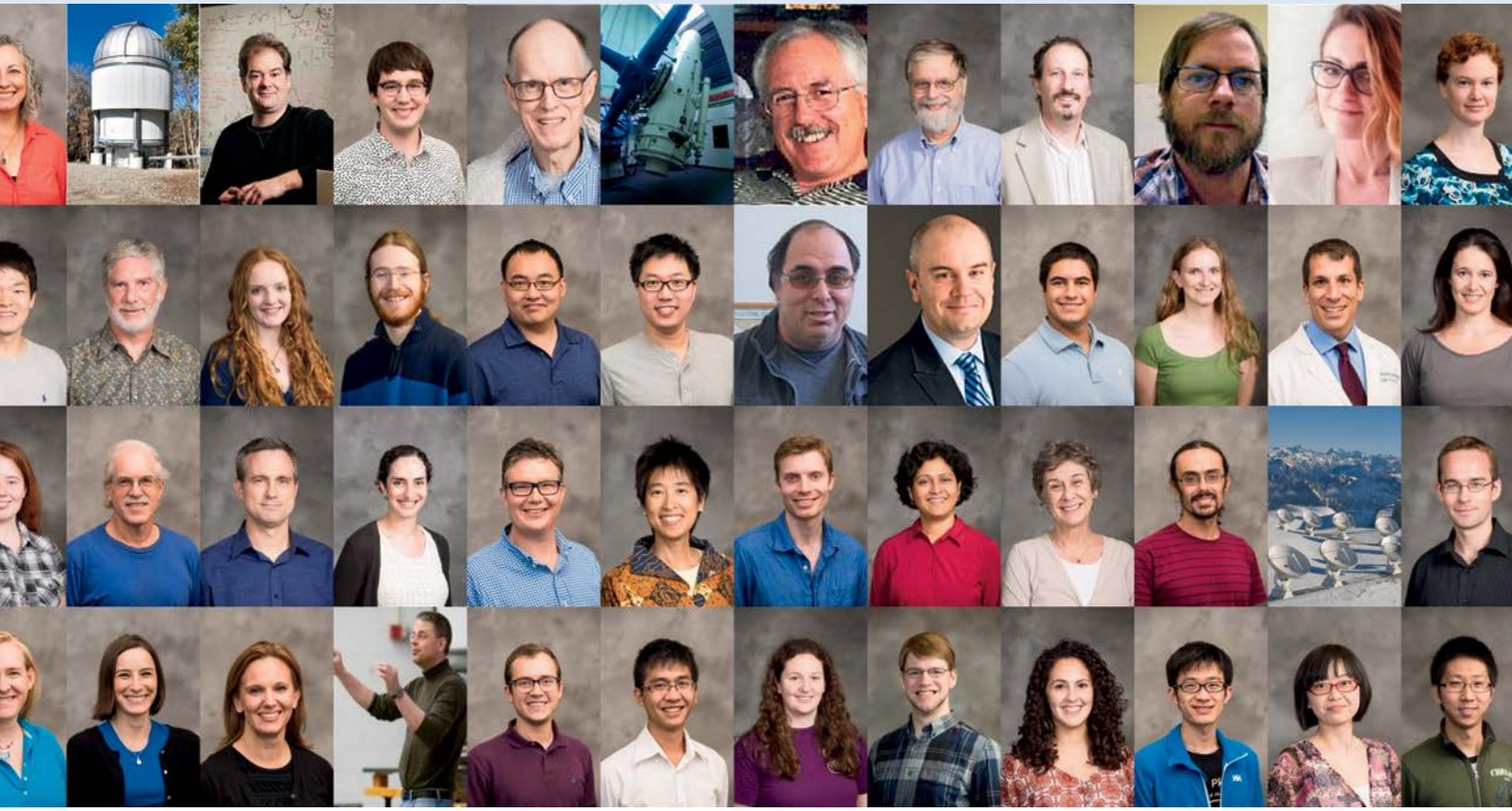
UNIVERSITY OF MICHIGAN

Fall 2016

Michigan Astronomy News

FOR ALUMNI & FRIENDS OF THE UNIVERSITY OF MICHIGAN ASTRONOMY DEPARTMENT



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UNIVERSITY OF MICHIGAN
BICENTENNIAL

