meetings and develop web tools for massive-star research.

The Local Group irregular dwarf galaxy IC 1613 as seen by the William Herschel Telescope, the Galaxy Evolution Explorer, and the Very Large Array. Young star-forming regions with large numbers of low-metallicity massive stars are easily identifiable, particularly in the large bubbles in the northeastern region. *[G. Perez (SMM-IAC) & M. Garcia (CAB)]*

4. Foster new ways of active participation in our community, particularly for young researchers, through regular consultation and web tools. We expect a large number of Associates for which these ways of participation will be of primary importance.
5. Reinforce public outreach by means of open web pages, public talks, and seminars. To achieve this we will seek links with and advice from the IAU Office for Astronomy Outreach and the National Outreach Contacts.

Massive-star research is centered on the stars themselves, but it offers a large number of links to other areas of astrophysics. Massive stars are very luminous, and thus they can be studied

individually at relatively large distances via high-resolution spectroscopy, spectropolarimetry, or interferometry. They are the key agents behind starbursts and giant HII regions. Due to these broad topics, we feel that the new Commission will be of interest to a large community, and we invite all interested astronomers to join us. ✿

ARTEMIO HERRERO DAVO was born in Valencia, Spain, and obtained his Ph.D. at Ludwig Maximilian University in Munich, Germany. He is Professor of Astrophysics at the Institute of Astrophysics of the Canary Islands and La Laguna University in Tenerife, Spain. He is incoming President of IAU Commission G2, Massive Stars.

COMMISSION H4

Stellar Clusters Throughout Cosmic Space and Time

By RICHARD DE GRIJS

Commission H4, Stellar Clusters Throughout Cosmic Space and Time, is a new Commission for scientists unraveling the mysteries of stars and stellar evolution using star clusters. Star formation results from the fragmentation of molecular clouds into star clusters.

Over time, open clusters dissolve or are destroyed by interactions with molecular clouds or through tidal stripping, and their stars become part of the general field population. Star clusters are thus among the basic building blocks of galaxies. In turn, star-cluster populations, from young associations and open clusters to old globular clusters, are powerful tracers of the formation, assembly, and evolutionary history of their parent galaxies. Star clusters are the observational foundation for stellar astrophysics; they provide essential tracers of galactic structure, and they represent unique stellar dynamical environment.

Our understanding of star formation, stellar structure, stellar evolution (including the importance of binary systems and stellar rotation), and stellar nucleosynthesis continues to benefit and improve tremendously from the study of star clusters. Additionally, fundamental quantities, such as the shape of the stellar initial mass function and its postulated environmental dependence, can be successfully derived from modeling either the Hertzsprung–Russell diagrams or the integrated velocity structures of, respectively, resolved and unresolved clusters. Star-cluster studies thus span the fields of galactic and extragalactic astrophysics, while heavily affecting our detailed understanding of the process of star formation in dense environments.

The Starburst Cluster displays celestial fireworks. *[NASA, ESA, R. O'Connell (Univ. of Virginia), F. Paresce (INAF), E. Young (USRA, NASA/ARC), the WFC3 Science Oversight Committee, and the Hubble Heritage Team (STScI, AURA)]*

Recent advances in instrumentation are driving a renaissance in studies of galactic clusters, while extragalactic cluster studies are significantly aided by the development of new instrumentation supporting ever-wider fields of view. Dynamical modeling of both individual clusters and entire cluster systems, at any age, poses a considerable challenge for both theory and computa-

tional requirements. The six-dimensional coverage of phase-space by Global Astrometric Interferometer for Astrophysics (Gaia) will soon have a major impact. From the Chandra/XMM telescopes and the Galaxy Evolution Explorer (GALEX) at short wavelengths to the Spitzer Space Telescope and Herschel in the mid- and far-infrared and the Atacama Large Millimeter/sub-millimeter Array (ALMA) at millimeter wavelengths, our observational window for studying both star clusters and their stellar populations is unsurpassed in terms of wavelength coverage and spatial resolution. With major efforts being expended on the planning for new 30–40 meter telescopes, now is the time to look forward to future progress in mapping a representative slice of the local Universe at the highest possible resolution and thus in the greatest detail ever achieved. Combining the emerging, unprecedented understanding of local stellar populations with observations of galaxies ("composite" stellar populations) at ever-higher redshifts, we now have a fighting chance to constrain the evolution of the basic galactic building blocks throughout space and time.

Our predecessor Commission 37 filled a real need in the community. Commission H4's Organizing Committee aims at re-establishing an active Commission. We call on the IAU membership at large to support our efforts in trying to understand the large variety of physical aspects that studies of star clusters and their stellar populations can contribute to. We are looking forward to welcoming your contributions and encourage anyone to join Commission H4's membership. ✿

RICHARD DE GRIJS is Professor of Astrophysics at the Kavli Institute for Astronomy and Astrophysics at Peking University, China, and Discipline Scientist at the International Space Science Institute–Beijing, China. He has been leading the IAU's East Asian Regional Office of Astronomy for Development since its inception in 2012. *[Portrait: Zhang Wenxin]*

COMMISSION X1

Supermassive Black Holes, Feedback & Galaxy Evolution

By WILLIAM FORMAN & THAISA STORCHI-BERGMANN

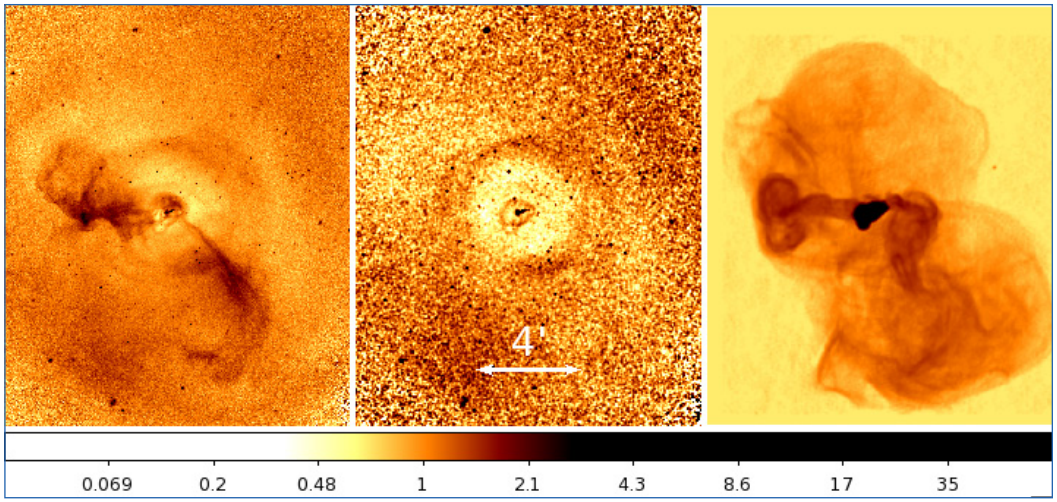
IAU Commission X1 is a new cross-division commission that combines scientific interests from Division D, High Energy Phenomena and Fundamental Physics, and Division J, Galaxies and Cosmology, to explore feedback processes over cosmological time between supermassive black holes (SMBH), their host galaxies, and the surrounding environment. The discovery of the correlation between galaxy properties and SMBH mass, the understanding of the key role of feedback in galaxy evolution models to regulate galaxy growth, and the detection of radio-mode feedback in all hot gas-rich systems have demonstrated the key role of feedback.

Feedback studies utilize the broadest wavelength range including gamma-ray and X-ray satellites, the Hubble Space Telescope, integral-field spectrographs on 8- to 10-meter-class telescopes, and all manner of radio observations. Major observatories are dedicating significant fractions of their time to observe and characterize these phenomena and constrain the relevant physical mechanisms.

Commission X1 will facilitate communication among interested researchers to coordinate multiwavelength observations and theoretical efforts that are key to advancing the field. We thus plan to bring together observers, from across the electromagnetic spectrum, with theorists to understand the interplay between the growth of supermassive black holes and

galaxy evolution, from the earliest epochs to the present day universe.

The Commission plans to continue the past progress and extend the discussion to directly address active galactic nuclei and galaxy interactions at high redshifts. Detailed studies at high redshift will be possible with future, more powerful observatories, both on the ground (notably the Large Synoptic Survey Telescope, European Extremely Large Telescope, Giant Magellan Telescope, and Thirty-Meter Telescope in the optical and infrared; and the Jansky Very Large Array, Square Kilometre Array, Giant Meterwave Radio Telescope, and Low-Frequency Array in the radio); as well as in space (James Webb Space Telescope, Euclid, Wide-Field Infrared Survey Telescope, Athena X-ray Observatory, Advanced Technology Large Aperture Space Telescope, and X-ray Surveyor).



These images of M87 in Virgo are matched to scale and show the galaxy in soft X-rays (left, from Chandra), hard X-rays (middle, also from Chandra), and radio wavelengths (from the VLA). Most of the structure visible in the images can be traced to energetic activity in the central supermassive black hole. *[William Forman]*

The goals of IAU Commission X1 are to promote the development of the field and foster interaction between observational and theoretical astronomers working on all covered topics, providing a well-defined forum for discussion and dissemination of results. To achieve this goal, we plan the development and support of the following activities, most of which will begin in the first year of the Commission and continue through its duration:

- Provide a forum for discussions about the best observational campaigns.
- Enable a forum for discussion of particular objects or classes of objects to be observed along with needed multiwavelength surveys.
- Support, propose, and organize meetings, especially IAU Symposia.
- Encourage discussion of theory and simulations and support the dissemination of computing codes. Our Organizing Committee includes theorists who are expert in simulation.
- Plan and coordinate sessions at IAU General Assemblies.
- Prepare a quarterly newsletter to announce meeting deadlines, key science advances, opportunities for collaboration, and observing proposal deadlines.

The Commission organizers (Bill Forman, Harvard-Smithsonian Center for Astrophysics, and Thaisa Storchi-Bergmann, Rio Grande do Sul Federal University) welcome suggestions and participation in Commission activities from all interested scientists. We look forward to working with all interested members of the IAU and the astronomical community. ✿

BILL FORMAN has spent his career concentrating in the field of X-ray astronomy using satellite observations from Uhuru, Einstein, Rosat, and Chandra. He is Associate Director at the Harvard-Smithsonian Center for Astrophysics for the High Energy Astrophysics Division. THAISA STORCHI-BERGMANN is a professor at the Rio Grande do Sul Federal University, Porto Alegre, Brazil, where she is Head of the Astrophysics Research Group. She won the 2015 L'Oreal/UNESCO Prize for Women in Science.

COMMISSION A3

Fundamental Standards

By CATHERINE HOHENKERK

Commission A3, Fundamental Standards (FS), is a new Commission in Division A, Fundamental Astronomy (see page 11). At the last General Assembly, the IAU announced its goal to reorganize the Commissions to make them more relevant to the members. With that in mind, it seems to me, nothing is more relevant than the issue of standards. I refer not only to the standards used to produce the products and services we use as astronomers (and consumers in general), but more importantly, to the standards that are used by us in the products, services, and research we carry on as scientists.

Users of IAU fundamental standards include governments, businesses, scientists, engineers, and astronomers; some are members of the IAU, and some are not. When told that something is an IAU standard, what does that actually mean? How does it apply to me and the particular product or service that I am interested in or produce? Where should I go to find out about standards? If I am not an expert in the field, will I be able to find an understandable explanation of the standards and its application? Once an IAU Resolution is adopted, how is it implemented in practice?

Upon investigating, I found that two Past Presidents of Division I (the predecessor of Division A), Dennis McCarthy (USNO, retired) and Nicole Capitaine (Paris Observatory), had similar ideas. Thus together with Brian Luzum (USNO & the International Earth Rotation and Reference Systems Service), we put forward a successful proposal for this new Commission. Brian Luzum has now been elected Vice-President, and the Organizing Committee will benefit from elected members John Bangert (USNO, retired) and Charles Acton (JPL).

The goal of FS is simple: to facilitate advances in astronomy and other fields of science and engineering by developing, implementing, and communicating IAU-endorsed standards for fundamental astronomy. Such standards include, but are not limited to, celestial and terrestrial reference systems and frames, time-scales, precession-nutation and Earth orientation models, star catalogs, and solar-system ephemerides. Details may be found at our temporary website.

An important role will be cooperation and collaboration with various groups within the IAU to provide not only state-of-the-art services, but also to develop standards and services designed to meet emerging needs. Such Division A groups include Standards of Fundamental Astronomy (SOFA), the Working Group (WG) on Numerical Standards of Fundamental Astronomy (WGNSFA), and the Division F/A WG on Cartographic Coordinates & Rotational Elements (WGCCRE). Other IAU groups, such as producers of solar system ephemerides, and external groups such as the International Association of Geodesy (IAG) and the Global Geodetic Observing System's Bureau of Products and Standards, have also been very supportive and will provide valuable expertise. SOFA, the WGNSFA, and the WGCCRE (all long-term Working Groups) already play an important role in developing and promulgating IAU standards via software and numerical data.

FS will serve as the primary point of contact between Division A and the broad user community regarding IAU standards for fundamental astronomy. ✿

CATHERINE HOHENKERK is the President of Commission A3: Fundamental Standards. She is a Senior Analyst at H.M. Nautical Almanac Office, which is part of the U.K. Hydrographic Office in Taunton, U.K.

Kai'aleleiaka THE MILKY WAY

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Wally Pacholka / AstroPics.com

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INTERNATIONAL YEAR OF LIGHT 2015

COSMIC LIGHT IAU

Resolution, Not Revolution, for the Next Triennium

By PAMELA L. GAY, *Kaiʻaleleiaka*

The second Business Meeting of the IAU XXIX General Assembly was held on Thursday afternoon, 13 August, with outgoing President Norio Kaifu and outgoing General Secretary Thierry Montmerle presiding. The session began with acknowledgement of the nearly 1,200 new Individual Members admitted by the Executive Committee (page 3), followed by a minute of silence to honor the 348 members whose deaths were learned of during the last triennium (some had passed away earlier, but word hadn't reached the IAU till more recently).

A highlight of the Business Meeting for Individual Members was the opportunity to vote on the four Resolutions submitted for their consideration earlier this summer:

- Resolution B1: Continuation of the IAU Strategic Plan to 2021.
- Resolution B2: Zero points for the absolute and apparent bolometric magnitude scales.
- Resolution B3: Nominal units for selected stellar and planetary properties.
- Resolution B4: Protection of radio astronomy observations in the frequency range 76 to 81 GHz.

