



UNIVERSITY OF MICHIGAN

*Fall 2014*

# Michigan Astronomy News

FOR ALUMNI & FRIENDS OF THE UNIVERSITY OF MICHIGAN ASTRONOMY DEPARTMENT



**From Left:** Doug Richstone, Jon Miller, Emily Rauscher, Hugh Aller, Elena Gallo, Joel Bregman, Keren Sharon, Oleg Gnedin, Nuria Calvet, Eric Bell, Lee Hartman, Mateusz Ruszkowski.



**From Left:** Yuan Li, Rich Plotkin, Jesus Lopez Hernandez, Chuck Cowley, Abdu Zoghbi, Fred Adams, Nick Indriolo, Mike LoPresto, Ian Roederer, Gus Evrard, Margo Aller.





# Letter From The Chair

that extra work would become popular?

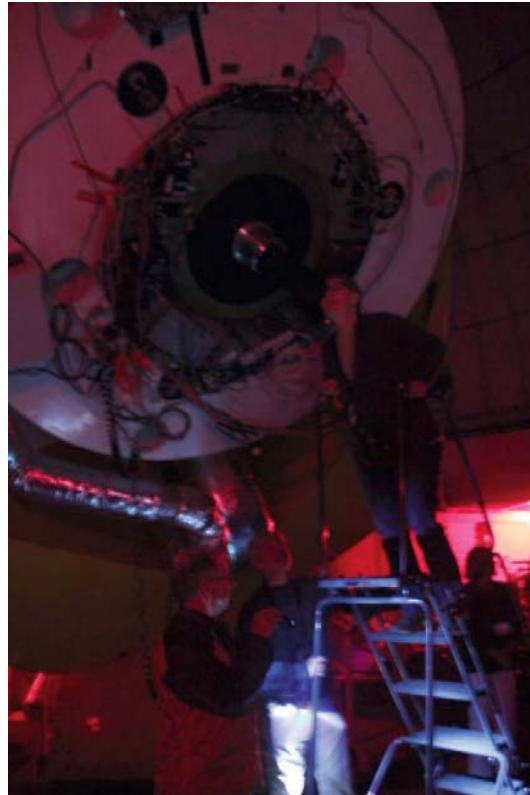
We are full in the swing of the Fall semester in what has been a year with many events. The biggest change is moving into a new building after 50 years in Dennison. We are now in the top two floors of the south part of West Hall, which has been fixed up and is very pleasant. All of our faculty are finally

had a Star Party at our MDM Observatory on Kitt Peak in Arizona for friends of astronomy and it was an amazing night. We had eyepieces made for the 2.4 and 1.3-m telescopes and mounted them in place of the usual electronic guiding cameras. Even professional astronomers hardly ever get to look through the eyepiece of a large telescope, so it was a real treat to see Mars, Jupiter, a planetary nebula, the Whirlpool galaxy, and a globular star cluster. The wonderful pre-observing dinner party set the stage for an excellent night of viewing.

on one level and we have a greater sense of unity.

Our introductory undergraduate courses continue to be extremely popular, with about half of each graduating class having taken at least one astronomy course. For students who ask “what’s next?”, we’ve added a new 200 level class “Black Holes” — developed and taught by Professor Gallo. At first, students think that there’s not much to see when looking at black holes, but material falling toward a black hole really lights up, making these some of the brightest of celestial objects.

Our majors (they are no longer “concentrators”!) and minors continue to thrive in their classes and research projects. A couple of our star majors started a program where they lead honors students in non-major classes through some fairly advanced activities in “Structured Study Groups”. (See Undergraduate News on page 3.) Who ever thought



The MDM Star Party: viewing through the 2.4-m telescope involved climbing a ladder to the lens. The smaller telescope had a platform that could be raised and lowered for such viewing. (Photo Credit: J. Bregman.)

Closer to home, we regularly hold open house at Angell Hall, featuring our planetarium and student telescope, which is run by our undergraduate club, the Student Astronomical Society (see <http://umichsas.com/openhouse>). In the winter and spring, we’ll have two public talks: one by the accomplished photographer-musician-astronomer José Salgado (the Distinguished Alumni talk in January, date to be arranged; José is an astronomer and science visualizer at the Adler Planetarium); and one by Sara Seager, who finds and studies planets around other stars (the Mohler Prize Lecture on April 9 or 10; Sara is a Professor of Planetary Science and Physics at MIT). I hope to see you at one of these events (the times and locations will be updated — check out the department web page: see <http://www.lsa.umich.edu/astro/>), or if you are in the neighborhood, just drop by.