Letter From The Chair

Greetings from the Michigan Astronomy Department! As I start my second year as chair, I am grateful to have such a fantastic Department, College, and University. Last year I noted some of the new faces we have on our faculty and how this department is clearly rising. This year I am amazed to report that we have expanded to having over 65 individuals (faculty, graduate students, and postdocs) working on astronomical science just in our Department alone – this is a 15% increase from last year! When you add in our inquisitive, hard-working, and brilliant undergraduates, we have over 100 astronomers working here at the University. Given this I could take numerous pages talking about the astronomical exploration that is ongoing, but here are a few snippets. Over the past year, we have discovered what happens when a star is swallowed by a black hole (really!), constrained the birth of stars in the early universe using massive clusters of galaxies as a magnifying telescopic lens, and taken the first images of regions near stars where planets are being born – essentially watching planet birth in action.

Given this growth and increased activity, I want to extend my gratitude to all of our supporters of this department and to the funding agencies that are central to supporting astronomical study (NASA and the National Science Foundation). I can sincerely state we would not be where we are without your strong support. I also want to encourage you to continue your support not only for us, but also for basic science. We are training the next generation of scientists as our central – important – core mission but, more generally, astronomical science has actually had an impact on your daily life. Did you know that the camera in your phone, or at home, owes its origin to the development of sensitive detectors in astronomy in the 1970s, or that when you go to the doctor to get a CT scan or an MRI, the technicians are using software and algorithms developed by astronomers? So looking up at the night sky and just asking "why?" can lead not only to advancing the boundaries of human knowledge, but also to real life changes in our society.

In the coming year we will continue to have our star party in Arizona where we look through our two telescopes at the Michigan-Dartmouth-MIT observatory. Last year we were fortunate to have a very clear night and were able to observe the rotation of Jupiter as the great red spot came into view over the night. Not something you see every day! This year we will also take advantage of the total solar eclipse that intersects the United States on August 21, 2017. Prof. Oey and I will lead a group of individuals at Camp Davis in Wyoming which intersects with the "line of totality" (where the Sun's light is completely blocked). Here in Ann Arbor a partial eclipse can be observed and we aim to hold an event on the Diag – and you are welcome to come!

Prof. Ted Bergin with Jean-Loup Puget signing the agreement between UM and IRAM to collaborate on NOEMA.

As always you are more than welcome to visit our department in West Hall. Look at the pictures on the wall (they are amazing) or come to an open house and look through a telescope. But please – go outside on a clear night – look up and wonder! (and then support your local astronomer!).

—Ted Bergin

Department of Astronomy Fast-Facts

People

- 25 Tenure-track Faculty (4 are within Physics & History)
- 9 Research Scientist/Professor Faculty
- 2 Emeritus Faculty
- 15 Postdoctoral Fellows and Research Associates
- 30 Graduate Students
- 10 Administrative and Technical Staff
- 72 Undergraduate majors and minors

Computing

- University-wide Flux cluster, with approximately 27,000 cores, InfiniBand network, and 1.5 PB scratch storage.

Observatories

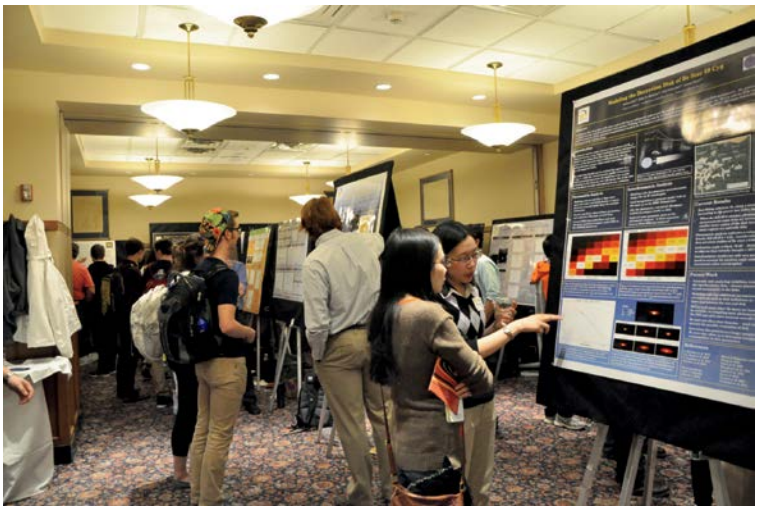
- Magellan Telescopes: 2 x 6.5-m telescopes at the Las Campanas Observatory, Chile
- MDM Observatory: a 1.3 and 2.4-m telescope on Kitt Peak, Arizona
- Curtis-Schmidt telescope at the Cerro Tololo Inter-American Observatory, Chile
- CHARA optical/infrared interferometer on Mount Wilson, California
-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