Members cast their votes in favor of four Resolutions on topics as diverse as the IAU Strategic Plan and the zero point of the bolometric magnitude scale. *[Rick Fienberg, Kaiʻaleleiaka]*

Attendees voted to approve all four Resolutions with little debate or discussion and with only a handful of abstentions. In addition, the National Representatives approved or ratified (according to the Union's rules) the proposed slates of candidates for several key IAU committees:

- Division Presidents and Vice-Presidents (page 10)
- Commission Presidents and Vice-Presidents (page 17)
- Finance, Membership, Resolutions, Special Nominating, and Executive Committees

A report on the IAU's financial health was received and discussed, and revisions to the agreement between the IAU and the South African National Research Foundation for operation of the IAU Office of Astronomy for Development (OAD) were explained. Finally, in the only truly dramatic moment of the session, the location of the XXXI General Assembly, 16–27 August 2021, was announced: Busan, Republic of Korea (i.e., South Korea). ✿

Kaiʻaleleiaka THE MILKY WAY

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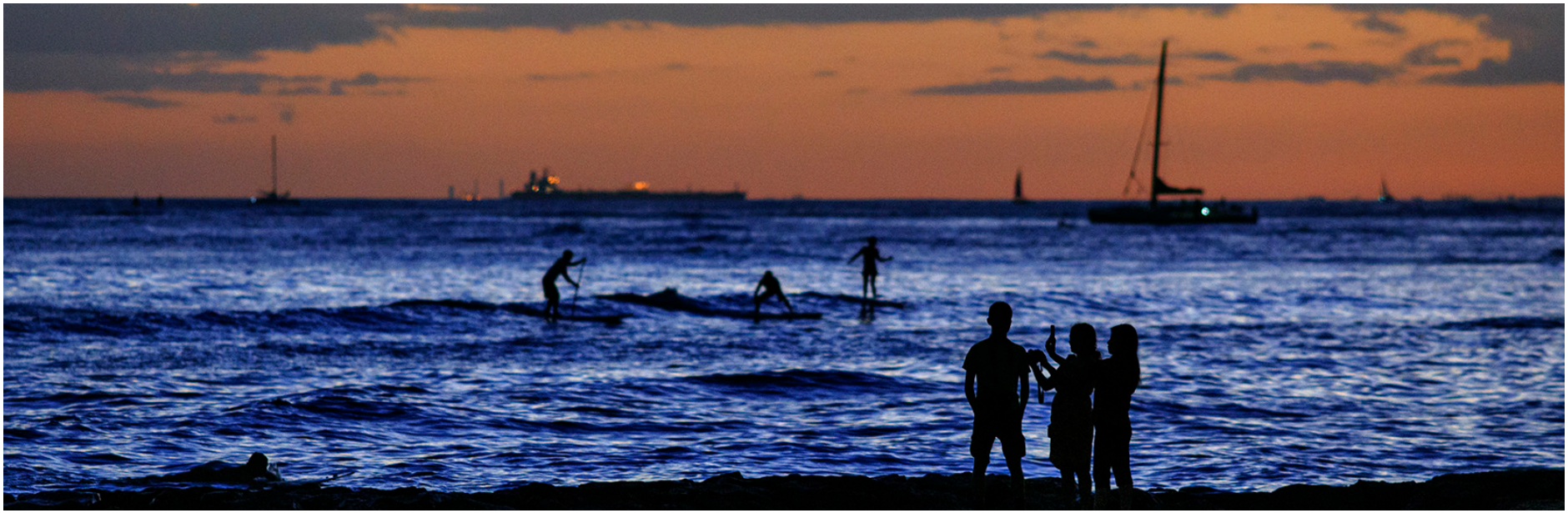


[IAU/B. Tafreshi, twanight.org]

A New Tally of Individual IAU Members

By RICK FIENBERG, *Kaiʻaleleiaka*

As of today, the IAU has a record 12,450 Individual Members representing 79 countries. That's an increase of more than 10% since yesterday, when nearly 1,200 astronomers from 61 countries were admitted to the Union at the second Business Meeting of the XXIX General Assembly.

One new National Member joined the IAU this triennium — Colombia — bringing the total country count to 73 (not including Bolivia, which has no Individual Members and is currently inactive in Union affairs).

The table on the next page lists, for each country, the number of new Individual Members admitted yesterday, the number of existing members as of the previous day, and the new total. For additional information, see the Geographical Distribution of Individual Members on the IAU website.

IAU Members as of 14 August 2015.

Country	New	Existing	Total
Argentina	8	138	146
Armenia	7	19	26
Australia	49	282	331
Austria	4	63	67
Azerbaijan*	2	8	10
Belgium	9	138	147
Brazil	23	183	206
Bulgaria	9	59	68
Canada	42	270	312
Chile	13	114	127
China Nanjing	37	616	653
China Taipei	9	65	74
Colombia**	25	2	27
Costa Rica	0	2	2
Croatia	7	18	25
Cuba	0	7	7
Czech Republic	14	108	122
Denmark	7	79	86
Egypt	26	44	70
Estonia	1	29	30
Ethiopia	1	2	3
Finland	7	72	79
France	73	766	839
Georgia	0	12	12
Germany	50	632	682
Greece	9	110	119
Honduras	0	2	2
Hungary	12	57	69
Iceland	1	5	6
India	22	260	282
Indonesia	0	17	17
Iran	10	31	41
Ireland	3	46	49
Israel	8	90	98
Italy	62	605	667
Japan	63	664	727
Kazakhstan	7	3	10
Korea (North)	0	19	19
Korea (South)	24	135	159
Latvia	0	16	16
Lebanon	0	5	5
Lithuania	0	20	20
Macedonia*	1	1	2
Malaysia	1	8	9
Mauritius*	1	3	4
Mexico	24	125	149
Mongolia	0	6	6
Morocco	0	8	8
Netherlands	17	218	235
New Zealand	1	37	38
Nigeria	0	10	10
Norway	2	38	40
Pakistan*	1	1	2
Panama	0	5	5
Peru	0	3	3
Philippines	0	6	6
Poland	10	155	165
Portugal	21	43	64
Romania	2	31	33
Russian Federation	31	400	431
Saudi Arabia	0	12	12
Serbia	12	39	51
Singapore*	1	3	4
Slovakia	6	42	48
Slovenia*	1	7	8
South Africa	21	95	116
Spain	31	348	379
Sweden	16	123	139
Switzerland	6	131	137
Tajikistan	0	7	7
Thailand	9	22	31
Turkey	20	61	81
Ukraine	14	187	201
United Kingdom	53	654	707
United States	241	2,567	2,808
Unknown***	3	14	17
Uruguay	0	5	5
Vatican	1	8	9
Venezuela	4	19	23
Viet Nam	0	9	9
Grand Total	**1,195**	**11,264**	**12,450**

**Non-Member Country, ** New Member Country, ***Country Unknown*

IAU Signs Agreements for Five New Coordinating Offices

By LARS LINDBERG CHRISTENSEN

The IAU Office of Astronomy for Development (OAD) has established new coordinating offices in Armenia, Colombia, Jordan, Nigeria, and Portugal. These offices support the use of astronomy as a tool for development in specific regions and languages. The new partnerships align with the IAU's Strategic Plan, which aims to realize the societal benefits of astronomy.

Ferney Rodriguez (left), Dean of Science at Universidad de Los Andes, and Kevin Govender (right), Director of the OAD, following the signing of the agreement establishing the Andean Regional Office of the OAD. *[IAU]*

The agreements were signed at the Hawai'i Convention Center during the IAU XXIX General Assembly, with final signatures made during a press conference yesterday morning.

These new regional offices of the OAD (i.e., ROADs) will perform two important functions. First, they'll coordinate astronomy-for-development activities in their parts of the world. Second, Language Expertise Centers will coordinate across shared languages and/or cultural aspects. Each office is hosted by a local institution or consortium and is supported by regional partners. The new coordinating offices of the OAD are as follows:

1. The South West Asian Regional Office, hosted at the Byurakan Astrophysical Observatory in Armenia.
2. The Andean Regional Office, hosted jointly by the University of Los Andes, Colombia; Explora Park and Planetarium of Medellín, Colombia; and the Chilean Society of Astronomy, Chile.
3. The Arab Regional Office and Arabic Language Expertise Center, hosted by the Arab Union for Astronomy and Space Sciences and located at the United Nations Regional Centre for Space Science and Technology Education in Jordan.
4. The West African Regional Office, hosted at the Center for Basic Space Science, National Space Research and Development Agency, Nigeria.
5. The Portuguese Language Expertise Centre, hosted at Núcleo Interactivo de Astronomia, in collaboration with the Institute of Astrophysics and Space Sciences, Portugal.

These five sites bring the total OAD network to eight regional and three language nodes. These new facilities join the East Asian Regional Office and Chinese Language Expertise Centre in China; the East African Regional Office in Ethiopia; the South East Asian Regional Office in Thailand; and the Southern African Regional Office in Zambia.

The IAU is open to proposals for new Regional Offices and Language Expertise Centers. ✿

LARS LINDBERG CHRISTENSEN is IAU Press Officer, Head of the education and Public Outreach Department (ePOD) at the European Southern Observatory in Garching, Germany, and former President of IAU Commission 55.

On the ROAD in Armenia

By AREG M. MICKAELIAN & SONA V. FARMANYAN

We are delighted to announce that Armenia will host the South West Asian (SWA) Regional Office of Astronomy for Development (ROAD). The founding agreement for this new office was signed between the IAU and Byurakan Astrophysical Observatory (BAO) on 13 August at the XXIX General Assembly (page 5).

The history of astronomy in Armenia goes back to ancient times, when Armenians recorded this heritage in their landscape and culture through rock art, ancient observatories, calendars and chronology, historical records of astronomical events, medieval sky maps, and astronomical terms.

Located in the Southern Caucasus region, Armenia is uniquely situated to develop and promote astronomy education and knowledge. The non-Arabic nations in this region are making great strides to advance astronomy. These include Georgia, Azerbaijan, Iran, Turkey, and Israel; Arabic countries in the region have developed their own project for a similar center). In addition, Armenia is a former republic of the Soviet Union, and its astronomical community maintains close relations with other former Soviet republics, including other South Caucasus nations such as Russia, Ukraine, Belarus, and Moldova, as well as the Baltic and Central Asian states. (Some of the Central Asian countries may also join SWA ROAD.) Many European countries regard Armenia as a bridge between Europe and the East within the framework of the European Eastern Partnership program.

Recently we have conducted a number of new activities related to astronomy for development. For instance, in October 2014 the BAO and Armenian Astronomical Society organized the meeting "Relation of Astronomy to Other Sciences, Culture, and Society"

Byurakan Astrophysical Observatory in Armenia. *[BAO]*

in Byurakan. The meeting was important from the point of view of increasing the visibility of astronomy as a leader in interdisciplinary and multidisciplinary sciences. Activities related to archaeoastronomy and astronomy in culture were initiated as well.

We have begun efforts to strengthen collaborations with neighboring countries. A number of research projects have been accomplished between Armenian and Georgian astronomers, and many Georgian astronomers have defended their Ph.D. work at the BAO. This builds on the history of Armenian–Georgian astronomical colloquia. Since 1974, 14 meetings have been held at the Byurakan and Abastumani observatories. Each year, approximately 15 astronomers from one nation visit the other nation for scientific talks, joint discussions, and friendly competitions.

A new Armenian–Iranian Astronomical Workshop is planned for October 2015 to strengthen our scientific relations and establish new collaborations. We plan to organize similar workshops annually. Armenian–Iranian astronomical collaboration will include collaborative research grants, mutual visits for joint research work, organization of joint meetings as part of the collaborations, a summer school with participation by Iranian students, observations on joint projects with the Byurakan 2.6-meter telescope, and joint archaeoastronomical and cultural studies. ✿


AREG M. MICKAELIAN is Director of the South West Asian ROAD and Co-President of the Armenian Astronomical Society. He is also Lead Scientist at Byurakan Astrophysical Observatory. SONA V. FARMANYAN is the manager of Task Force 3, Astronomy for the Public, in the IAU South West Asian ROAD and serves as the IAU's Armenian National Coordinator.

COMMISSION C1

Astronomy Education and Development

By BEATRIZ GARCIA

Imagine a girl writing this list in her notebook: starlight, supermassive black hole, neutron star collision, 2nd law. Is this research? Is it homework? Not at all — these are the titles of songs by a British rock band called Muse. We are living in an era in which science and technology are everywhere, not just in universities, research institutions, and observatories.

The recent creation of Commission C1, Astronomy Education and Development, presents us with a unique opportunity to integrate programs, demonstrate the power of astronomy in everyday life, and play a fundamental role in the development of science education. After centuries of scientific endeavor, humans have developed powerful ways of explaining the workings of the universe. Ideas like elementary particles, general relativity, ships to planets or comets, and habitable zones or black holes in the galactic center, are everyday subjects of press articles, children's conversations, TV shows, cartoons, anime, clothes, and even songs by groups such as Muse. As astronomers we daily deal with new technologies and new discoveries, but we are we prepared to handle the public and educational aspects of astronomy?

In 2012, Commission 46 went through a revision as a result of the establishment of the Office of Astronomy for Development (OAD) and the corresponding transfer of activities of several Program Groups to the OAD. Moreover, the fact that the new IAU structure has no Program Groups has provoked a serious process of renovation and innovation.

The reorganized Commission prompted a new mission statement on education in astronomy, one that emphasized both the

Muse album covers. *[Muse]*

uniqueness of C46, which it was replacing, and its importance in the IAU structure: "The Commission seeks to further the development and improvement of scientific research into education and specifically astronomical education at all levels throughout the world, through stimulating, gathering, and exchanging scientific research in the field. This research should address epistemological questions, as well as innovative teaching and learning processes appropriate to the needs of astronomy education. The Commission will further encourage and develop efforts to disseminate this information at all levels, including people with special educational needs, or people with visual, hearing. and/or motor disabilities."

The main purpose of the new Commission C1 is to work on educational problems that support activities in the different Task Forces of the OAD. It realizes its mission through a thoroughly renewed structure with Working Groups on: Theory and Methods in Astronomy Education (WG1), the Network for Astronomy School Education (WG2), and the Working Group on Astronomy and Inclusion (WG3). It fosters projects that emphasize astronomy across disciplines, and research into how astronomy can improve the scientific literacy of youngsters.

The strategy developed in the past has proved to be quite successful, and the first step to realize our mission is the support of the IAU Symposium 326," Research in Astronomy Education: Far Reaching Impacts and Future Directions" to be held in October 2016.

As we look to the future, our immediate challenge is to coordinate the work of many people in the IAU and beyond who are promoting the adoption of successful educational programs such as Global Hands On Universe (GHOU), the Galileo Teacher Training Program (GTTP), the Association for Science Education (ASE), and Universe Awareness (UNAWE). The Commission can foster best practices in education, support diversity, defend identity, and help create a repository for resources, thus giving visibility to many anonymous collaborators. Ultimately, education in astronomy can help us to defend one of the great world heritages: the starry sky. ✿

BEATRIZ GARCIA is an astrophysicist and professor at the National Technological University, Faculty Mendoza, Argentina. She is the Chair of the IAU Working Group on Astronomy and Inclusion and President of Commission C1 for the period 2015-2018.

Applause for Every Shiny Meteor

An excursion to see the Perseid meteor shower from O'ahu's dark North Shore.