—Joel Bregman

## Department of Astronomy Fast-Facts

### People

- 19 Tenure-track Faculty (3 are within Physics)
- 10 Research Science Faculty
- 3 Emeritus Faculty
- 15 Postdoctoral Fellows and Research Associates
- 23 Graduate Students
- 6 Administrative and Technical Staff
- 25-30 Undergraduate majors and minors

### Computing

- University-wide Flux cluster, with approximately 16,000 cores, InfiniBand network, and 640 TB storage.

### Observatories

- Magellan Telescopes: 2 x 6.5-m telescopes at the Las Campanas Observatory, Chile
- MDM Observatory: a 1.3 and 2.4-m telescope on Kitt Peak, Arizona
- Curtis-Schmidt telescope at the Cerro Tololo Inter-American Observatory, Chile
- CHARA optical/infrared interferometer on Mount Wilson, California
- Angell Hall student telescopes and planetarium, and Detroit Observatory Fitz telescope, on Main Campus

# News From West Hall

We moved into West Hall in August. Remarkably, after half a century in Dennison Building (named for physics professor David M. Dennison) we are now in offices above the Denison Archway (named for engineering professor Charles S. Denison, who suggested the archway to provide unimpeded access from the “Diag” to South University Avenue).

## Undergraduate News

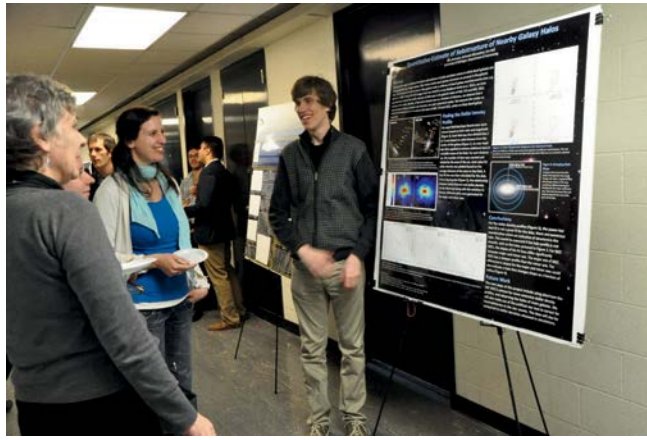
Our undergraduate program continues its strong growth with numbers 50% above the 5 year average. Prof. Ted Bergin reports that during the last year we had 27 Astronomy and Astrophysics majors, of whom 5 graduated this year, and 4 Interdisciplinary Astronomy majors, of whom 3 graduated this year. The Interdisciplinary Astronomy track is designed for students who want to achieve a broad understanding of astronomy, ideal for careers like teaching, science writing, and outreach. The graduating Astronomy and Astrophysics majors were Maria Mate-Kodjo, Adrianna Oraiqat, and Sam Swihart, with Kyle Twadelle, and Nico Wagner receiving honors. The new Interdisciplinary Astronomy alumni



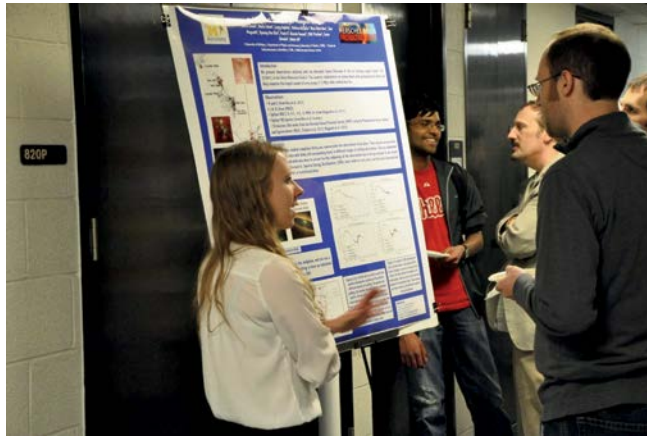
Prof. Sally Oey with Nicolas Kern. (Photo Credit: Michigan Photography.)

are Talor Henderson, and Evan Kasal, with Alex Blaty receiving honors. Neal Al-Attar, Jordan Haddad, Joshua Higgins, Devin Hupp, Neilesh Parikh, Sarah Scholten, Ciara Turner, and Karlie Weltman graduated with a minor.

