The Washburn Observer

DEPARTMENT OF Astronomy
UNIVERSITY OF WISCONSIN–MADISON

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GradPak and HexPak—A World First at WIYN

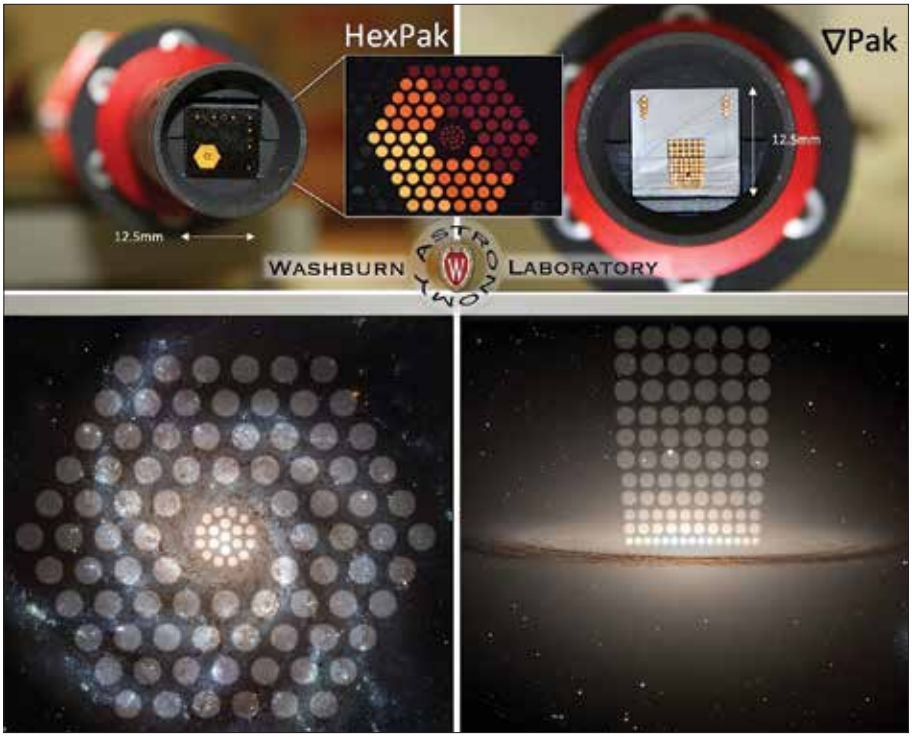
One dramatic way to harness the power of a large telescope is to take the light from a faint object—a star or a galaxy—and to spread it out by wavelength, creating a spectrum that tells the story of what the object is made of and what its physical properties are. To make that telescope truly efficient means doing this not just for one object, but for many objects *all at once.*

Modern telescopes can do this by using bundles of optical fibers, each taking the light from a separate part of the sky and turning it into a spectrum that astronomers can analyze. And when the fibers are packed close together, you can take many spectra of the different parts of an entire galaxy all at once. Such an instrument is called an integral field unit (IFU).

Wisconsin's 3.5-meter WIYN telescope at Kitt Peak, Arizona, used an IFU, called DensePak, on the Bench Spectrograph UW had designed and built for the telescope, but its performance had degraded, limiting Wisconsin astronomers' options in their quest to understand the nature of galaxies.

Several years ago, Professor Matt Bershady was awarded a competitive grant from the National Science Foundation to give the WIYN telescope's Bench Spectrograph new capabilities and improve WIYN's usability with a new type of IFU. Using NSF funding, supplemented by a generous gift organized by the Board of Visitors, Matt and Dr. Marsha Wolf at UW's Washburn Laboratories hired graduate students Corey Wood and Arthur Eigenbrot to join them in designing two new IFUs for WIYN, each adding capabilities not offered by the previous generation of IFUs.

To make these additional IFUs practical tools, they were designed to use much of the same hardware, sparing the spectrograph recalibration at each switch and so enabling an IFU switch to happen in a record-setting 10 minutes.



Matt Bershady

Sebastian Heinz NASA/ESO

Top: The fiber heads that hold HexPak (left) and GradPak (right). Bottom: HexPak and GradPak view disk galaxies by placing small fibers where the galaxy is bright for optimal resolution, and large fibers where the galaxy is dim for optimal light-gathering power.

But HexPak and GradPak aren't just innovative because they are so convenient. Each densely packed optical fiber bundle uses multiple sized fibers to capture light across space in ways that bundles with uniform fibers cannot—a world's first! The arrangement of the fibers across the array provides greater resolution in a smaller space and the varying diameters allow capture of light across greater ranges in intensity, great for studying galaxies which have bright centers and faint outskirts.

Once the two new IFUs were built and tested, Arthur and undergrad Curtis Bartosz accompanied them to Arizona and worked with the engineers at WIYN to install them. Their trip was funded by generous support from our donors.

Since installation in November, at least three research groups have booked time with the new IFUs. Graduate students are using them for their thesis work and there have been requests for more information on the capabilities of the new technology. In addition to all the science that will be made possible by the new IFUs, the training our students received in the conception, construction, testing, and delivery of these two innovative instruments will continue to pay off for decades to come.