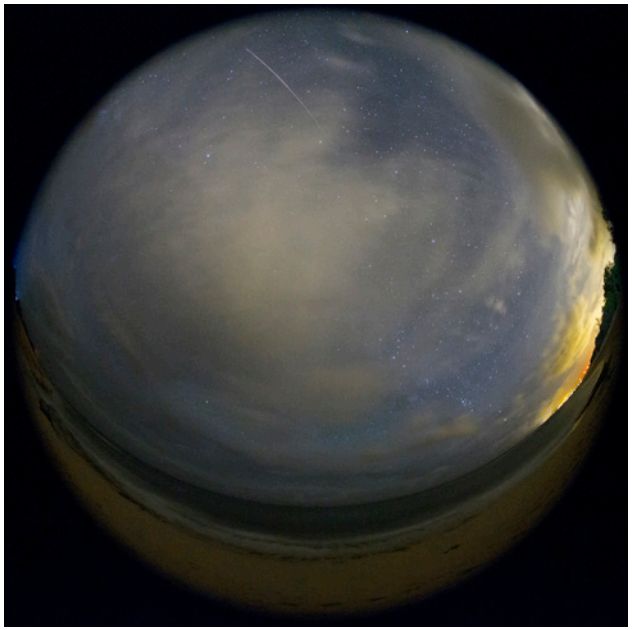
By IRIS NIJMAN, *Kai'aleleiaka*

In the night of 12–13 August, a group of 11 General Assembly attendees, including astrophotographer Babak Tafreshi, drove to Ka'ena Point on the North Shore of O'ahu to see the Perseid meteor shower. We brought blankets, chips, Japanese cookies, beer, cameras, and music — we would survive.

Lying on the beach, we could see the Milky Way prominently. While clouds didn't bother us too much, there was still some light pollution even though we were in one of the darkest spots on O'ahu. Hawai'i wasn't at the optimal longitude for this year's Perseids; the shower's peak occurred earlier in the day, favoring the U.S. East Coast. Nevertheless, we still saw more than 50 meteors, including a very bright streak behind the clouds, close to the horizon in the north — not a fireball but still impressive.

Left to right: Hidehiko Agata, Ramasamy Venugopal, Silvia Verdolini, Lucia Marchetti, Tibisay Sankatsing Nava, Ricardo García, Pedro Russo, Sze-leung Cheung, Iris Nijman, and Kevin Govender. *[Babak Tafreshi, twanight.org]*

Since our group consisted of people from almost every continent on Earth, interesting discussions came up about where one can see the best parts of the Milky Way, and some of us saw the stars in the northern sky — and a meteor shower — for the first time. We applauded loudly for every shiny meteor. Someone guessed, "The next one will show us the direction of where the 2021 General Assembly will be held!" A lot of them went northwest. It was a successful shooting star party! ✿



[Babak Tafreshi, twanight.org]

New IAU Division Steering Committees

By SUSANNA KOHLER & RICK FIENBERG, *Kai'aleleiaka*

The table on the next page lists the members of the IAU Division Steering Committees (DSCs) for the 2015–2018 triennium, reflecting the results of the recent elections. For additional information, including statistics on voter turnout, see Announcement ann15021 on the IAU website. Congratulations to all IAU members who won election to a Division Steering Committee!

IAU Division Steering Committees as of August 2015

Division A: Fundamental Astronomy

President: Anne Lemaître
Vice-President: Daniel Hestroffer
Elected Members (1st Term): Elisa Arias, Fernando Roig, Ralph Gaume
Elected Members (2nd Term): Nicole Capitaine, Sylvio Ferraz-Mello, Susan Stewart
Ex-Officio Members (Commission Presidents): Anthony Brown, Richard Gross, Catherine Hohenkerk, Cristian Beaugé, C.X2 Representative TBD
Advisor (Past President): Sergei Klioner

Division B: Facilities, Technologies and Data Science

President: Pietro Ubertini
Vice-President: Michael Burton
Elected Members (1st Term): Ana I. Gómez de Castro, Peter Quinn, Wenwu Tian
Elected Members (2nd Term): Gloria Dubner, Lisa Storrie-Lombardi
Ex-Officio Members (Commission Presidents): Simon F. Portegies Zwart, Michael Wise, Eric D. Feigelson, Gabriele Giovannini, Farid Salama, Saul J. Adelman, Richard F. Green
Advisor (Past President): David Silva

Division C: Education, Outreach and Heritage

President: John Hearnshaw
Vice-President: Susana Deustua
Elected Members (1st Term): Katrien Kolenberg, Linda Strubbe, Pamela L. Gay, Saeko S. Hayashi
Elected Members (2nd Term): Michèle Gerbaldi, Kazuhiro Sekiguchi
Ex-Officio Members (Commission Presidents): Beatriz Garcia, Pedro Russo, Xiaochun Sun, Clive Ruggles
Advisor (Past President): Mary Kay Hemenway

Division D: High Energy Phenomena and Fundamental Physics

President: Chryssa Kouveliotou
Vice-President: Elena Pian
Elected Members (1st Term): Anna Watts, Isabelle Grenier, Tadayasu Dotani
Elected Members (2nd Term): Anna Wolter, John Kirk, Xavier Barcons
Ex-Officio Members (Commission Presidents): Neil Gehrels, C.X1 Representative TBD
Advisor (Past President): Diana Worrall

Division E: Sun and Heliosphere

President: Yihua Yan
Vice-President: Sarah Gibson
Elected Members (1st Term): Toshifumi Shimizu, Eduard Kontar, Nandita Srivastava
Elected Members (2nd Term): Marc DeRosa, Rudolf von Steiger, Arnab Rai Choudhuri
Ex-Officio Members (Commission Presidents): Natalie A. Krivova, Lyndsay Fletcher, Ingrid Mann
Advisor (Past President): Lidia van Driel-Gesztelyi

Division F: Planetary Systems and Bioastronomy

President: Nader Haghighipour
Vice-President: Gonzalo Tancredi
Elected Members (1st Term): Maria Barucci, Daniela Lazzaro, Athena Coustenis
Elected Members (2nd Term): Paul Chodas, William Irvine, Didier Queloz
Ex-Officio Members (Commission Presidents): Jiri Borovicka, Alain Lecavelier des Etangs, Sun Kwok, C.X2 Representative TBD
Advisor (Past President): Giovanni Valsecchi

Division G: Stars and Stellar Physics

President: Corinne Charbonnel
Vice-President: David Soderblom
Elected Members (1st Term): Tabetha Boyajian, Geraldine J. Peters, Pierre Kervella
Elected Members (2nd Term): Francesca D'Antona, Virginia Trimble, Martin Asplund
Ex-Officio Members (Commission Presidents): Andrej Prsa, Artemio Herrero, John Lattanzio, Simon Jeffery, Ivan Hubeny
Advisor (Past President): Ignasi Ribas

Division H: Interstellar Matter and Local Universe

President: Bruce Elmegreen
Vice-President: Leonardo Testi
Elected Members (1st Term): Eva Schinnerer, Francisca Kemper, Cristina Chiappini
Elected Members (2nd Term): Holger Baumgardt, Diego Mardones, Michael Meyer
Ex-Officio Members (Commission Presidents): Eva K. Grebel, Thomas J. Millar, Letizia Stanghellini, Richard de Grijs
Advisor (Past President): Ewine van Dishoeck

Division J: Galaxies and Cosmology

President: Claus Leitherer
Vice-President: Matthew Malkan
Elected Members (1st Term): Leslie Hunt, Marcella Carollo, Jeremy Mould
Elected Members (2nd Term): Stephane Courteau, Andy Bunker, Monica Rubio
Ex-Officio Members (Commission Presidents): Denis Burgarella, Avery A. Meiksin, C.X1 Representative TBD
Advisor (Past President): Françoise Combes

A New Paradigm in Academic Publishing

PonoPubs is changing academic publishing to benefit authors and readers.

By INGE HEYER, *Kai'aleleiaka*

Have you ever wanted to publish a monograph on your research or a new astronomy teaching tool but found that no traditional publisher will take a risk on it because "there just isn't a market for this sort of thing?" Sure you have. Yet your friends and colleagues keep asking you for copies of your notes. So there *is* a market — you just can't be sure how big it is.

This is where Stephanie Slater comes in. She's the owner and Managing Editor for Pono Publications, a small independent publisher that uses innovative print-on-demand techniques to create both physical and electronic versions of your work. Slater has a platform for rapidly marketing and quickly distributing your product. Pono Publications has science editors, copy editors, and layout, design, and graphics experts to make your book or e-book look exactly the way you want.

Asked for the philosophy of her approach to publishing, Slater explains, "Pono is a rich Hawaiian word that loosely translates as 'being righteous and harmonious,' so Pono Publications is built upon the idea of helping people learn and share knowledge to be harmonious with the world. Practically, this means working closely with the authors and producing results that the readers find useful and enjoyable."

If you work with Pono Publications, you become an integral part of the team that works on your book, so spreading the word is partially up to you. The more you tell people about your work

Stephanie Slater explains to local Hawaiian teachers how to use Galileo's Classroom at the Pono Publications booth in the IAU Exhibit Hall. *[Inge Heyer, Kai'aleleiaka]*

Congratulations to

Farid Salama!

You have won a
FirstScope 76-mm reflector (value: $50) from Celestron in Torrance, California.

Redeem your prize at Exhibit Hall Booth 336

— not only through traditional means such as conferences and websites, but also via social media — the more people will know about it, the more instructors are likely to adopt your work for their classrooms, and the more profit you'll make. The cost of publishing with a small press is generally lower than the cost of working with a larger "legacy" publisher. This benefits both the author (who makes more money) and the reader (who pays less for the product).

If this concept of a small publishing house appeals to you, visit Booth 306 in the Exhibit Hall and talk to Slater and her team. You can take the opportunity to look at the books Pono has already published and talk to some of their highly satisfied authors. ✿

COMMISSION F3

A New Commission on Astrobiology

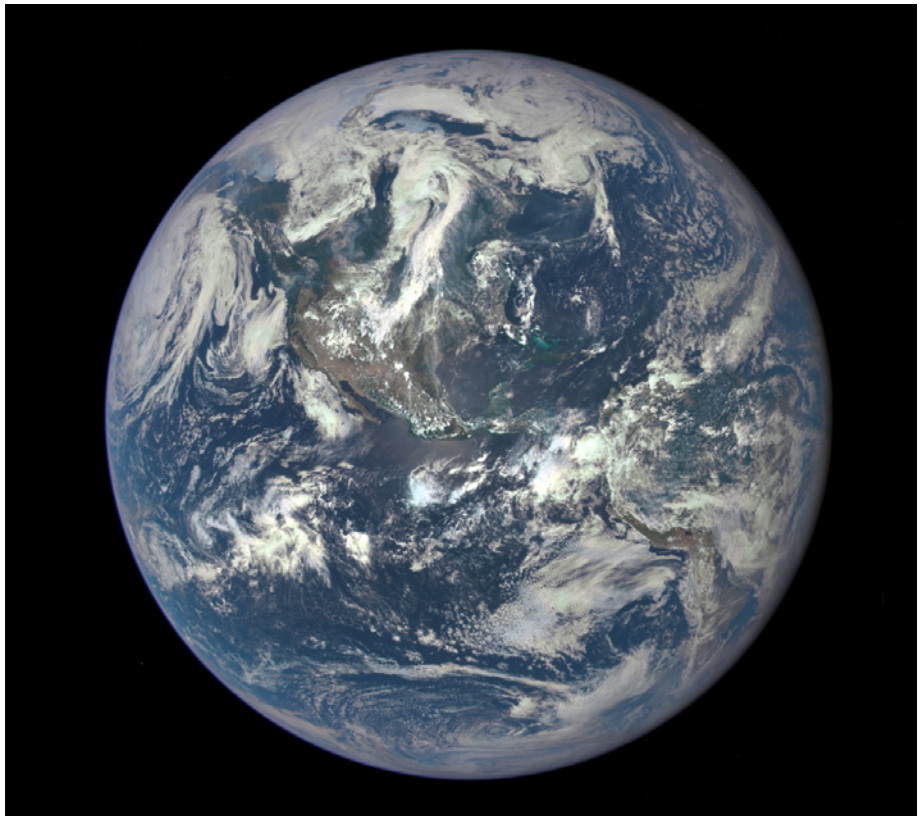
By SUN KWOK

Astrobiology is an interdisciplinary subject that encompasses research in astronomy, biology, chemistry, geology, and planetary science. It integrates results obtained from space missions to planets, planetary satellites, comets, and asteroids with laboratory studies of meteorites and with spectroscopic observations of circumstellar and interstellar molecules and solids, protoplanetary disks, and exoplanets. In also ties together theorists and observers, along with scientists performing laboratory simulations on the formation of organics in the space environment and laboratory studies on chemical pathways to life.

The grand goal of astrobiology is to paint a coherent picture of the synthesis of the basic ingredients of life (as we know it) in circumstellar envelopes, the interstellar medium, the solar system, and other planetary systems — and to correlate these findings with studies of the early Earth. Through these interdisciplinary efforts, astrobiology expands our understanding of the origin of life on Earth and the possibility of life elsewhere in the universe.

The new Commission F3 evolved from the previous IAU Commission 51, Bioastronomy. C51 has organized interdisciplinary conferences every three years since 1984, and C.F3 plans to continue this tradition.

Beside conferences, Commission F3 plans to have an active education program. Since there is a great deal of public inter-



The Deep Space Climate Observatory (DSCOVR) is revealing the Earth and its rich biosphere in amazing detail. A major goal of astrobiology is to determine whether our planet is unique as an abode for life. *[NASA]*

est in astrobiology, the C.F3 hopes to serve as an authoritative resource for answering public questions on the implications of new findings from space missions relating to extraterrestrial life, and for debunking pseudo-scientific theories that often appear in the popular press. We will also seek to establish astrobiology as an attractive and exciting field of research for our fellow scientists. ✿

SUN KWOK, of the University of Hong Kong, China–Nanjing, works on the synthesis of organic compounds in the late stages of stellar evolution. He acknowledges assistance with this article from Edwin Bergin and Pascale Ehrenfreund, his co-chairs on the Scientific Organizing Committee of Focus Meeting 15, held during the first week of the IAU XXIX General Assembly in Honolulu.

Honolulu Almanac 🐟 14 August 2015

Sunrise / set	6:10 am / 7:02 pm
Twilight[1] start / end	4:51 am / 8:20 pm
Moonset / rise	6:17 am / 7:12 pm
Moon phase[2]	● New (0% illum.)
Evening planet[3]	Saturn (SSW)
Morning planet[3]	Mars (E)
Special event	New Moon (exact at 4:53 am)

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

A bright Perseid meteor streaks across the sky on Thursday morning, 13 August, as seen from O'ahu's North Shore. *[Babak Tafreshi, twanight.org]*

Astronomy Outreach Challenged by a Data Tsunami

By PEDRO RUSSO

Astronomy communication has evolved rapidly during the past few years, as new techniques and technologies have been adopted. Research astronomy has also visibly changed, as the automation of survey systems and the launch of new telescopes have produced a tsunami of big data sets. We are still defining the best techniques to prevent important knowledge from being drowned out by the sheer volume of content.

With an average of 40 scientific papers published on the astro-ph preprint server every day, it is necessary to curate and develop new and innovative ways of steering both professional astronomers and the public through the huge amounts of research output. There have been some successful initiatives designed to research the best practices for using new technologies to communicate science, ranging from using social media to reach new audiences, to engaging the public through citizen science.