Nicolas Kern received the Sweetland Writing Center Granader Family Prize for Ex-



At this year's Poster Fair undergraduate Ben Harmsen explains his work on galaxy halos to Prof. Nuria Calvet and postdoctoral researcher Antonela Monachesi.



Undergraduate Sierra Grant explains her work on circumstellar disks to Prof. Ted Bergin and graduate students Matt Miller and Dan Gifford. (Photo Credits: S. Murphy.)

cellence in Upper-Level Writing for his paper “A New Class of Supergiant Stars?”, a popular summary of a technical article, written for the Senior Seminar in Astronomy. Prof. Sally Oey found it eloquently written, capturing perfectly the science. He did a wonderful job translating some complex physical phenomena in a way that is simple enough for a beginning student to understand, while also keeping the reader engaged throughout — and made it look easy! Nick's work is a model for popular science writing.

Nico Wagner and Alex Blaty also received awards for Excellence in Astronomy Research and Community Outreach. Nico and Alex were instrumental in introducing Structured Study Groups to the department, which were inaugurated last Winter. They invested an enormous amount of time and energy in providing a setting for almost 20 students from

a number of 100-level classes to explore far beyond the class material. A response on one of the evaluations noted that “Nico and Alex are awesome and so knowledgeable”; we agree!

## Graduate Student News

Meghin Spencer, Tom Rice and Bryan Terrazas were awarded NSF graduate research fellowships. Ilse Cleeves was awarded a Rackham predoctoral fellowship.

Thomas Brink (advisor Prof. Mario Mateo) defended “The Kinematics of the Sagittarius Stream” on April 16th. This detailed his work to map the motions of stars associated with the remnants of a dwarf galaxy ripped apart by the tidal field of our Milky Way. Tom's work is one of the most comprehensive studies of the stream, a structure that wraps completely around the sky. Much of his work was based on observations carried out at the Magellan

**Cover Photographs:** Members of the department at the Fall term reception in our new location in West Hall. (Photo Credit: Michigan Photography.)

**Newsletter Production:** P. Hughes



telescopes at Las Campanas Observatory in Chile. Tom is currently converting his dissertation to papers for publication as he pursues a future career involving astronomy/science education.

**Xiao Che** (advisor Prof. John Monnier) defended “Near-infrared View of Stellar Surfaces and Circumstellar Disks with an Upgraded Optical Interferometer” on April 30th. Xiao’s research included substantial instrumentation upgrades to the CHARA Array and pioneering studies of gravity darkening in hot stars. He was the first to image the surface of the hot star Regulus and his modeling of its temperature and shape has led to a fundamental re-evaluation of energy transport in the outer layers of non-spherical stars and re-ignited theoretical interest in a range of topics related to rapidly-rotating stars. Xiao began a software engineer position in Manhattan this summer with Bloomberg, the financial service and media company.

**Ashley King** (advisor Prof. Jon Miller) defended “Accretion Driven Outflows from Black Holes Across the Mass Scale” on May 30th. She explored the connection between the accretion onto black holes and the resulting outflows that are produced, for both stellar mass and supermassive black holes, finding a common dependence of outflow power on source luminosity. This suggests that winds and jets are regulated by a common mechanism. She took up a Postdoctoral Fellowship at the University of Cambridge this Fall, and will be a Einstein & Kavli Fellow at Stanford University through 2019.

**Melissa McClure** (advisor Prof. Nuria Calvet) defended “Influence of Dust Grain Evolution on the Structure of Protoplanetary Disks” on June 20th. She has become an artist of protoplanetary disk modeling, extracting the most detailed information on the dust composition and spatial distribution, by fitting observations of ground and space telescopes with our self-consistent disk models. She has also submitted successfully many observing proposals to Magellan, IRTF, and Herschel. With 28 refereed papers, Melissa has set a high target for future grads! She started an ESO Fellowship in Garching this Fall.