Members of the department, graduating students, and family members, at the Spring commencement reception. (Photo Credit: S. Murphy.)

Undergraduate News

The year's graduating seniors were Andreia Carrillo, who achieved Highest Honors, received the Astronomy Education & Community Outreach Award, and has started graduate school at the University of Texas at Austin; Samuel Dunham with Honors; Adham El-Batal, with Honors, and a move to Boston University for graduate school; Galal Galal; Benjamin Harmsen; Keith Johnson who has taken a software engineering position in Madison, WI; Kara Kundert who also achieved Highest Honors, was the recipient of the Excellence in Astronomy and Astrophysics Award, and has gone west to graduate school at UC Berkeley; Katherine Murray who has taken up a position at STScI; Trevor Picard, with High Honors, who has taken a graduate position at New Mexico State; Madelyn Popp, who will choose between working with City Year in Tulsa, OK, or a teaching fellowship in Baltimore, MD; and William Waalkes leaving UM with High Honors for graduate school at the University of Colorado, Boulder.

Will Waalkes received an Honorable Mention in the Chambliss student poster competition at the Florida AAS meeting. Congratulations, Will!



The Spring 2016 Undergraduate Poster Session, this year held in the Michigan Union, again saw an extraordinary number of high quality posters, highlighting the great research experience that our undergraduates receive. (Photo Credit: S. Murphy.)

Graduate Student News

Adam Smercina received an NSF Graduate Research Fellowship, while **Renee Ludlam, Allison Bostrom, Alexandra Kuznetsova** and **Ryan Farber** received honorable mentions.

Vivienne Baldassare was awarded a Rackham Predoctoral Fellowship. "The Rackham Predoctoral Fellowship supports outstanding doctoral students who have achieved candidacy and are actively working on dissertation research and writing. We seek to support students working on dissertation that are unusually creative, ambitious and risk-taking."

Daniel Gifford (advisor Prof. Chris Miller) defended "Estimating Cosmological Parameters and Cluster Masses through Escape Velocity Measurements in Galaxy Clusters" on November 11th. Dan used cosmological N-body simulations to study how to measure the masses of galaxy clusters. His work focused on observable uncertainties, including biases and other systematics that occur in real data. Dan also presented a new software suite to analyze data taken on the MDM 2.4m telescope using the OSMOS multi-object spectrograph. He then used his data and techniques to place constraints on the cosmological parameters. Dan is now working as a Data Scientist for Getty Images based in Seattle, WA.

On December 11th, **Rachael Roettenbacher** (advisor Prof. John Monnier) defended "Shifting the Starspot Paradigm through Imaging Magnetic Structures and Evolution." She used the Michigan InfraRed Combiner at the CHARA Array and data from the Kepler satellite to study a class of active stars through imaging their starspots. She made the first detections of previously unseen companions and the highest-resolution image of a star other than the Sun, showing that these active stars have magnetic dynamos that behave differently than the solar dynamo.

Cover Image: A snapshot of the department as the University of Michigan enters its bicentennial year. Visit the department web page to identfy the people in this rogue's gallery.

Newsletter Production: P. Hughes

Rachael accepted a fellowship from Stockholm University and continues to study active stars.

Matt Miller (advisor Prof. Joel Bregman) defended his dissertation "Determining the Origins and Impact of Hot Gas in the Milky Way" on May 2nd. His work established the presence of a hot gas halo surrounding the Milky Way and going out to distances several times the size of the optical galaxy. His discoveries were based on X-ray absorption and emission observations taken with the orbiting observatory XMM-Newton. The work focused on questions such as whether the hot halo accounts for the missing normal matter around the Milky Way (it does not, so much matter is still missing) and whether the hot halo is "pristine" or if it has been polluted with the metals of previous stellar populations (it is polluted). Matt is now an analyst with Allstate Insurance, a pioneer in the use of `big data'.