Focus Meeting 19, Communicating Astronomy with the Public in the Big Data Era, was a forum to discuss best practices and lessons learned, and to address how we can stay ahead of the new challenges for the field of astronomy communication. FM 19 combined traditional invited talks with extensive discussion-based workshops.

Invited speakers tackled a diversity of topics. Rick Fienberg (AAS and Editor in Chief of this newspaper) discussed the challenges of career recognition for astronomy researchers and communicators who engage in education and public outreach (EPO). He cited the "Sagan effect" — the attitude that contact with the public is inversely proportional to academic achievement. He suggested that it's less prevalent among young scientists than older ones, but that since older ones still do most of the hiring, the Sagan effect still causes problems for early-career astronomers.

Karen Masters (University of Portsmouth, U.K.) presented results from her project Volunteer and Crowdsourcing Economics (VOLCROWE), which investigates the relationship between people's participation in science and their motivations. They found that citizen-science projects with a higher scientific impact engage more with their volunteers.

Marta Entradas (University Institute of Lisbon & London School of Economics) stressed the need for a better understanding of the public through science-communication research and the need to support astronomy communicators through research. Mathieu Isidro (SKA) outlined the challenges to communicate a global project in the new social-media landscape and emphasized the need for a strong and trustworthy relationship between the communication team and the research team for successful EPO initiatives.

How to Say It in Hawaiian

- Kilo hōkū: astronomer
- Lewa: sky, space
- Nāhiku: Big Dipper
- Makaliʻi: Pleiades
- Ukalialiʻi: Mercury
- Hōkūloa: Venus
- Kaʻāwela: Jupiter

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 ʻokina, signals a glottal stop. Source: Ulukau Hawaiian Dictionary.

Discussion groups explored ideas around the use of data for informal learning, public understanding of data, data visualization, EPO training for researchers and future communicators, and using data to build digital engagement initiatives. A comprehensive report of these discussions will be published by Cambridge University Press in the publication *Focus on Astronomy*.

It is clear that scientists and communicators must work together to engage the public with science and safely navigate this data flood. The next couple of decades will be exciting for astronomy — we just need to make sure that we will be able to bring that excitement to the public. ✿

PEDRO RUSSO is International Project Manager for Universe Awareness at Leiden University, the Netherlands, and the President of IAU Commission C2, Communicating Astronomy with the Public.

Book 'em, Danno!

Reporting from the streets of Honolulu at the filming of the TV show "Hawaii Five-0."

By INGE HEYER, *Kaiʻaleleiaka*

Many people recognize "Book 'em, Danno!" as the signature catchphrase of Commander Steve McGarrett, leader of the special investigative team in the TV show *Hawaii Five-0*. The original series ran for 12 seasons, from 1968 to 1980, and featured a team of four police investigators solving crimes throughout Hawaiʻi. McGarrett was played by Jack Lord, who stayed in Hawaiʻi after the series' end and whose statue you can visit at the Kahala Mall in Honolulu, outside the entrance to Macy's.

The TV series was revived in 2010, with new actors playing the familiar roles, albeit with some character changes and new additions to the team. The new series, like the original, is filmed entirely in the state of Hawaiʻi, bringing in revenue and providing work for local film and TV crews.

While my brother-in-law, who lives here, tends to complain whenever the filming causes traffic jams, most folks in Hawaiʻi take the occasional disruptions by McGarrett and his team in stride. Tourists, on the other hand, find it fascinating, if Wednesday's scene at the Sheraton Waikīkī is anything to go by.

The film crew had set up at the Edge Bar, one of the poolside watering holes on the oceanfront Sheraton property. Each scene was carefully planned by the crew and the "second team," standins for the principal actors. When everything was ready, taking light, wind, and noise from occasional passing airplanes or boats into account, the actors came out and shot the scene.

Filming *Hawaii Five-0* on location: McGarrett (played by Alex O'Loughlin) and Kalākaua (played by Grace Park). *[Inge Heyer, Kaiʻaleleiaka]*

Wednesday afternoon's filming involved McGarrett (now played by Alex O'Loughlin) and officer Kono Kalākaua (played by

Actors Alex O'Loughlin and Willie Garson in discussion. *[Inge Heyer, Kai'aleleiaka]*

The badge carried by all Five-0 members. *[Inge Heyer, Kai'aleleiaka]*

The scene at The Edge Bar. *[Inge Heyer, Kai'aleleiaka]*

Grace Park) arresting a guest character (played by Willie Garson). The crew filmed the same scene several times from a few different angles, both long shots and close-ups. The production assistants moved among the crowd, trying to keep the tourists from taking pictures, which was like trying to herd cats. This reporter, playing tourist, employed stealth techniques to get a few shots of the action while the cameras weren't rolling.

A second scene was set up after sunset at the Rum Fire restaurant, also on the Sheraton grounds. This scene involved the *Five-0* team getting together with some associates for dinner. The second team set up the scene, then the actors came in to take their places while waitresses brought them refreshments. McGarrett and Kalākaua were now joined by Detective Chin Ho Kelly (played by Daniel Dae Kim), Captain Lou Grover (played by Chi McBride), intrepid shrimp-truck operator Kamekona (played by Taylor Wily), conspiracy expert Jerry Ortega (played by Jorge Garcia), and surprisingly, the previously arrested guest character. Notably absent was Detective Danny Williams (played by Scott Caan). Sadly it was then too dark to take a photo of this group from my location, so my days as a stealth paparazzi photographer were over.

Hawaii Five-0's sixth season premieres on 25 September on CBS, so it shouldn't be too long before you can watch the episode that was filmed in Honolulu this week. ✿

New IAU Commission Organizing Committees

By SUSANNA KOHLER & RICK FIENBERG, *Kai'aleleiaka*

The following tables list the members of the IAU Commission Organizing Committees (OCs) for the 2015–2018 triennium, reflecting the results of the recent elections. For additional information, including statistics on voter turnout, see Announcement ann15024 on the IAU website. Congratulations to all IAU members who were elected to a Commission Organizing Committee!

IAU Commission Organizing Committees as of August 2015

C.A1: Astrometry

President: Anthony G.A. Brown; **Vice-President**: Jean Souchay; **Members**: Norbert Zacharias, Dafydd Evans, Alexandre Humberto Andrei, Stephen C. Unwin, Yoshiyuki Yamada

C.A2: Rotation of the Earth

President: Richard Stewart Gross; **Vice-President**: Florian Seitz; **Members**: Jose Ferrandiz, Vladimir Zharov, Alberto Escapa, Daniela Thaller

C.A3: Fundamental Standards

President: Catherine Y. Hohenkerk; **Vice-President**: Brian Luzum; **Members**: Nicole Capitaine, Dennis Mc-Carthy, Charles H. Acton, John A. Bangert

C.A4: Celestial Mechanics and Dynamical Astronomy

President: Cristian Beaugé; **Vice-President**: Alessandra Celletti; **Members**: Jacques Laskar, Daniel Scheeres, Douglas P. Hamilton, Eiichiro Kokubo, Bonnie Alice Steves

C.B1: Computational Astrophysics

President: Simon F. Portegies-Zwart; **Vice-President**: Dmitrij Bisikalo; **Members**: Sungsoo Kim, Mike Shara, Christian M. Boily, Irina N. Kitiashvili, Garrelt Mellema

C.B2: Data & Documentation

President: Michael Wise; **Vice-President**: Anja C. Schröder; **Members**: Robert J. Hanisch, Chenzhou Cui, R. Elizabeth M. Griffin, Arnold H. Rots, Rob Seaman

C.B3: Astroinformatics and Astrostatistics

President: Eric D. Feigelson; **Vice-President**: Prajval Shastri; **Members**: Eric B. Ford, Alan Heavens, Fionn Murtagh, Saeqa Dil Vrtilek, Yanxia Zhang

C.B4: Radio Astronomy

President: Gabriele Giovannini; **Vice-President**: Anthony Beasley; **Members**: Xiaoyu Hong, Nicholas Seymour, Joseph Lazio, Jan van der Hulst, Wim van Driel, Tony H. Wong

C.B5: Laboratory Astrophysics

President: Farid Salama; **Vice-President**: Helen J. Fraser; **Members**: Paul Barklem, Thomas Henning, Harold Linnartz, Gianfranco Vidali, Feilu Wang

C.B6: Astronomical Photometry and Polarimetry

President: Saul J. Adelman; **Vice-President**: Antonio Mario Magalhaes,; **Members**: Carme Jordi, Kevin Volk, Pierre Bastien, Richard Ignace, J. Allyn Smith

C.B7: Protection of Existing and Potential Observatory Sites

President: Richard F. Green; **Vice-President:** Constance Elaine Walker; **Members:** Ramotholo Sefako, David Galadí-Enríquez, Harvey Steven Liszt, Yongheng Zhao

C.C1: Astronomy Education and Development

President: Beatriz Elena Garcia; **Vice-President:** Paulo Sergio Bretones; **Members:** Jean-Pierre de Greve, Amelia Ortiz Gil, Kathleen DeGioia Eastwood, Christopher David Impey, Nicoletta Lanciano

C.C2: Communicating Astronomy with the Public

President: Pedro Russo; **Vice-President:** Rick Fienberg; **Members:** Lars Lindberg Christensen, Megan Kirsty Argo, Carol Ann Christian, Kingsley C. Okpala, Sylvie D. Vauclair

C.C3: History of Astronomy

President: Xiaochun Sun; **Vice-President:** Wayne Orchiston; **Members:** Ray Norris, David Valls-Gabaud, Owen Gingerich, Jay M. Pasachoff, Christiaan L. Sterken

C.C4: World Heritage and Astronomy

President: Clive L.N. Ruggles; **Vice-President:** Gudrun Wolfschmidt; **Members:** Mikhail Marov, Malcolm Smith, Roger Ferlet, Siramas Komonjinda

C.D1: Gravitational Wave Astrophysics

President: Neil Gehrels; **Vice-President:** Marica Branchesi; **Members:** Pierre Binetruy, Richard Manchester, Federico Ferrini, David H. Shoemaker, Robin Stebbins

C.E1: Solar Radiation and Structure

President: Natalie A. Krivova; **Vice-President:** Alexander Kosovichev; **Members:** Gianna Cauzzi, Natalia Shchukina, Michele Bianda, Nicolas Labrosse, Yoshinori Suematsu

C.E2: Solar Activity

President: Lyndsay Fletcher; **Vice-President:** Paul S. Cally; **Members:** Karel Schrijver, Philippa K. Browning, Jongchul Chae, Manolis K. Georgoulis, Amy R. Winebarger

C.E3: Solar Impact Throughout the Heliosphere

President: Ingrid Mann; **Vice-President:** Carine Briand; **Members:** Olga Malandraki, Dibyendu Nandi, Margit Haberreiter, Kanya Kusano, Ilya G. Usoskin

C.F1: Meteors, Meteorites, and Interplanetary Dust

President: Jiri Borovicka; **Vice-President:** Diego Janches; **Members:** Petrus Matheus Marie Jenniskens, Galina O. Ryabova, David J. Asher, Margaret D. Campbell-Brown, Jérémie J. Vaubaillon

C.F2 Exoplanets and the Solar System

President: Alain Lecavelier des Etangs; **Vice-President:** Jack J. Lissauer; **Members:** Mark Lemmon, Regis Courtin, Patrick Michel, Alessandro Morbidelli, Feng Tian, Paul A. Wiegert

C.F3: Astrobiology

President: Sun Kwok; **Vice-President:** Masatoshi Ohishi; **Members:** Muriel Gargaud, Nils Holm, Jesus Martinez-Frias, Joseph A. Nuth, Sergio Pilling

IAU Commission Organizing Committees as of August 2015

C.G1: Binary and Multiple Star Systems

President: Andrej Prsa; **Vice-President**: Virginia Trimble; **Members**: Brian Mason, Robert D. Mathieu, Terry Oswalt, John Southworth, Christopher Adam Tout, Tomaž Zwitter

C.G2: Massive Stars

President: Artemio Herrero Davo; **Vice-President**: Jorick S. Vink; **Members**: Gregor Rauw, Nicole St-Louis, You-Hua Chu, Asif ud-Doula, Jose H. Groh

C.G3: Stellar Evolution

President: John C. Lattanzio; **Vice-President**: Marc Howard Pinsonneault; **Members**: Marco Limongi, Zhanwen Han, Franz Kerschbaum , Marcella Marconi, Gražina Tautvaišiene, Jacco Th. Van Loon

C.G4: Pulsating Stars

President: Christopher Simon Jeffery; **Vice-President**: Jaymie Matthews; **Members**: Karen Pollard, Denis Stello, Saskia Hekker, Joyce Ann Guzik, Hiromoto Shibahashi

C.G5: Stellar & Planetary Atmospheres

President: Ivan Hubeny; **Vice-President**: Carlos Allende Prieto; **Members**: France Allard, Katia Cunha, Adam Showman, John D. Landstreet, Thierry Lanz, Lyudmila I. Mashonkina

C.H1: Local Universe

President: Eva K. Grebel; **Vice-President**: Dante Minniti; **Members**: Gang Zhao, Evangelie Athanassoula, Sofia Feltzing, Yasuo Fukui, Vanessa M. Hill, Margaret Meixner

C.H2: Astrochemistry

President: Thomas J. Millar; **Vice-President**: Edwin A. Bergin; **Members**: Satoshi Yamamoto, Paola Caselli, Yuri Aikawa, Maria R. Cunningham, Jes K. Jørgensen

C.H3: Planetary Nebulae

President: Letizia Stanghellini; **Vice-President**: Albert Zijlstra; **Members**: Arturo Manchado, Karen B. Kwitter, Orsola De Marco, Miriam Pena

C.H4: Stellar clusters throughout Cosmic Space and Time

President: Richard De Grijs; **Vice-President:** Amanda I. Karakas; **Members:** Francesca D'Antona, André Moitinho, Jan Palouš, Ernst Paunzen, Alison I. Sills

C.J1: Galaxy Spectral Energy Distributions

President: Denis Burgarella; **Vice-President:** Cristina Carmen Popescu; **Members:** Amy Barger, Rob Kennicutt, Asantha R. Cooray, Daniel Schaerer, Toru Yamada

C.J2: Intergalactic Medium

President: Avery Abraham Meiksin; **Vice-President:** Hsiao-Wen Chen; **Members:** Nissim Kanekar, Joop Schaye, Valentina D' Odorico, Jason X. Prochaska

C.X1: Supermassive Black Holes, Feedback and Galaxy Evolution

President: William Richard Forman; **Vice-President:** Thaisa Storchi-Bergmann; **Members:** Judith H. Croston, Sebastian Heinz, Roberto Maiolino, Sera B. Markoff, Hagai Netzer, Marta Volonteri

C.X2: Solar System Ephemerides

President: Andrea Milani Comparetti; **Vice-President:** William M. Folkner; **Members:** Jean-Eudes Arlot, Steven R. Chesley, Elena V. Pitjeva, Paolo Tanga

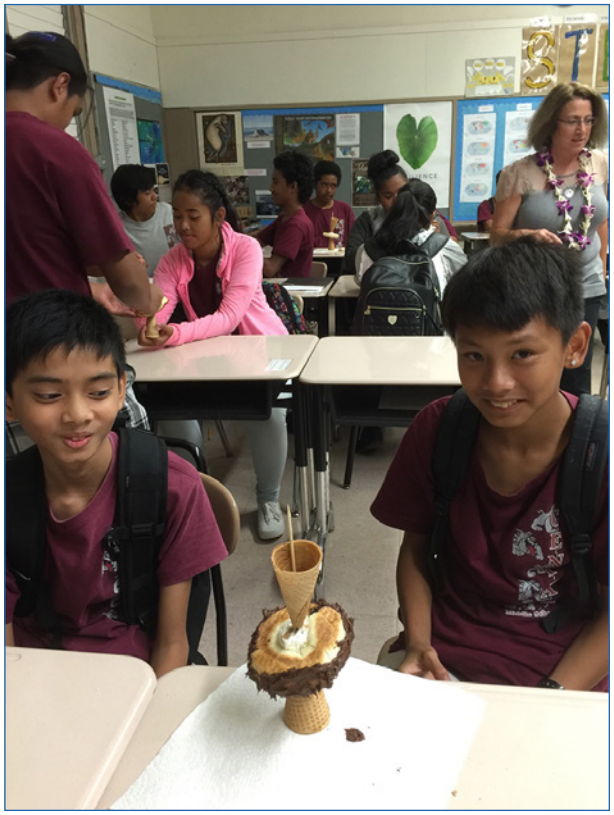
The Subaru and Keck I telescopes on Maunakea at sunset. *[Babak Tafreshi/NAOJ]*

What Does an Active Galaxy Taste Like?