**Anne Jaskot** (advisor Prof. Sally Oey) defended “H I Gas Cycles and Lyman Continuum Optical Depth in Low-Redshift Starbursts” on July 10th. Among other accomplishments, she successfully proposed for, and obtained, Hubble data of nearby starbursts dubbed “Green Pea” galaxies, which she finds are likely to be leaking ionizing radiation. Anne has departed to take up the Five College Astronomy Department postdoctoral fellowship at Smith College and U. Mass, Amherst. We wish all these successful students the very best!

## Postdoc News

**Dr. Hsiang-Yi (Karen) Yang** has been awarded an Einstein Fellowship. She will continue her work on the or-

igin of the Fermi bubbles while at the University of Maryland, College Park. **Dr. Amy Reines** has been awarded a Hubble Fellowship. She stays in the department to continue her study of massive black holes in dwarf galaxies. **Dr. Nathalie Degenaar** is taking up a Marie Curie Fellowship at the University of Cambridge at the end of this year. Nathalie studies accretion in X-ray binary systems, with particular interest in this process at low X-ray luminosity.

## Faculty News



**Dr. Emily Rauscher** has received a President’s Postdoctoral Fellowship. She will have the Fellowship for one year starting in Fall 2014, followed by an assistant professor position, beginning the following year. She researches the atmospheres of exoplanets using 3-D numerical models to explore their circulation, with the goal of understanding the atmosphere-planet connection and determining what observations can constrain the models.



**Prof. John Monnier** has been awarded the 2014 Michelson Investigator Prize for scientists working in the field of astronomical interferometry. This was presented at the SPIE meeting in Montreal, and the citation noted his extensive and varied contributions to the field, including development of the Michigan InfraRed Combiner, and its use with the CHARA array. Imagery of rapidly rotating stars has provided new constraints on stellar

structure, and interferometry of young stellar objects is shedding light on planet formation.

## Alumni News

**Dr. Mike Anderson** (currently a postdoc at the Max Planck Institute in Garching, Germany) was awarded a ProQuest Distinguished Dissertation Award. This is given in recognition of the most exceptional scholarly work produced by doctoral students at the University of Michigan who completed their dissertations in 2013.

**Dr. Shannon Schmoll**, whose 2013 thesis “Toward a Framework for Integrating Planetarium and Classroom Learning” integrated her passion for astronomy and education, has accepted the position of Director of the Abrams Planetarium at Michigan State University.

# The Lamont-Hussey Observatory

The University of Michigan's first observatory outside of Ann Arbor was in the Southern Hemisphere on Naval Hill in Bloemfontein, South Africa. Designed to study double stars in the southern skies, it had a 27-inch refracting telescope, the largest in the Southern Hemisphere. The U-M owned and operated it from 1928 until 1971, when the telescope was removed and the lens shipped back to Ann Arbor. For many years afterwards the building was used as a drama theater.

During 2013 the building was converted into the first digital planetarium in southern Africa, and rededicated as the Naval Hill Planetarium on November 1, 2013. A smaller projection dome was suspended inside the original 56-ft observatory dome by an entirely South African consortium of the Mangaung Metro Municipality; the Free State Department of Economic Development, Tourism and Environmental Affairs; the University of the Free State; and the South African Department of Science and

Technology.

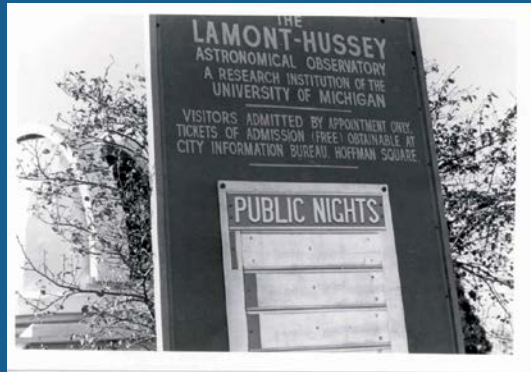
Research Professor Patrick Seitzer attended the dedication and spoke on behalf of the University of Michigan and the Department of Astronomy. In his speech he congratulated the South Africans on their achievement, and remarked how appropriate it was that the Lamont-Hussey building would be used for educational purposes, and would once

again see starlight, this time coming from a projector inside the building

rather than from the cosmos. He also read letters from University President Mary Sue Coleman, LSA Dean Susan A. Gelman, and Astronomy Department Chair Joel Bregman.