John 'Jeb' Bailey (advisor Prof. Mario Mateo) defended "Multiplexed High-Precision Radial Velocities: Searching for Hot Jupiters in Southern Open Star Clusters" on December 14th. Jeb created an automated control system for the Michigan/Magellan Fiber System that enables users to rapidly reconfigure it for different scientific programs, and developed a novel mechanism to triple its maximum resolving power. He used this to survey members of two young, nearby open star clusters. New members of M 47 were identified, as were possible members of a background Milky Way halo stream. He identified many new spectroscopic binaries, and candidate hot-Jupiter hosts worth follow-up investigation – culminating an extraordinarily fruitful project with major instrumentation, software, and observational components. Jeb has taken a postdoctoral position at Leiden Observatory, The Netherlands.

Faculty News

Research Scientist **Dr. Alicia Arnio** is taking up the George Ellery Hale Postdoctoral Fellowship in Solar and Space Physics at the University of Colorado, Boulder. She will continue her work on young stars and the solar-stellar connection, as the National Solar Observatory prepares for first light on DKIST (the Daniel K. Inouye Solar Telescope).

Prof. Elena Gallo (who has been elected to the University Senate Assembly) and **Prof. Chris Miller** have been awarded tenure. Congratulations to both! Also, Chris has been awarded a 2016 Class Of 1923 Memorial Teaching Award. These awards are "selected each year by the College of LSA executive committee from among those recommended for promotion from assistant to associate professor with tenure who have demonstrated outstanding teaching during their first years on the faculty" .

Prof. Monica Valluri has been awarded a 2016 Research Faculty Achievement Award. This recognizes significant scholarly achievement and is a fantastic recognition for Monica.

Alumni News

Dr. Ashley King (Stanford) was awarded the 2016 AAS/HEAD Dissertation Prize. "The HEAD Dissertation Prize is awarded at the time of the Division Meeting (every 18 months) to recognize an outstanding doctoral dissertation in high-energy astrophysics." Ashley received a monetary award, gave the Baldwin Prize talk at Michigan on March 23rd, and gave a special talk at the HEAD meeting in April.

Prof. Catherine Espaillat (Boston University) has been awarded a Sloan Research Fellowship. This adds to Catherine's series of recognitions including a NSF fellowship, a Sagan fellowship and a NSF CAREER award.

Two of our recent graduates, **Dr. John Tobin** and **Dr. Zhaohuan Zhu**, have accepted faculty positions. John has a named professorship at the University of Oklahoma and Zhaohuan has an assistant professor position at the University of Nevada-Las Vegas.

Dr. Ilse Cleeves' thesis, "Molecular Signposts of the Physics and Chemistry of Planet Formation", which she defended in April 2015, has won the 2016 Ralph B. Baldwin Prize in Astrophysics and Space Sciences. She is currently a Hubble Fellow at the Smithsonian Astrophysical Observatory.

Staff News

Following Jan Malaikal's move to become the Chief Administrator for Chemistry, **Bebe Zuniga-Valentino,** already Department Administrator for Statistics, has been appointed to that role also for Astronomy. **Stacy Tiburzi** has joined us as Executive Secretary, moving from the Office of the Vice-President for Student Life, after a career with Takata Corporation and Merrill Lynch & Co.

Prof. Joel Bregman introduces Prof. Rashid Sunyaev, who gave the Mohler Prize public lecture "Hot Gas In Clusters Of Galaxies, Cosmic Microwave Background Radiation, and Cosmology" on October 7th. (Photo Credit: S. Murphy.)

As we approach the University's 2017 Bicentennial, Karen Wight, of the Bentley Historical Library, reminds us of the central role Astronomy has played – and continues to play – in the intellectual and student life of this campus.

Prof. George Palmer Williams, ca. 1858.