By LYNN COMINSKY

On Thursday, 6 August, I visited more than 120 eighth-grade students (ages 13-14 years old) at Central Middle School in downtown Honolulu during their Earth science classes. Throughout the day I helped students develop a taste for active galaxies by building models out of familiar food items, including bagels, ice-cream cones, marshmallows, chocolate frosting, and chocolate sprinkles.

I augmented this popular classroom activity with the *Active Galaxy Pop-Up Book* produced by NASA's Fermi Gamma-ray Space Telescope mission and with a video slideshow to help students understand the difference between fact and fiction when it comes to black holes. Once the models were built, the students could view them from different angles and compare what they saw to astronomical images of active galaxies. This helps them to understand that distant galaxies with supermassive black holes in their cores can appear quite different depending upon your viewing angle.



Students sit with their edible active galaxy model. The bagel plays the role of the galaxy's disk, while the ice-cream cones represent energetic jets. *[Becky Moylan]*

I always love doing this activity with kids, as black holes are one of the few astronomical phenomena that are familiar to almost everyone, but much of what students have learned about them is scientifically inaccurate. Plus, kids love activities that include food, and everyone is always happy to eat their models once they're done learning about them!

The students' teacher, Becky Moylan, said, "It is so exciting for the students to make a black-hole model using food. They are so lucky to have a real astronomer come and visit the classroom!"

Honolulu Weather Forecast 14–15 August 2015

FRIDAY, 14 AUGUST		***High: 87°F / 30°C Low: 76°F / 24°C***
Morning	**Afternoon**	**Evening**
Partly cloudy	Partly cloudy	Partly cloudy
15% chance of rain	20% chance of rain	10% chance of rain
SATURDAY, 15 AUGUST		***High: 87°F / 30°C Low: 76°F / 24°C***
Morning	**Afternoon**	**Evening**
Partly cloudy	Partly cloudy	Partly cloudy
25% chance of rain	10% chance of rain	10% chance of rain

Extended forecast: Extended forecast: Temperatures will be cooler over the coming week. On Friday gusty winds will develop during the afternoon, then after Sunday the chance of rain will increase to between 50% and 75% until Thursday, 20 August. By then, of course, most General Assembly attendees will no longer be in Honolulu. We hope you enjoyed your time in beautiful Hawai'i! Source: Weather Underground.

For details of other classroom activities on active galaxies and black holes, please take a look at the Fermi Telescope Teacher Resources webpage. If you would like to receive a copy of the *Active Galaxy Pop-Up Book* and the accompanying educator's guide, please email me with your postal address. ✿

LYNN COMINSKY is Professor and Chair of the Physics and Astronomy Dept. at Sonoma State University (SSU) in California. She is also Director of the SSU Education and Public Outreach Group, which develops innovative school curricula for primary-school, secondary-school, and college classrooms.

The IAU Office for Astronomy Outreach

By SZE-LEUNG CHEUNG

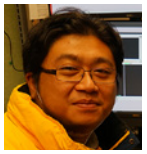
During the International Year of Astronomy 2009 (IYA 2009), the European Southern Observatory hosted a coordinating office on behalf of the IAU Secretariat. Based on the incredible success of this office and the endeavors it facilitated, in 2012 the IAU Executive Committee funded the establishment of the IAU Office for Astronomy Outreach (OAO). The OAO is hosted by the National Astronomical Observatory of Japan (NAOJ) in Tokyo.

The OAO is the IAU's hub for coordinating public-outreach activities worldwide. The aim is to build networks to support and disseminate information to the amateur-astronomy and public-outreach communities, and to ultimately make it easier for the public to access information about our universe.

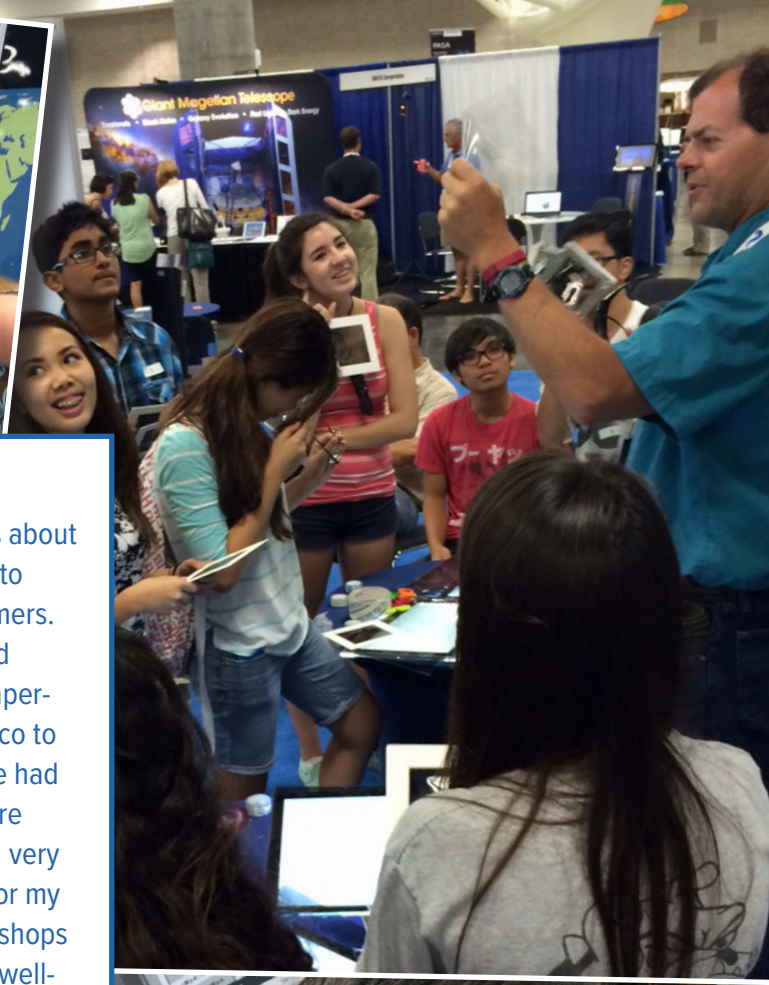
One of the key goals of the OAO is to build a global network of astronomy-related organizations through two channels: the National Outreach Contacts (NOCs) and the IAU Directory of World Astronomy. Ultimately we hope to build a global astronomy network that connects all interested astronomers, observatories, amateurs, educators, and teachers. The OAO will leverage the NOCs network to reach diverse local communities. To date we have registered more than 600 organizations in the IAU Directory of World Astronomy, but we do need help recruiting more organizations.

The next phase of development will include the launch of an events calendar to serve as a portal for worldwide astronomical activities. This builds on the OAO's goal of distributing and promoting global astronomical events and outreach news through the IAU Astronomy Outreach Newsletter. Please subscribe online to get astronomy-outreach information delivered to your inbox.

The OAO has been responsible for the implementation of two flagship outreach programs: the Cosmic Light projects for the International Year of Light 2015 and the NameExoWorlds contest to engage the public in naming exoplanets. ✿



SZE-LEUNG CHEUNG, originally from Hong Kong, is the International Outreach Coordinator at the IAU Office for Astronomy Outreach, based at the National Astronomical Observatory of Japan in Tokyo.



Hooray for Hands-on Science!

On Wednesday the IAU Exhibit Hall was busier than usual as about 200 local primary- and secondary-school students came by to engage in hands-on activities and ask questions of astronomers. Sponsored by Associated Universities, Inc., the event proved extremely popular with both the children and their adult chaperones. “Thank you for making it possible for my nephew Marco to attend today’s student activities,” wrote the boy’s uncle. “He had a great time and came back with many stories and even more questions. It was a true learning experience that he enjoyed very much.” “Thank you so much for a phenomenal experience for my girls,” wrote their mother. “We thoroughly enjoyed the workshops and appreciate all the hard work that everyone put into the well-run program.” *[Top left: Carey & Ivan Yen; bottom right: Linda Baek Cho; all others: Debbie Kovalsky, AAS]*

— Rick Fienberg, Kaiʻaleleiaka

Don’t Miss CAP 2016 in South America!

Join us in Colombia for “Communicating Astronomy with the Public 2016” next May.

By OANA SANDU

Join members of IAU Commission C2 and other astronomy communicators in Medellín, Colombia, for the CAP 2016 conference next 16–20 May. *[Parque Explora]*

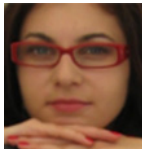
Research astronomers with an interest in science communication and outreach, as well as professional communicators, press officers, science journalists, amateur astronomers, and facilitators engaging different audiences with science and technology are invited to Colombia from 16 to 20 May 2016 to discuss the latest challenges in astronomy communication and public outreach.

The IAU, in cooperation with the Explora Park Science Center, will organize the Communicating Astronomy with the Public (CAP) 2016 conference in Medellín, Colombia. This is the eighth in a series of meetings organized by IAU Commission 2 (formerly C55). CAP 2016 will be the first such gathering in South America.

At the conference you’ll have the opportunity to participate in workshops and hands-on activities on three main themes: public engagement, media relations, and challenges in astronomy communication. Public-engagement topics are designed to address the needs of informal audiences and include using entertainment to communicate science, developing a visitor center, global networking campaigns, and citizen science. The media-relations programming is designed to train professionals in a variety of fields in writing press releases, talking with the media, and getting media exposure on a low budget. Finally, recognizing that communications isn’t always straightforward, the final track addresses issues of management and crisis communications as well as fundraising.

Also on the CAP 2016 agenda will be opportunities to meet others from around the world who share your interests in astronomy communication, as well as chances to meet the people behind some of the most popular, original, and unconventional astronomy outreach campaigns.

To register your interest in CAP 2016, please join the conference mailing list. We encourage you to follow our Facebook page and keep an eye on the Twitter hashtag #CAP2016. Registration will open soon. ✿



OANA SANDU is Community Coordinator for ESO’s education and Public Outreach Department (ePOD), where she works on social-media management, promotion and distribution, and networks and partnerships. She is Co-Chair of C.C2’s CAP Conferences Working Group.

Inspiring Every Child with Our Wonderful Universe

By GEORGE MILEY, TIBISAY SANKATSING NAVA & IRIS NIJMAN

Universe Awareness (UNAWE), a pioneering global science-education program, has developed a lot since its international office was founded in Leiden, the Netherlands, in 2006. UNAWE uses the beauty and grandeur of the universe to encourage young children — particularly those from underprivileged backgrounds — to take an interest in science and technology and to foster their sense of global citizenship. Our network has grown to involve 61 countries, has been endorsed by the IAU, and is an integral part of the IAU's Strategic Plan) — a blueprint that aims to use astronomy to foster education and provide skills in science and technology throughout the world, particularly in developing countries.

In the past four years, UNAWE has produced more than 10,000 inquiry-based learning resources and trained more than 2,300 teachers — reaching 81,000 students through direct and indirect activities. Other major achievements include the development and distribution of 10,000 Earth balls; the development and distribution of 1,000 Universe in a Box astronomy kits for primary-school teachers; and the creation of Space Scoop, an astronomy news service for children.

A new follow-up project, EU Space Awareness, has been welcomed to the fold, thanks to 2 million euros in funding from the European Union, which will also facilitate limited continuation of UNAWE activities for an additional three years. EU Space Awareness will use the excitement of space science to attract young people to science and technology, while also stimulating European and global citizenship. Unlike UNAWE, this project will also have activities for teenagers. The project will highlight opportunities offered by careers in space science and engineering and inspire children at a moment in their lives when their curiosity is high and their value systems are being formed. EU Space Awareness is a three-year project; it began in March 2015 with 10 partner organizations and 15 network nodes in 17 European countries, with global dissemination by the IAU Office of Astronomy for Development (OAD) in South Africa.

UNAWE's educational toolkit Universe in a Box features a variety of activities to stimulate interest and learning in science, technology, engineering, and mathematics. *[UNAWE]*

EU Space Awareness will develop and distribute educational resources, organize teacher training, and sponsor a high-impact event for teachers and policy makers at the European Parliament. It will leverage extensive European school networks and science museums to reach teachers, schools, and the general public and will work closely with the European Space Agency (ESA). Particular attention will be paid to stimulating interest among girls and ethnic minorities, reaching children in underprivileged communities, where a lot of talent is currently unrecognized. ✿



GEORGE MILEY is the founder of UNAWE and Professor of Astronomy at Leiden University in Leiden, the Netherlands. TIBISAY SANKATSING NAVA is National Project Manager for UNAWE in the Netherlands. IRIS NIJMAN studied biomedical sciences at Leiden University and now works in the UNAWE office as a science writer. She is also on the staff of *Kaiʻaleleiaka*.