Research Professor Patrick Seitzer.



Sign outside the observatory during the 1960s. (Photo Credit: F. Holden.)



Dedication day on November 1, 2013. (Photo Credit: P. Seitzer.)



On the road to the Observatory, which is located in the Franklin game reserve on Naval Hill. (Photo Credit: P. Seitzer.)

With **Prof. Ted Bergin** taking the lead on this department initiative, the IRAM executive committee has voted to allow our participation in the Northern Extended Millimeter Array (**NOEMA**) project. The initial phase of the project will see the construction of a set of 4 antennas with receivers and a new correlator, leading to a second phase with two more antennas and extension of the baselines. We will be well-placed to exploit a facility that will be the most sensitive millimeter array in the northern hemisphere, and a key partner to ALMA.

We have also become a member of the **Swift** X-ray Observatory project, with of order 1 Msec/year for 3 years, available to the department through a TAC system that involves faculty, postdocs, and students — great experience for the latter! The deadline for proposals is set so that Chandra and Hubble proposals that would benefit from Swift time will be able to benefit from Swift review before submission. Thanks to **Prof. Jon Miller** for his efforts on this.





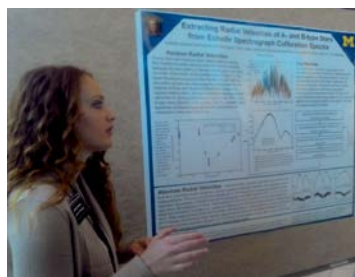
# MIRA

## Prof. Eric Bell, the first director, explains the goals of the new Michigan Institute for Research in Astrophysics.

The Michigan Institute for Research in Astrophysics (MIRA) — a collaboration between the College of Literature, Science and the Arts and the Departments of Astronomy, Physics, and Atmospheric, Oceanic and Space Sciences (AOSS) — was established in summer 2013 to help the University of Michigan play a greater role in pushing the frontiers of astrophysics. Astrophysics is an increasingly broad topic, with connections being made between the study of the solar system and the properties of exoplanets and planet-forming dust and gas disks on one hand and cosmology and fundamental physics on the other. The time is ripe to foster and encourage collaboration between astrophysicists campus-wide, regardless of which department they happen to belong to.

With this objective in mind, MIRA sponsors and helps to organize conferences, workshops, seminars and visitors. Our activities nurture collaboration and innovation at the cutting edge of astrophysics at the University of Michigan.

We spent a few months setting up the infrastructure to allow MIRA to function — selection of an executive committee, recruitment of the MIRA Administrator, Cheryl Israel, the establishment of twice yearly meetings of MIRA members in an informal context to trade ideas and start new collaborations, and the development of the MIRA website <http://www.lsa.umich.edu/mira>.



*Graduate student Juliette Becker explains her research to conference participants. (Photo Credit: C. Israel.)*

As I write this, we have just had our first MIRA-sponsored conference on circumstellar disks and planet formation on October 12-14, during the fall Study Break. Organized by faculty in the Physics, Astronomy and Earth and Environmental Sciences Departments and coordinated by Physics and Astronomy Professor

Fred Adams, this conference brought together 75 researchers from 6 different countries, with themes as diverse as the formation and fate of disks of gas and dust around stars and the physics of the interiors of ‘Super-Earths’, planets that have been found around other stars with masses larger than the Earth but smaller than Neptune — no such planets exist in our solar system, and the physics of their interiors is literally terra incognita. A large number of UM Astronomy researchers and alumni were in attendance, building new collaborations and showcasing their research.

Looking forward, there are around a dozen events planned over the next nine or so months. They span a wide range of topics. We plan a series of small workshops on interdisciplinary instrumentation, allowing instrument builders and experimental scientists from diverse backgrounds to collaborate and share expertise. We are hosting a series of breakfast seminars about the challenges that members of underrepresented groups face in pursuing a career in astrophysics. Next spring, researchers from the AOSS and Astronomy departments plan a workshop exploring the connections that can be made between Solar physics and the study of stars similar to the Sun. This lies right at the interface of traditional astronomy and Solar physics, and is particularly appropriate given the history of ground-breaking Solar research at UM.