In 1817 Judge Augustus Woodward gave Astronomy pride of place in UM's founding documents. Yet actual classes in the subject had to wait until the 1840s, when George Palmer Williams became our first 'Professor of Natural Philosophy.' Affectionately known to generations of students as 'Punky,' Williams "excelled as a teacher of astronomy, and in spite of meagre appliances, excited much enthusiasm in that pursuit."

Taking those instruments from 'meagre' to cutting-edge was a priority for Henry Philip Tappan when he became Michigan's first president in 1852. Within two years, the new Detroit Observatory – honoring Detroit donors but located in Ann Arbor – signaled UM's ambition to become a center of scientific research.

Detroit Observatory, Frank Leslie's Weekly Magazine, May 1859.

Meridian Circle, 2009.

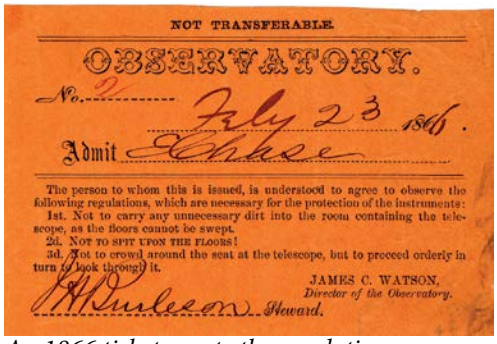
Equipped with a gleaming Meridian Circle transit from the Berlin firm of Pistor and Martins, and a refractor made by American telescope pioneer Henry Fitz (with a 17-foot mahogany tube and a 12.6-inch lens), UM suddenly had one of the finest observatories in the country.

More importantly, as student William Anderson boasted in a letter dated August 21, 1854 "[we] have called one of the best astronomers in the world to take charge of it, namely Dr. Brunnow of Berlin, Prussia. On his way here he stopped at some of the eastern colleges and caused many of them to envy the University of Michigan its good fortune on obtaining the services of such a man. His name will bring a large procession of students." Spoiler alert: it did.

Prof. Franz Brunnow, first UM faculty member with a Ph.D.

Brunnow became the first in a long line of UM astronomers who, in addition to teaching, were expected to use those cutting-edge instruments to conduct original research. In an attempt to manage the competing demands of students and researchers for time on the telescopes during Michigan's (frustratingly unpredictable) clear skies, the University experimented with issuing tickets for public "viewing nights."

This system was not ideal, however. In February of 1868 the University Chronicle (forerunner to the Michigan Daily) reported: "Some dissatisfaction is expressed by many students of the professional departments in regard to the management of the Observatory. They state that they have considerable trouble in obtaining tickets of entrance, and still greater difficulty in gaining the desired admission. It is quite a treat to look through a large telescope for those who have never had such an opportunity, and so long as the University advertises to allow admission to the Observatory, it might be well to make the means of gaining this entrance a little more practical."



NOT TRANSFERABLE.

OBSERVATORY.

No. 2 July 23 1866.

Admit Chase

The person to whom this is issued, is understood to agree to observe the following regulations, which are necessary for the protection of the instruments:
1st. Not to carry any unnecessary dirt into the room containing the telescope, as the floors cannot be swept.
2d. Not to spit upon the floors!
3d. Not to crowd around the seat at the telescope, but to proceed orderly in turn to look through it.

JAMES C. WATSON,
Director of the Observatory.

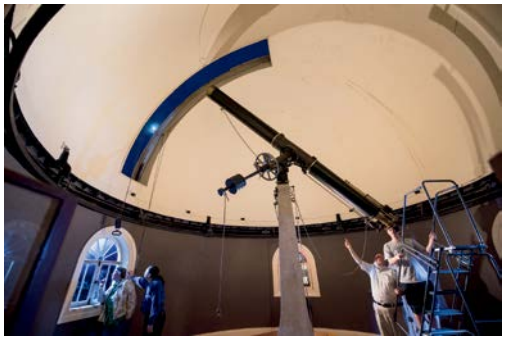
H. Buleson Steward.

An 1866 ticket – note the regulations.

UM astronomers eventually moved on to more esoteric research instruments, and for decades the Detroit Observatory was essentially shuttered. Things began looking up when the building was restored in the late 1990s, and today it is preserved by the Bentley Historical Library as an important turning point in UM history. Interest really blossomed, however, when UM's Astronomy department marked the 400th anniversary of Galileo's astronomical observations by initiating a revival of public viewing nights using Detroit Observatory's 1857 Fitz refractor. Students (including our volunteer telescope operators) were thrilled to re-discover and confirm that it remains quite a treat to look through a monumental telescope.