The Social Network

Newly added to the General Assembly this year, the IAU Networking Reception was held on Wednesday evening, 12 August, in the Rainbow Room at the Hilton Hawaiian Village resort. Packed with hundreds of attendees, it provided a great opportunity to catch up with colleagues in an informal setting, meet new friends, and enjoy top-notch food and drink. *[All photos: Jennifer Cline, AAS]*

COMMISSION H1

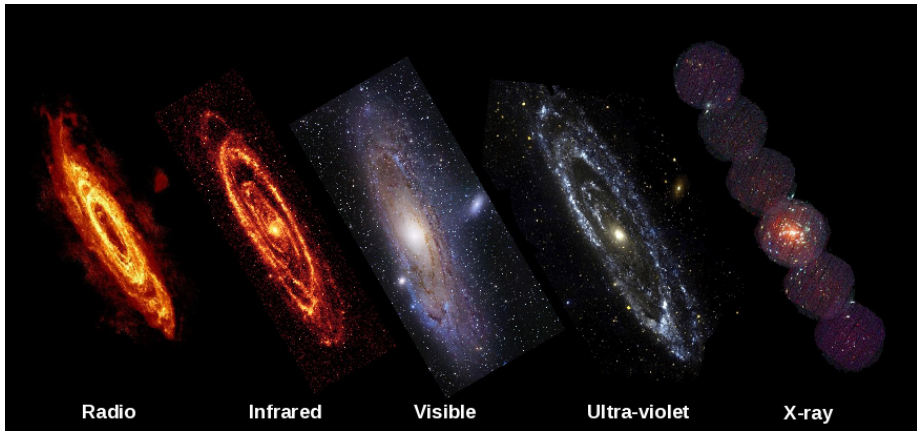
Exploring the Local Universe

By EVA GREBEL

The new Commission H1, Local Universe, concerns “near-field cosmology” — how galaxies form and evolve based on high-resolution observations of the Milky Way and nearby galaxies. The field is supported by a wide range of recent, ongoing, and forthcoming surveys in all wavelength ranges, by novel observing capabilities of high resolution and sensitivity, and by substantial advances in theoretical modeling.

We live in the era of massive ground-based and space-based photometric, spectroscopic, and astrometric surveys of resolved stellar populations. These efforts are complemented by extensive campaigns to map the properties of dust and the multiphase interstellar medium across a wide range of temperatures. Other efforts focus on high-energy sources or on searches for dark-matter signals from nearby dwarf galaxies.

In the longer term, major new facilities will play key roles, including the Large Synoptic Survey Telescope (LSST), the European Extremely Large Telescope (E-ELT), the Giant Magellan Telescope (GMT), the Thirty Meter Telescope (TMT), the James Webb Space Telescope (JWST), Euclid, the Wide Field Infrared Survey Telescope (WFIRST), the Square Kilometre Array (SKA), the Cerenkov Telescope Array (CTA), the extended Röntgen Survey with an Imaging Telescope Array (eROSITA), and the Advanced Telescope for High ENergy Astrophysics (ATHENA). Complex cosmological and chemo-dynamical simulations combining dark matter and baryons are now approaching the resolution required to realistically model disk and even dwarf galaxies.



A multiwavelength view of M31 and two of its satellite galaxies, NGC 205 and M32. Understanding galaxy evolution requires deciphering star-formation history as traced by stellar populations of different ages and the interplay between stars, gas, dust, dark matter, and the galactic environment. *[Radio: WSRT, R. Braun; IR; NASA, Spitzer, K. Gordon; Visible: Robert Gendler; UV: NASA, GALEX; X-ray: ESA, XMM, W. Pietsch]*

The exploration of the nearby universe is a vibrant, growing field that combines and indeed requires coordinated efforts in a wide range of astronomical disciplines. Commission H1 continues the functions of the old Commission 33 while at the same time adopting a more modern definition of its focus, including the multiwavelength approach. H1 is a Commission of Division H, Interstellar

Matter and Local Universe, and currently has 292 members.

Our main goals are near-field cosmology and the understanding of galaxy evolution in the local universe. Hence we are interested in the use of massive stars (C.G2), planetary nebulae (C.H3), pulsating stars (C.G4), and star clusters (C.H4) as tools for understanding galaxy evolution, though their detailed study in their own right is not within the purview of our Commission. Similarly, methods of, e.g., astrochemistry (C.H2), astrometry (C.H1), photometry and polarimetry (C.B6), or computational astrophysics (C.B2) are essential tools towards those goals, which opens avenues for fruitful exchanges and cooperation between these Commissions, including joint Working Groups.

Dante Minniti introduced C.H1 during the Division H meeting on Friday, 7 August. The coming years promise exciting breakthroughs in understanding the local universe and offer new opportunities for international collaboration and new scientific endeavors — efforts that will be accompanied by future IAU meetings around the world. We look forward to discussing and working with you. ✿

EVA GREBEL is a full professor of astronomy at Heidelberg University and director of the Astronomical Calculation Institute. She studies how galaxies form and evolve using resolved stellar populations to conduct galactic archaeology.

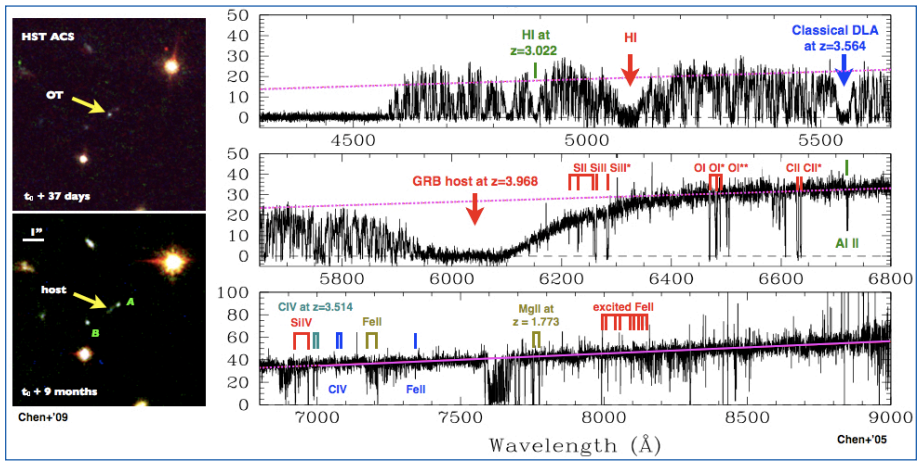
COMMISSION J2

The Intergalactic Medium

By AVERY MEIKSIN

Over the past 50 years, the subject of the intergalactic medium (IGM) has flourished into a major branch of cosmological structure formation. Early pioneering surveys revealed the IGM through its hydrogen absorption lines imprinted on spectra of bright background quasars. Since then, activity in this field has grown exponentially, including measurements of intergalactic helium and metal-enrichment patterns revealed by metal-absorption features. Observational studies of the IGM continue to thrive. Gamma-ray bursts and bright galaxies have now been added to quasars as background sources revealing the structure of the IGM.

Study of the IGM is an interdisciplinary subject of wide international interest, a trend that will continue to grow as facilities become increasingly international and connect the IGM to an increasingly large array of astrophysical phenomena. Numerical simulations have demonstrated that the structures of the IGM arise naturally as part of cosmological structure



Many gamma-ray bursts (GRBs) are followed by long-wavelength "afterglow" emission. At visual wavelengths, GRB afterglows are known to be brighter than the brightest quasars for a few hours after the initial burst! Similar to QSOs, GRB afterglows serve as bright background sources for probing intervening gas. Because of their transient nature, however, optical afterglows do not interfere with follow-up studies of absorbing galaxies close to the sightlines, enabling a new means of establishing the connection between star-forming galaxies and their gaseous surroundings. *[H.-W. Chen]*

formation in a cold-dark-matter-dominated universe with a cosmological constant. Together with advances in IGM observations, simulations have allowed the various contributions to the UV metagalactic ionizing background to be quantified over a broad range of redshifts. This informs our understanding of the process of hydrogen and helium reionization, and simulations have become an essential tool for relating metal-absorption systems to galaxy formation. New radio facilities are poised to revolutionize our understanding of reionization through 21-cm measurements of neutral hydrogen during the epoch of reionization.

While the IGM has never had its own Commission before, the diversity of questions it now addresses has justified a new IGM Commission of its own. C.J2 covers a broad range of topics, including the structure of the IGM, tests of cosmological models, the galaxy–IGM connection, and the epoch of reionization. We anticipate three or four IAU conferences discussing these and other topics over the next several years. Commission J2 will also provide a forum to launch discussion and planning papers. ✿

AVERY MEIKSIN is President of Commission J2, Intergalactic Medium, and Chair of Theoretical and Computational Astrophysics at the University of Edinburgh, U.K.

Hawaiian, Oceanic, and Global Cultural Astronomy

The UNESCO World Heritage Commission and the International Year of Light (IYL) Committee are hosting a cultural astronomy conference in Hilo, Hawai'i, 16 to 20 August 2015, right after the IAU General Assembly in Honolulu. This meeting, "Hawaiian, Oceanic, and Global Cultural Astronomy: Tangible and Intangible Heritage," is still open for registration.

The conference will bring together astronomers, archaeologists, and linguists to discuss the nature of cultural astronomy throughout the Pacific Basin. The chair of the Scientific Organizing Committee is archaeoastronomer Clive Ruggles, Past President of Division C, Commission 41, and co-author of the just-revised work on Hawaiian astronomy *Nā Inoa Hōkū: Hawaiian and Pacific Star Names*.

The Hawaiian cultural site Pā Lehua on the island of O'ahu is thought to have astronomical relevance. *[Inge Heyer, Kaiʻaleleiaka]*

For more information on this cultural-astronomy conference, please visit the Portal to the Heritage of Astronomy website.

— Stephanie Slater (CAPER Team, USA)

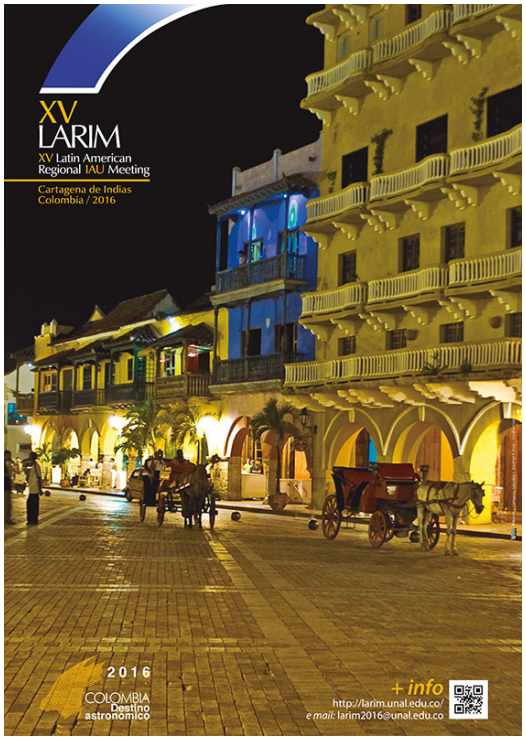
XV Latin American Regional IAU Meeting in Cartagena

By MARIO ARMANDO HIGUERA GARZÓN

From 3 to 7 October 2016, Colombia is hosting the XV Latin American Regional IAU Meeting (LARIM 2016). This is the most important meeting for the astronomy and astrophysics community in Latin America and represents an important milestone for Colombia, which this week became the IAU's newest National Member.

More than two centuries ago, José Celestino Mutis and Francisco José de Caldas led the first astronomical expeditions to Colombia. Following in their footsteps, Colombia now has a community of more than 30 astronomers linked to six institutions nationwide; another 35 Colombian students and researchers work elsewhere around the world.

Some prime examples of the continuing growth of astronomy and astrophysics in Colombia are the creation of the under-



graduate program in astronomy at the University of Antioquia; the establishment of astronomy courses at the University of the Andes; the offering of a Master of Science in Astronomy and a planned Ph.D. in Astronomy at the National Astronomical Observatory of the National University of Colombia; and the astronomy postgraduate program at the Industrial University of Santander. More than 100 contributions by Colombian researchers have been published in recent international astronomy journals, and there have so far been five published editions of the Colombian Congress of Astronomy and Astrophysics. The Colombian astronomy and astrophysics community is linked with Colombian diaspora researchers worldwide through an active mailing list: astrocol@yahoo-groups.com.

LARIM 2016 in Cartagena has been organized to recognize the growing internationalization of research in astronomy and astrophysics and to further the development of scientific talent in Latin America. Furthermore, the regional meeting provides an opportunity for the public and private sectors to join in providing logistical and financial support for astronomy in our region. Finally, LARIM offers an important arena for consolidating the research agenda of Latin American researchers, educators, and students under the generous sponsorship of the IAU. Colombia is proud to host this latest in an ongoing series of meetings spanning more than 30 years.

LARIM will draw attendees from Latin America, Europe, Asia, and North America. We welcome students in astronomy programs (undergraduate, master's, and doctorate) from Colombia and the wider Latin American community. We are planning for an attendance of about 500 people and invite everyone in the astronomical community to join and support our Latin American meeting. For more information about LARIM 2016, visit the conference website and the IAU website. ✿

MARIO ARMANDO HIGUERA GARZÓN is a professor at the National Astronomical Observatory, National University of Colombia and Chair of the Local Organizing Committee for the XV Latin American Regional IAU Meeting, to be held in Cartagena, Colombia, in October 2016.

IAU XXX GENERAL ASSEMBLY 2018

Join Us in Vienna for the IAU XXX General Assembly

By GERHARD HENSLER

Austrian astronomers invite our colleagues from around the world to the IAU XXX General Assembly in Vienna, Austria, from 20 to 31 August 2018.

Vienna, Austria's capital, is located in the very heart of Europe and easily reachable from all over the world. Many major international organizations, such as the United Nations Organization (UNO), the United Nations Industrial Development Organization (UNIDO), the International Atomic Energy Agency

University of Vienna. *[© University of Vienna]*

(IAEA), and the Organization of Petroleum Exporting Countries (OPEC) are based in this city.

Vienna is a model city, meeting strict environmental criteria for water supply and wastewater management, waste disposal, clean air management, and ecological balance. Vienna is renowned as a steward of the environment, ranking among the most livable cities worldwide.

Vienna is well known for its historical role as an imperial city, exemplified by the splendid baroque Schönbrunn Palace, the Spanish Riding School, the magnificent buildings along the Ring Boulevard, and the Imperial Palace of the former Habsburg Empire. Moreover, the city is regarded as a metropolis of music: more famous composers have lived here than in any other city. In Vienna, music is literally in the air.

Vienna has a long history of pioneering scientific and medical research. It has developed into a hub of learning, harboring nine universities. The most prominent of these, the University of Vienna, looks back on a long tradition of excellent science research and education, having hosted many Nobel-Prize winners. Its foundation goes back to 1365, which means that it celebrates its 650th anniversary in 2015.

Vienna has established an outstanding reputation as conference city. For six years in a row, it has been the first-choice destination worldwide for association meetings. Its Austria Center Vienna (ACV) is the largest conference center in Austria and one of the largest and most modern in Europe.