From June 1-4 next year, MIRA will host a large conference on the Local Group in conjunction with a hands-on workshop on Astrostatistics — the application of cutting-edge statistical techniques to astrophysical problems. Later in the summer, we’ll have a conference on extracting fundamental cosmological parameters by combining cosmological datasets, as well as a pair of smaller workshops on the physics of galaxy formation and evolution.

What are my hopes for the more distant future? Many of the most important advances in astrophysics come from fruitful collaboration between young postdoctoral scholars and a diverse and engaged interdisciplinary faculty, in a supporting and stimulating research environment. One of MIRA’s major goals — one that we cannot currently pursue with the current budget — is the establishment of a post-doctoral prize fellowship program in astrophysics, with the intention of bringing some of the best and brightest young astrophysicists to UM. We hope to be able to offer these prize fellowships soon, further enhancing UM astrophysics.



*Graduate student Ilse Cleeves gives a presentation on her research on protoplanetary disks during the Circumstellar Disks and Planets conference. (Photo Credit: C. Israel.)*

# A Sense Of History



Al with the meridian circle, 1953. (Photo Credit: Bentley Historical Library, University of Michigan.)

The MDM Star Party brought together a number of old friends of the department.

**Al Boggess** grew up in Texas, receiving his doctorate from the department in 1954 (Photometry of Galactic Emission Nebulae). He started his career in Washington, DC at the Naval Research Laboratory, moving to NASA 4 years later to become senior scientist for the HST at the Goddard Space Flight Center.

**Nancy Boggess** grew up in

Maine, received her doctorate from the department in 1967 (The Structure Of NGC 6822) and joined NASA in 1968 as a staff scientist (also in Washington, DC). Later she was deputy project scientist for the COBE satellite and has had a long and distinguished career in infrared astronomy. They now live in Boulder, CO.



Nancy with the COBE test dewar. (Photo Credit: NASA.)

Their paths lead back to some of the best known names in Michigan Astronomy. Both started their doctoral research under the influence of Lawrence Aller, and their committees included eminents of the time such as William Bidelman, Leo Goldberg, Freeman Miller, Orren Mohler, and Helen Prince.



Al and Nancy at the GMT casting event in Tucson, Arizona, July 23, 2005. (Photo Credit: M.Stecker.)



**Herman Zanstra** (dark suit) holding a model planetary nebula made by graduate students at the University of Michigan Department of Astronomy. The group is standing in a yard outside the newer part of the Observatory on Observatory Ave. Notes from Zanstra's course are cataloged (QB 855.Z33). The photo was taken just prior to Zanstra's departure in 1961. Left to right: **Peter Boyce, Helene Ramsayer (Dickel), Robert Chapman, Vida Wackerling, James Kaler, Herman Zanstra, Lloyd Wackerling, Charles Cowley, Anne Pyne Cowley.** (Photo Courtesy Of D. Wentzel.)

## ...And A Sense Of Place!

Graduate students **Jeb Bailey** and **Hui Li** and **Prof. Mario Mateo**, pose atop Cottonwood Pass on the Continental Divide in Colorado after an invigorating climb to the pass on their bikes. (Photo Credit: M. Mateo.)



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**Alumni Updates & News:** [astro.alumni@umich.edu](mailto:astro.alumni@umich.edu)



**Graduate students from left:** Karina Mauco (visitor, Universidad Nacional Autonoma de Mexico), Ilse Cleeves, Fujun Du (postdoc), Jessica Kellar, Matthew Miller, Vivienne Baldassarre, Colin Slater, Jaehan Bae, Traci Johnson, Jesse Golden-Marx, Kamber Schwarz, Dan Gifford, Meghan Spencer, Brian Devour, Marina Kounkel, Bryan Terrazas, Erin May, Alejo Stark, Juliette Becker, Aleksandra Kuznetsova, Yingyi Song.



**Staff from left:** Cheryl Israel, Shannon Murphy, Brian Cox, Jan Malaikal, Lisa Kisabeth, Ann Thomson.