Today, Detroit Observatory retains its original telescopes and mechanical systems. Daylight tours explore the working life of this Victorian research facility and the early campus. But the most rewarding experience is when weather permits visitors to use the 1857 Fitz telescope, exploring the night sky much as researchers did 150 years ago. Simply viewing Saturn, Jupiter and its satellites, or even our own Moon, allows visitor to share the curiosity, excitement, and wonder felt by astronomers past and present.

For those who wish to judge the merits of this claim for themselves, the general public is encouraged to join us at a viewing night. While we can't always predict the weather, tentative viewing dates are posted online. On the afternoon of any scheduled viewing date, Astronomy's Shannon Murphy consults the latest



Public viewing. (Photo Credit: E. Bronson.)

forecasts, then updates that site to cancel or confirm the event. Visit dept.astro.lsa.umich.edu/detroit.php for the full viewing schedule — or simply do a web search for the phrase "viewing nights at Detroit Observatory."

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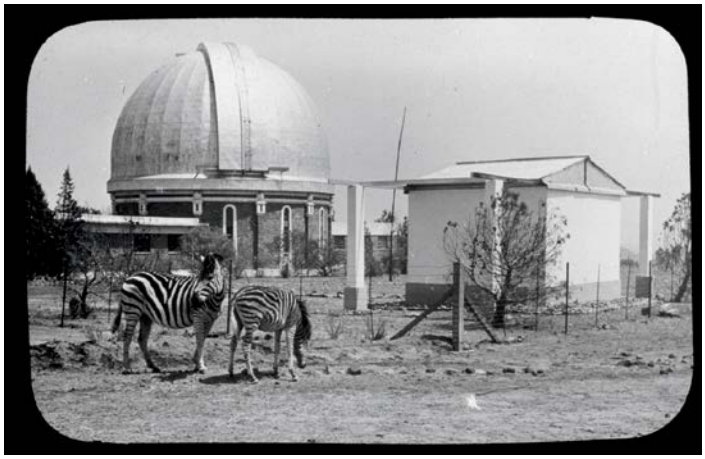
Research Professor Patrick Seitzer and Research Scientist Philip Hughes use images from the Bentley Historical Library to highlight a century of department observatories.



The Lamont-Hussey observatory was Michigan's first observatory outside of Ann Arbor, and was located in a game reserve on Naval Hill in Bloemfontein, South Africa. It was dedicated to the study of double stars, and had the largest refractor (27-inch) in the southern hemisphere. The observatory was used from its founding in 1928 until 1971, when the telescope was scrapped. The building and dome still exist, and in 2013 became the first digital planetarium in southern Africa.

The McMath-Hulbert Solar observatory was founded as a private solar observatory near Pontiac, Michigan in the 1920s, it became part of the University of Michigan Observatories in 1931. Observations continued until the late 1970s, when the Observatory was closed and transferred to private ownership. At its peak, it was one of the most important solar observatories in the world.

The Curtis-Schmidt telescope is a 24-inch aperture wide field telescope designed for surveys of large areas of the sky. Installed in 1950 at the Portage Lake Observatory near Dexter, Michigan, it was moved in 1966 to the much better conditions at Cerro Tololo Inter-American Observatory in Chile. Since 2000 it has been dedicated to surveys for artificial space debris at geosynchronous orbit that results from break-ups of satellites.

The 26-m dish of the UM Radio Astronomy observatory, shown under construction in 1958 at Stinchfield Woods, was then one of the largest radio telescopes in the world. For five decades, until its closure in 2012, it was dedicated to the study of active extragalactic objects, and the discovery that they vary in brightness with time-scales of weeks to years was made in 1964-65. As highlighted in the Ann Arbor News clipping from 1989, the observatory pioneered automation, and the possibility of remote observing.