Austrian astronomy has a long tradition. It began to flourish at the University of Vienna with Georg von Peuerbach (1423–1461) and Johannes Müller von Königsberg ("Regiomontanus," 1436–1476). Johannes Kepler (1571–1630) in Graz and Linz, Maximilian Hell (1721–1792) at the Vienna University Observatory, and Carl Ludwig von Littrow (1811–1877) kept Austria

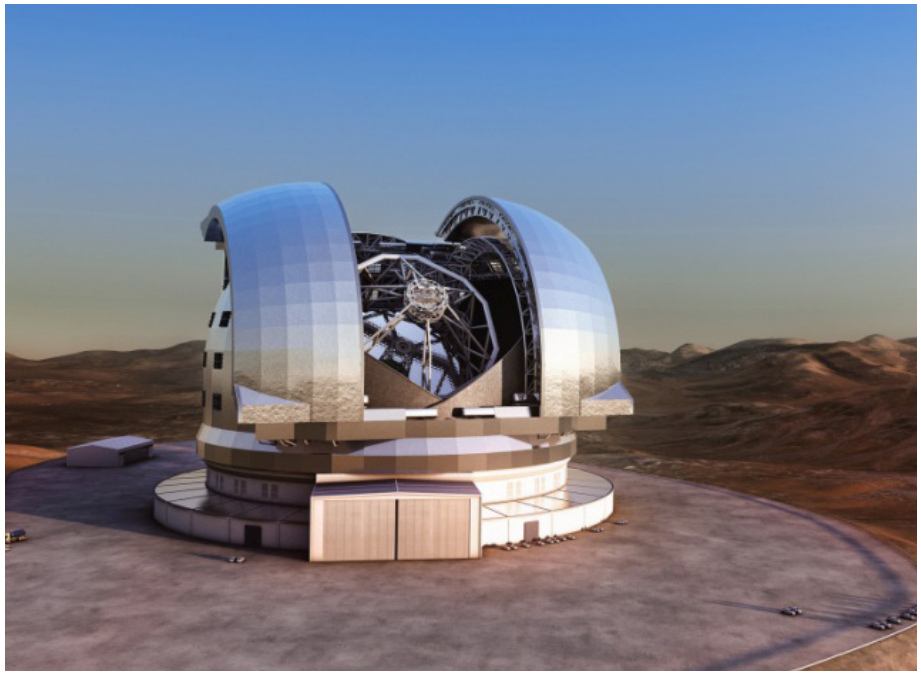
Austria Center Vienna. *[© ACV]*

at the forefront of astronomy. In addition to astronomers, many historical Austrian physicists also deserve to be mentioned, including Erwin Schrödinger (1933 Nobel Prize in Physics), Victor Hess (1936 Nobel Prize in Physics), Lise Meitner, Ludwig Boltzmann, Christian Doppler, Johann Josef Loschmidt, and Ernst Mach.

Today, astronomy teaching and research is carried out not only in Vienna but also at the University of Graz, Academy Institute of Space Research, and at the University of Innsbruck.

Full access to state-of-the-art telescopes and instruments of the 21st century was achieved in 2008 when Austria joined the European Southern Observatory (ESO). In 2018, Austrian astronomers will celebrate the 10th anniversary of ESO membership. This giant leap has spawned an unprecedented range of collaborations, consortia memberships, and the development of expertise in astronomical data processing and instrumentation. Austrian researchers are now involved in the development of current and future ESO instrumentation, particularly for the European Extremely Large Telescope. At the same time, Austria has essentially doubled the number of full professors in astrophysics.

Being a member of the European Space Agency (ESA) since its inception, Austria has made significant contributions to space-telescope missions, including ISO, Herschel, Rosetta, and Gaia. Austrian astronomers are also involved in future missions like BepiColombo, Solar Orbiter, Cheops, Plato, and Athena. Moreover, bilateral satellite projects like CoRot and BRITE (the first Austrian minisatellites) were initiated by Austria.



European Extremely Large Telescope. *[© ESO]*

Local organization of IAU XXX will be carried out by the Austrian Society for Astronomy and Astrophysics (ÖGA2). Founded in 2002, this society is affiliated with the European Astronomical Society and the German Astronomical Society and brings together both professional and amateur astronomers. Among many other tasks, it promotes public outreach and research meetings. ✿

GERHARD HENSLER is Professor for Theoretical Astronomy at the Department of Astrophysics at the University of Vienna. He is the initiator and organization chair of the 2018 IAU General Assembly.

Kai'aleleiaka THE MILKY WAY

Issue 11 • 21 August 2015

Wally Pacholka / AstroPics.com

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Outgoing President's Address

By NORIO KAIFU

The XXIX IAU General Assembly has now finished, and the newly re-organized IAU started quite successfully here in Honolulu.

It was regrettable that one of the important activities planned during this General Assembly, visits to the Maunakea telescopes by worldwide astronomers, could not be realized because of the local conflicts on Maunakea. However, I believe that all of you will agree, the XXIX General Assembly was very active and very successful.

I express millions of thanks to Meg Urry, Kevin Marvel, and all those associated with the American Astronomical Society, who hosted and executed this General Assembly in Honolulu so nicely. Thanks also to Günther Hasinger, Roy Gal, Doug Simon, and the Local Organizing Committee, including all of the Maunakea Observatories, for wonderful social events and tremendous efforts behind the scenes that resulted so well.

[Rick Fienberg, Kaiʻaleleiaka]

I thank all Divisions, Commissions, and organizers for such rich and fruitful scientific meetings. My thanks are also extended to the Hawaiʻi Convention Center and all local communities of Hawaiʻi for their work toward the success of the IAU General Assembly.

As we saw in the Business Sessions, the IAU welcomed one new National Member, Colombia, and nearly 1,200 new Individual Members. The rapid increase in Individual Members is a prominent characteristic of the IAU, demonstrating that the IAU is a growing international scientific union, with more and more members of the younger generation.

However, I would also draw your attention to the National Membership. The number of IAU National Members is currently 74, whereas it was 61 in 1994, 21 years ago.

Therefore, the National Membership has increased 21% within the past 21 years. But if we compare it with the increase in Individual Members of 44% during the same period, the increase in National Membership is considerably slower.

This means that the rapid growth of astronomy is happening mostly in the economically developed countries and less in the developing world. This fact clearly shows how important the recent IAU activities — the Office of Astronomy for Development (OAD), Office for Astronomy Outreach (OAO), and the newly started Office for Young Astronomers

Kaiʻaleleiaka THE MILKY WAY

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(OYA) — are to develop astronomy worldwide toward its future. Also, the promotion of regional coordination, like the newly established East Asian Observatory, the new regional coordinating offices of the OAD, and worldwide efforts to develop the Square Kilometre Array (SKA), will give the IAU and world astronomy a new perspective for the global growth of astronomy.

Through the past six years as President-Elect and President, I have learned a great deal about the truly rich activities of the IAU. I feel strongly that an important base that enabled the IAU to promote such diverse activities was the introduction of Individual Membership, formally started in 1961, and this system made the IAU an extremely active international scientific union. We deeply thank those previous great leaders of the IAU, and wish that the new scientific organization started here in Honolulu will provide a solid platform for a new leap toward the future of the IAU.

Finally, I express many thanks to Thierry Montmerle for his passion and tremendous work as General Secretary, a well-known position of extremely hard work. I thank Silvia Torres-Peimbert and Piero Benvenuti for working together as a wonderful team of Officers of the IAU. My deep thanks are also extended to advisors Robert Williams and Ian Corbett for their continuous support and helpful advice on many difficult occasions during the past three years.

I feel very happy to remain on the next Executive Committee as an Advisor, together with Thierry, to support the new Officers for the coming three years.

Aloha and mahalo, thank you! ✿

NORIO KAIFU is Director of the National Astronomical Observatory of Japan and, having now completed his three-year term as IAU President, will serve as Advisor to the IAU Executive Committee for the next three years.

CLOSING CEREMONY

Outgoing General Secretary's Address

By THIERRY MONTMERLE

Aloha! Dear colleagues, dear guests, dear friends,

As this triennium draws to a close, my term as General Secretary is ending too. When I took over from Ian Corbett in Beijing, I had no idea of how much the IAU would accomplish in three years!

There were many adventures. Most of them started in the U.S. and are ending (in the present phase) in the U.S. again.

Let me briefly explain. After Rio de Janeiro, at my first Executive Committee (EC) meeting as freshly elected Assistant General Secretary, which took place at the Space Telescope Science Institute (STScI) in Baltimore at the invitation of Bob Williams, I presented a few slides explaining why I, as an IAU member, was not happy with the Division structure, and boldly started inventing new Divisions and assigning Commissions to them. Bob was taken aback, and after some discussion with the EC, offered me a challenge: "Well, Thierry, OK, come back to us next time with a project."

This early trust from the EC to undertake

[Rick Fienberg, Kaʻaleleiaka]

a restructuring of the Divisions and the Commissions, followed by other initiatives taken by various people, played a key role in my term as General Secretary.

This is a story that deserves to be told, even briefly, because it illustrates what I now, here, like to call "the aloha spirit of the IAU," and which can be summarized in three buzzwords: "We dare. We care. We share."

We Dare

You have all lived the various episodes of the Division Restructuring (approved in Beijing) and the Commission Reform (approved here in Honolulu by the EC and the Division Presidents), so I will not repeat them here. I just want to say that it is the result of a long (six years) and trusty collaboration between two successive ECs and two "generations" of Division Presidents (and one generation of Commission Presidents), and, ultimately, of the will of the IAU membership to adapt to a constantly evolving astronomical world. I'm proud to be able to say today, "Mission accomplished."

The new Commissions, with their new or updated topics, with a renewed, more focused demography, and the exceptionally large participation rate for the election of their new Organizing Committees (from 60% up to nearly 90%), demonstrate that the IAU is ready for the future, and that it is really composed of what I like to call "IAU citizens," not just "IAU members."

The new Commissions will be in place in a couple of weeks on the IAU website, but you can already start thinking about establishing new Working Groups. The procedure is easy, and the fact that the Division Steering Committees now incorporate ex-officio Commission Presidents should facilitate selecting the best scientific structure between Commission Working Groups and Division Working Groups.

We Care

The mission of the IAU is to be not only a forum for professional astronomers, but is also to go out to society and participate in education and development worldwide, using astronomy as a tool for fostering interest in science and technology, even in less developed countries.

The IAU has now three offices, developed in partnership with institutions from several countries:

- The Office of Astronomy for Development (OAD) in Cape Town, in partnership with the South African National Research Foundation, has seen a spectacular development of its activities initiated during the previous triennium. It now has several "Regional Nodes" and "Language Centers" across five continents, and with its revised structure will be even more efficient at selecting and helping educational projects from all over the world to thrive.
- The Office for Astronomy Outreach (OAO) in Tokyo, in partnership with the National Astronomical Observatory of Japan and other Asian countries, was developed and plays a key role in the projects specific to 2015 that I will briefly describe in a minute.
- The Office for Young Astronomers (OYA) in Oslo, in partnership with the Norwegian Academy of Science and Letters, will continue to broaden the decade-long International Schools for Young Astronomers worldwide.

We Share

The IAU must also go toward the public. The year 2015, and in particular this General Assembly, is seeing the culmination of two projects initiated by the Executive Committee and implemented by the Office for Astronomy Outreach: the so-called Cosmic Light cornerstone of the UNESCO International Year of Light and Light-base Technologies, also know as IYL 2015, and the IAU's NameExoWorlds contest to call for the public naming of selected exoplanets and their host stars.

The Cosmic Light project draws heavily on the legacy of the International Year of Astronomy, IYA 2009, which gave an enormous advantage in starting early IYL 2015, far earlier than our physicists colleagues! Actually, the IAU, though not in the drivers'

seat in IYL 2015, which was run essentially by physicists and the lighting industry, was setting the standards for many IYL 2015 cornerstones. Here, you may have seen Cosmic Light in action, at stargazing parties in Ala Moana Park, or in conferences and displays at the Bishop Museum.

The NameExoWorlds contest is about engaging the public worldwide to attribute names for 20 exoplanetary systems and their host stars, selected by astronomy clubs and similar non-profit organizations interested in astronomy. The launch of the vote took place in this very room last Tuesday (11 August), and I'm pleased to report that, at the time of writing this address, the number of votes received by the IAU is close to 125,000 — in only three days !

Last, but not least, the IAU continues to develop a very fruitful collaboration with UNESCO in the process of nomination of astronomical sites (past or present) to the list of World Heritage sites. One such project, for example, concerns high-altitude observatories across the world.

In summary, this has been a fantastically rich and exciting experience, which many, or perhaps all, of us on the Executive Committee or among Division Presidents, will remember, and is formally (but perhaps not in reality) ending here at this extra-ordinary — beyond ordinary — General Assembly. I have been helped and supported by wonderful people, and I am most grateful to them.

I'm proud to be an IAU member.

I'm proud to be an "IAU citizen."

Mahalo! ✿

THIERRY MONTMERLE of the Institut d'Astrophysique de Paris, France, was IAU General Secretary during the 2012–2015 triennium and now serves as Advisor to the IAU Executive Committee. He spent most of his scientific career as a high-energy astrophysicist at the Saclay Center for Nuclear Studies working on star and planet formation.

CLOSING CEREMONY

Incoming President's Address

By SILVIA TORRES-PEIMBERT

It is a great honor to be President of the International Astronomical Union, traditionally one of the most active international scientific organizations. From 2000 to 2006 I participated as Vice-President. During that period I met IAU Presidents Bob Kraft, Franco Pacini, Ronald Eckers, and Catherine Cesarsky. I also worked with the General Secretaries Johannes Andersen, Hans Rickman, Oddbjørn Engvold, and Karel van der Hucht. For the last three years, as President Elect, I have had the privilege of working directly with Bob Williams, Norio Kaifu, Thierry Montmerle, Piero Benvenuti, and Ian Corbett, as well as with six Vice-Presidents who were part of the Executive Committee. All of us have worked with enthusiasm for the same goal: the well-being of the Union.

I am especially grateful to Norio Kaifu for his strength and serenity and to Thierry Montmerle for his energy and enthusiasm. Both of them have decidedly led the Union through its restructuring process, which has now been implemented.

The Division Presidents during this period worked outstandingly in establishing the new structure. It is now firmly in place, and we are confident that it will indeed fulfill the IAU mission "to promote and safeguard the science of astronomy in all its aspects through international cooperation." There are now a set of very active Divisions, Commissions, and Working Groups that will continue to promote the unifying tasks that our discipline requires.

My main concern as President is to involve each of the members in understanding that this organization does have an impact in our professional lives. It helps us to maintain contact with our international colleagues, and to keep us informed of the different activities and developments carried out by the astronomical community. The General Assemblies, Symposia, and Regional Meetings are the backbone of the Union. They play a central role in fostering astronomy around the world, as well as in attaining consensus on important decisions that affect our science. In other words, I invite all of you to participate more actively in this organization.

It is our intention to strengthen the ties between the governing bodies and the membership of the Union. To this end we plan to use intensively the webpage as a means of communication, and to start a new epoch of the *Information Bulletin* series, probably mainly in an electronic version to all the community. In parallel we request that you keep in contact with us.

For several decades the IAU has been committed to education projects, mainly through the International Schools for Young Astronomers (ISYA). In 2009, in Rio de Janeiro, the General Assembly approved the Strategic Plan for Astronomy in the Developing World, which led to the creation of the Office of Astronomy for Development (OAD). This office has become an important driver of astronomy education and outreach in several parts of the world. As you have heard already, through the OAD there have been 68 funded projects and nine regional nodes or language centers across the globe. We expect this activity to continue with increasing success.

Similarly the Office for Astronomy Outreach (OAO), based in Tokyo, has extended the action of the Union to the general public and in general to amateur astronomers around the world. This initiative recognizes the importance that the Union gives to these groups of friends and their activities, that until now have been disconnected to the community of professional astronomers.