THE ANN ARBOR NEWS • FRIDAY, AUGUST 11, 1989

EAR TO THE UNIVERSE — George Latimer, a supervisor for the U-M's radio telescope, stands well in front of the 85-foot 'ear' to the universe on Peach Mountain north of Dexter. The 30-year-old telescope is the only one in the world so thoroughly hooked up to computers it runs on a continuous basis unattended. It monitors quasars, those strange objects that give off gobs of energy from the edge of the universe. The telescope doesn't monitor meteors, but you can — with binoculars or the naked eye. The annual Perseid meteor shower, composed of debris from the tail of a comet, will stage its annual show for earthlings this weekend. Stories on A3.

NEWS PHOTO/ROBERT CHASE

In Memoriam

Prof. Richard G. Teske, who died in June at the age of 85, was born in Cleveland, Ohio, served in the U.S. Army during the Korean war, and received a B.S. from Bowling Green State (Ohio), an M.S. from the Ohio State University, and a Ph.D. from Harvard. He came to the University of Michigan in 1960 and served as a faculty member until his retirement in 1993. He was director of the MDM observatory from 1986 until 1992. He remained very active after retirement, chairing the LS&A scholarship committee, writing columns on astronomy, and contributing astronomy materials to the state's high school's classrooms.

During his time at Harvard he was charged with tracking the first U.S. artificial satellite, starting a career that would use some of the earliest spacecraft data. He was PI for a solar X-ray detector flown on OSO III, a project that provided the first comprehensive data on soft X-ray emission from solar flares. In the latter part of his career he embarked on a study of supernova remnants (SNR), making use of his knowledge of solar physics, and in particular the coronal [Fe] lines, to probe conditions near the SNR blastwave. He had a great love of the outdoors, and spent much time in Michigan and Europe hiking, camping and skiing with his wife of 40 years, Yvonne. His son, Steven, predeceased him.

Prof. Guenther H. E. Elste (1923 - 2015) was born in the German province of Silesia, now a part of Poland. He served in the German navy from 1942 until the end of WW II. He studied mathematics, physics, and astronomy at the University of Gottingen from 1946 to 1950, specializing in solar physics. His first publication was on solar line profiles. In May of 1954, he accepted an offer from the University of Michigan to work with Leo Goldberg, Edith Muller, and Lawrence Aller on abundances of the chemical elements in the Sun.

After returning to Germany, he came again to Michigan as an Assistant Professor in 1962. Professor Elste made use of computing machines very early in his career, and continued to employ them for his work with nine Ph.D. students on solar and stellar models and abundances. For several years, his Model 10 was "the" definitive solar atmospheric model. He retired from the University in December of 1991. Guenther Elste had a deep love of athletics, and enjoyed skiing, running track, and swimming. His wife Annelie died in 2002. They had two children, Volker (b. 1951) and Birgitte (b. 1957).

(Contributed by Prof. Charles Cowley.)

MIRA Report

Prof. Eric Bell, director of the Michigan Institute for Research in Astrophysics, writes that the institute has continued to host a discussion series "Conversations on Equity & Inclusion". This series of events brings MIRA astrophysicists together to discuss issues that affect the climate for women and minorities (including racial, ethnic, sexual orientation, learning and physical disability issues) and to envisage ways to improve the communication, support and thereby climate.

In November we heard from Dr. Kartik Sheth (Deputy Program Scientist Cosmic Origins, NASA, Goddard Flight Center), about the National Astronomy Consortium, a program led by the National Radio Astronomy Observatory and Associated Universities Inc., in partnership with the National Society of Black Physicists, and others, to increase the numbers of students from underrepresented groups and those otherwise overlooked by the traditional academic pipeline into STEM or STEM-related careers.

February saw a presentation by Dr. Chanda Prescod-Weinstein (Dr. Martin Luther King, Jr. Postdoctoral Fellow at the MIT Center for Theoretical Physics and the Kavli Institute for Astrophysics) on the theme "Do Black Lives Matter in Science?" She explored the role that scientists play in promoting the health and well-being of Black students in their departments and beyond.

Most recently, in April, Prof. Smadar Naoz (UCLA) recounted her personal story of overcoming challenges relating to learning disabilities, in combination with cultural impedance, being a women in STEM, and a first generation college graduate. She stressed that there is a wider range of individual differences than simply gender and race, and that it is important to learn about often invisible barriers, to provide support for a truly diverse group of scientists.

MIRA co-sponsored COSMO-16, the 20th annual International Conference on Particle Physics and Cosmology, held in August. There were almost 300 participants, with talks on dark matter and dark energy, inflation and primordial physics, LHC, CMB and LSS results, and particle astrophysics.

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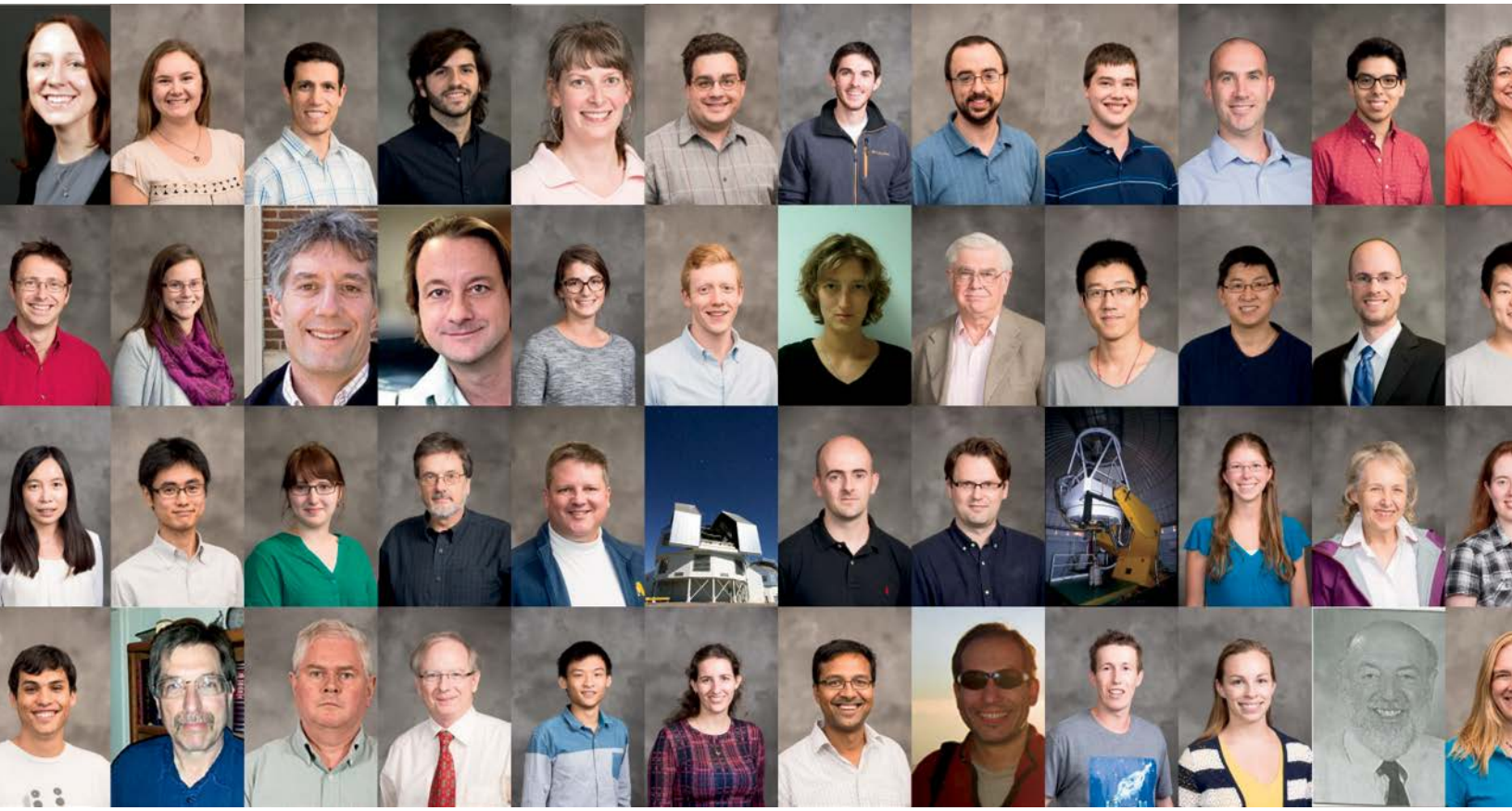

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