At this General Assembly, more than 3,000 astronomers and exhibitors from more than 70 countries have come to share with us their work. It was a very rich program. There were six Symposia, 22 Focus Meetings, and many Splinter Meetings. We also had the opportunity to listen to very inspiring invited and plenary talks. Moreover, there were teaching and public activities. And the exhibits were very informative and attractive.

[Rick Fienberg, Kaiʻaleleiaka]

Keep in mind that in three years the next General Assembly will take place in Vienna, where we will meet again old and new friends. We will have the opportunity to communicate to each other the new results and the exciting discoveries that continue to amaze and enlighten us. We will celebrate the first centennial of this great organization!

Finally let me thank our hosts, the astronomers of Hawaiʻi and the American Astronomical Society, for their hospitality, their generosity, and all the support given to us. Many thanks also to the many organizations that sponsored this meeting. We will remember this General Assembly for many years to come.

Thank you all! ✿

SILVIA TORRES-PEIMBERT, President of the IAU for the 2015–2018 triennium, is former Director of the Astronomy Institute of the National Autonomous University of Mexico (UNAM). She was honored with the 2011 L'Oréal-UNESCO Award for Women in Science and received the American Physical Society's 2012 Hans A. Bethe Prize jointly with Manuel Peimbert.

CLOSING CEREMONY

Incoming General Secretary's Address

By PIERO BENVENUTI

Aloha! Dear colleagues and friends, distinguished guests:

It is a great honor for me to start holding office as General Secretary of the International Astronomical Union, and I feel especially privileged to take up duty at this particular moment in time, at the XXIX General Assembly in Honolulu.

There are several reasons for that.

First of all, thanks to the fine and dedicated work of the previous Presidents and General Secretaries, I am inheriting a completely renewed Union: three years ago, in Beijing, the new Divisions; today, here the new Commissions; and the Working Groups that soon will follow suit.

New energy has been injected into the activities of the Union, and we had a tangible and vivid example of them during these two weeks. At this point I cannot but commit myself to continue supporting the renewal process, offering to the Divisions and Commissions those tools — e.g., dedicated interactive web services — that will facilitate their collaborative work.

During the first Executive Meeting of the new triennium, I will ask the Division Presidents to indicate to me their priority requirements that we will then try to implement to the best possible extent.

Talking about Divisions, in the past triennium I enjoyed their very fruitful interaction with the Executive Committee (EC), and I am convinced that it is essential for an efficient operation of the Union. Financially, we cannot afford to continue supporting directly their participation in every EC meeting, but, with the help of ever-evolving technology, we will find a way to keep them virtually present as interactive participants.

The second reason that makes me feel a privileged General Secretary is the renewed agreement with South Africa's National Research Foundation (NRF) on the Office of Astronomy for Development (OAD). I do hope each of you had a chance recently to have a look at the OAD web pages and check the great job that a small group of dedicated people, together with hundreds of volunteers, have achieved. If not, do it soon, and feel proud of it.

Because — you see — if the IAU were just to be concerned with the development of astronomy and with fostering international scientific collaboration, it would just do what any scientific union is supposed to do. But our Strategic Plan, Astronomy for the Developing World, makes the difference: it recognizes the deep root of our science with humanity, a unique characteristic that singles it out of any other discipline. And using the natural appeal of astronomy for promoting human progress brings it back to its classical function, so beautifully expressed by Plato in his dialogue *The Republic*.

What has been achieved so far is indeed impressive, as it was also highlighted by the recent external-review report. Just consider the five new OAD Regional Nodes that have been started during this General Assembly: all of them are strategically located and have great potential.

But growth alone is not enough: as the OAD's Khotso Mokhele warned us yesterday, the real work starts now. The

[Rick Fienberg, Kaʻaleleiaka]

OAD needs to consolidate its achievements and maintain control and coordination in its expanding international network. All this requires additional resources that are well beyond the modest investment that IAU can provide annually. I am committed to pursue an aggressive fundraising campaign that would allow us to prepare, in time for the next GA in Vienna, an affordable and credible plan that goes beyond 2021, as requested by the Resolution B1 that was approved yesterday.

Let me add that the fundraising campaign starts now, by asking each National Member to assure timely payment of their dues! I am fully aware of the intervening difficulties that various countries may encounter, but it is obvious that without that basic income, all activities of the Union will suffer and start starving.

On a related subject, I repeat here my full commitment to follow strictly the Union financial Working Rules, in particular by restarting the annual audit of the accounts and increasing transparency, regularly forwarding the annual reports of the Finance Committee to the National Members.

Let me now come to a more personal reason for feeling privileged. Before coming here, I was scanning through the long list of past General Secretaries — a spine-chilling exercise — and I discovered that I am the first Italian astronomer to hold that position — an honor that I wish to dedicate to my glorious University of Padova, that, with its motto "Universa Universis Patavina Libertas" reminds all of us that science is tantamount to freedom. And if the motto weren't enough, you just have to glance at the original Galileo's chair when entering its Aula Magna.

That is not, however, the only first of the next triennium: for the first time in the history of the Union, the majority of the Officers are women. One Italian and three women: you may start wondering if it is just a statistical fluctuation or if there are some hidden astrological connections.... Well, start pondering: you have three years to solve the conundrum!

Now, seriously: I believe our Union is setting a great example, and I wish to consider it not just a simple attempt to reach gender equality. As I believe astronomy — so deeply rooted as it is in the grain of humanity and culture — is not just a science as many others, similarly I believe a woman scientist is not just another scientist. Women have a special natural gift for caring and educating — and I underline the etymology of the Latin root *educo*, I pull out the best of someone — therefore a woman who is also an astronomer can have a greater impact on society than a simple scientist. It is not just a case that our Working Group on Women in Astronomy, in the report that they have prepared

Star Party Yes, Occultation No

The sky was clear enough on Thursday evening, 13 August, for the IAU's second public star party at Ala Moana Beach Park to take place as planned. Staffers from the Institute for Astronomy – University of Hawai'i at Mānoa set up telescopes and showed Saturn's rings and other celestial treats to dozens of eager locals.

Meanwhile David Dunham (International Occultation Timing Association) aimed his telescope at an obscure 10th-magnitude star in Aquarius, hoping to catch a brief occultation by asteroid (1197) Rhodesia, as he described on page 12 of *Kaiʻaleleiaka* Issue 9. "I video-recorded the target star right up to the predicted time of the occultation," reports Dunham, "when within a second a thick cloud covered the field of view. So all I know was that the occultation did not occur early at our location. A couple of observatories in Arkansas were only a few kilometers farther south of our location relative to the path, and under good conditions they had no occultation either."

[Jim Lattis, Univ. of Wisconsin]

As of this writing, only one observer has reported catching the occultation: Bart Billard of Fredericksburg, Virginia, USA. This suggests that Rhodesia's shadow passed considerably south of Oʻahu, so that even if the sky had remained perfectly clear, Dunham wouldn't have seen the star wink out.

— Rick Fienberg, Kaiʻaleleiaka

at this Assembly, has indicated the desire to closely collaborate with the OAD and in particular with the Regional Nodes for contributing to a better and more just society.

I am looking forward to working pleasantly and efficiently with my colleague women Officers!

Coming to the conclusion of my address, I like to invite you all to Vienna in 2018, for the XXX General Assembly. We will be celebrating there the first 100 years of the IAU and we should mark that important anniversary with some special and significant event. We are already planning to prepare a book about the history of the Union and, given the location of the Assembly, we may consider some additional project on the relation between astronomy and philosophy, in particular the philosophy of science.

Finally, I would like to express my gratitude to Norio and Thierry who, friendly and patiently, accompanied me during the past triennium.

Mahalo... und auf Wiedersehen in Wien in 2018! ✿

PIERO BENVENUTI is IAU General Secretary for the 2015–2018 triennium. He is based in the Department of Astronomy at the University of Padua, Italy, and was formerly the European Space Agency's Project Scientist for the Hubble Space Telescope.

New Committees for the New Triennium

By RICK FIENBERG, *Kaiʻaleleiaka*

In Issue 9 of *Kaiʻaleleiaka* on Thursday, 13 August, we listed the continuing and new members of the IAU Executive Committee for the 2015–2018 triennium, as approved at that afternoon's second Business Meeting of the General Assembly. At the same meeting the rosters of several other key committees were approved as well.

The Finance Committee advises the Executive Committee on budgetary matters between General Assemblies and advises the General Assembly on the approval of the budget and accounts of the Union. Continuing for his second term and now taking on the role of Chair is **Zhanwen Han** (China Nanjing); he replaces former Chair **Beatriz Barbuy** (Brazil). Also continuing on the Finance Committee are **João Alves** (Austria), **Kate Brooks** (Australia), **Nikos Kylafis** (Greece), **Tushar Prabhu** (India), and **Lee Anne Willson** (USA). Newly elected this year are **JJ Kavelaars** (Canada) and **Laszlo Kiss** (Hungary).

The Membership Committee advises the Executive Committee on matters related to the admission of Individual Members. The new Chair of the Membership Committee is second-term member **Helmut O. Rucker** (Austria), who replaces **Christian Henkel** (Germany). Also continuing for another term are **Myungshin Im** (South Korea), **Lex Kaper** (Netherlands), and **Ramotholo Sefoko** (South Africa). Beginning their first terms are **Soňa Ehlerová** (Czech Republic), **William Harris** (Canada), **Daniela Lazzaro** (Brazil), and **David Soderblom** (USA). Rotating off the Membership Committee are **Sara Heap** (USA), **Rene Bussard** (Chile), and **Nikolay Samus'**

At the second Business Meeting of the Honolulu General Assembly, then-Chair of the Resolutions Committee, Ian Corbett, introduced the four Resolutions that were subsequently approved by vote of the attending Individual Members. Outgoing General Secretary Thierry Montmerle (left) and then-President (now Past President) Norio Kaifu officiated at the session. *[Rick Fienberg, Kaiʻaleleiaka]*

(Russian Federation).

The Resolutions Committee examines the content, wording, and implications of all proposed Resolutions and advises the Executive Committee whether the subject of a proposed Resolution is a matter of policy or science. Beginning his second term and becoming Chair of the Resolutions Committee is **Bruce Elmegreen** (USA), who succeeds **Ian Corbett** (United Kingdom). Also continuing for another term is Renée Kraan-Korteweg (South Africa). New members are **Toshio Fukushima** (Japan), **Sergei Klioner** (Germany), and **Katia Cunha** (Brazil). Having finished their terms, **Yanchun Liang** (China Nanjing) and **Karel van der Hucht** (Netherlands) are rotating off the committee.

The Special Nominating Committee prepares the slate of candidates for election to the Executive Committee. Chairing the Special Nominating Committee is the IAU President, **Silvia Torres-Peimbert** (Mexico), assisted by the Past President, **Norio Kaifu** (Japan), who chaired the committee during the last triennium. Newly appointed members are **Matthew Colless** (Australia), **Monica Rubio** (Chile), **Thomas Henning** (Germany), **Xavier Barcons** (Spain), and **Dimitri Pourbaix** (Belgium). Rotating off the committee are **Francoise Combes** (France), **Malcolm Longair** (United Kingdom), **Matthias Steinmetz** (Germany), **Edward van den Heuvel** (Netherlands), **Robert Williams** (USA), and **Gang Zhao** (China Nanjing). The General Secretary and Assistant General Secretary serve as Advisors to the Special Nominating Committee, so **Piero Benvenuti** (Italy) and **Maria Teresa Lago** (Portugal) now fill those roles, while former General Secretary **Thierry Montmerle** (France) suddenly has more free time on his hands — but not *too* much, as he remains Advisor to the Executive Committee. ✿

PRESS RELEASE

IAU XXIX General Assembly Draws to a Close

By LARS LINDBERG CHRISTENSEN & RAQUEL SHIDA

The IAU XXIX General Assembly in Honolulu, Hawai'i, USA, ended on Friday, 14 August 2015, after two busy weeks packed with symposia, meetings and events. The General Assembly was an enormous success, with more than 3,000 attendees from 74 countries across the world, including almost 100 members of the press. These numbers made it one of the largest IAU General Assemblies ever organized. The participants enjoyed a vast collection of scientific presentations in six IAU Symposia and 22 Focus Meetings on research, development, advancement, and collaboration within astronomy.

One new country joined the organization on this occasion: Colombia. The General Assembly also approved nearly 1,200 new individual IAU members at its closing ceremony, bringing the total to almost 12,500 members.

Four Resolutions were approved by vote at the General Assembly. These included the confirmation and extension of the IAU strategic plan for astronomy in the developing world and the protection of radio-astronomy observations in the 76-81 GHz frequency band.

The newly elected IAU officers are

- Silvia Torres-Peimbert, Mexico, President;
- Piero Benvenuti, Italy, General Secretary;
- Ewine van Dishoeck, the Netherlands, President Elect; and
- Maria Teresa Lago, Portugal, Assistant General Secretary.

Seven press briefings took place on a wide range of topics, from the slow death of the universe to the first science conducted using night-time photographs taken by astronauts aboard the International Space Station, and received worldwide media coverage.

Attendees who made it to the Closing Ceremony lined up for a group photo before heading off to celebrate the end of a remarkable two weeks in Honolulu. *[IAU/B. Tafreshi, twanight.org]*

Agreements were signed for five new coordinating offices of the IAU Office of Astronomy for Development in Armenia, Colombia, Jordan, Nigeria, and Portugal. These agreements seek to realize the social benefits of astronomy as part of the IAU's decadal strategic plan.

During the General Assembly, the NameExoWorlds contest opened its public vote to decide the names of 15 stars and 32 exoplanets in orbit around them.

Several public-outreach events took place over the course of the General Assembly, including two stargazing parties, two school visits to the IAU Exhibit Hall, and visits by astronomers to more than a dozen schools, reaching about 2,000 local students.

The IAU XXX General Assembly will convene in Vienna, Austria, in August 2018, followed by the XXXI General Assembly in Busan, Republic of Korea (South Korea), in August 2021. ✿


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. RAQUEL SHIDA, also at ESO's ePOD, serves as IAU Deputy Press Officer and Webmaster.

Scenes from the Closing Ceremony

On Friday afternoon, 14 August, it was time to celebrate the end of a remarkable two weeks and look forward to the coming triennium. Outgoing IAU President Norio Kaifu and General Secretary Thierry Montmerle gave heartfelt retirement addresses (pages 2 and 3, respectively). Then their successors, Silvia Torres-Peimbert and Piero Benvenuti, gave stirring speeches pledging to serve the Union faithfully (pages 5 and 7, respectively).

AAS Executive Officer Kevin Marvel thanked everyone for coming to the XXIX General Assembly and introduced Gerhard Hensler of the University of Vienna, who invited us all there for the XXX GA in 2018. Then Roy Gal of the University of Hawai'i officiated as the IAU flag was ceremonially transferred from the USA to Austria.

The festivities were brought to a close with an oli (chant) by Kumu Pattye Wright, who then played her ipu (a type of drum) while six dancers performed a mesmerizing hula. Afterward, filing out of the ballroom and onto the 4th-floor patio for a group photo, attendees were greeted by a spectacular rainbow, as if the sky itself wanted to participate in our celebration!

[All photos: Rick Fienberg, Kai'aleleiaka]