Letter from the Chair

Welcome to the Summer 2014 edition of the *Washburn Observer*. You may notice that the *Observer* is a bit late this time. This is because we have just undergone a transition: Barb Sanford, the first editor of the newsletter, retired earlier this year. Following a long search process, Barb has now been replaced by Mary Farrell-Stieve. Please join us in welcoming Mary.

You'll read about other transitions in this newsletter. Blakesley Burkhart, Natalie Gosnell, Isak Wold, and Andrew Schechtman-Rook have completed their Ph.D. theses and are moving on. Some to postdoctoral research positions—Blakesley, as an Einstein Fellow, to the Institute for Theory and Computation at Harvard; Natalie to the University of Texas as a MacDonald Fellow; and Isak to the University of Texas as a researcher. And some to the private sector, as Andrew joins Capital One. Congratulations to them and to Alex Lazarian, Bob Mathieu, Amy Barger, and Matt Bershady, their advisors. We said *au revoir* to 19 majors, including Brianna Indahl, winner of this year's Lowell Doherty Award, who will be pursuing graduate work in Astronomy at (yes) the University of Texas this fall.

Here at the UW, Erin Boettcher and Elijah Bernstein-Cooper competed successfully for Predoctoral Fellowships from the National Science Foundation. Also, congratulations to Richard Townsend, lead of the Massive Stars research group, approved for promotion to associate professor with tenure effective the 2014-15 academic year; and to Jay Gallagher, the new UWF Chair Rupple Bascom Professor and Jubilee Professor at the University of Chalmers.

Two themes defined the first year of my term as Chair. Dean Scholz announced a new College of Letters & Science Career Initiative, and the Astronomy Department volunteered to become an Early Adopter. This inspired us to work with our Board of Visitors to mount a career event in April for Astronomy majors and prospective majors. Over pizza, students heard the Board member's stories—diverse, many with multiple strands, always leading to fulfillment—and then broke into small groups for personal discussions with members of the Board. It was such a useful, warm, and interesting occasion that a few weeks later our Astronomy graduate students, spearheaded by Greg Mosby and fueled by more pizza, presented their own career event, centered on how to prepare for, apply to, and succeed in graduate school. The goals of these two events, which we plan to regularly repeat, are simple. The Astronomy major—which introduces scientific computing, advanced technology, scientific writing, and research skills along with physics, and math, all in the context of the workings of the universe—prepares students for many paths in life. We want to make Astronomy majors, and students contemplating the major, aware of the realm of possibilities open to them, and help them pursue what suits them best. As architects of our own curriculum, we're constantly looking for ways to enhance student experience, and are delighted to engage with the L&S Career Initiative to do so.

We are also exploring new ways to reach out into communities to let them know the opportunities waiting for students who study astronomy and to inform the public who want to know more about what we do. Included in this newsletter is a brochure we created last spring to use for recruitment and whenever we have a public event.

The second theme of the past year was promoting opportunities for scientific engagement. Graduate student Claire Murray organized a weekly Science Lunch where we discussed new research done inside and outside the department or heard informal seminars by visitors. We continued the weekly Journal Club Lunch, where students prepare to meet future speakers by discussing their work, and we augmented our list of visiting speakers with exceptional scientists selected by postdocs. By intensifying a dialog that was already there—and creating new opportunities for dialog—we have been able to define new research projects, initiate new collaborations, and develop new contacts. None of this would have happened without the gifts that funded the speakers and the lunches, and we are all grateful to the donors who made it possible.

Ellen Zweibel, Astronomy Department Chair

Private funding is also enhancing our engagement with the public. Universe in the Park, a series of astronomy programs in Wisconsin state parks hosted by department members, is now funded privately, and operated in part by equipment bought with private funds. I'd like to thank everyone who makes this program possible—the donors for their belief in the program and their gifts, and the presenters who set up the telescopes in the campground and share their love for the sky.

Wishing you a delightful fall,

Ellen Zweibel
Astronomy Department Chair

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Thank you for supporting Badger Astronomers!

News Notes

Congratulations New PhDs

Isak Wold's thesis, "An Observational Study of Quasar Host Galaxies, Radio Galaxies, and Lyman Alpha Emitters" was done under the guidance of Professor Amy Barger.

Natalie Gosnell presented "Blue Stragglers and X-Ray Binaries in Open Clusters: An Observational Study of Alternative Pathways in Stellar Evolution" conducted with Professor Bob Mathieu.

Blakesley Burkhart did her Ph.D. thesis, "New Frontiers for Diagnosing the Turbulent Nature of the Multiphase Magnetized Interstellar Medium" with Professor Alex Lazarian.

Last fall, **Andrew Schechtman-Rook** presented his work, "Lifting the Dusty Veil: Understanding the Stellar Structure of Spiral Disks" under the guidance of Professor Matt Bershady.

Department News

- **Professor Richard Townsend** was approved for promotion to associate professor with tenure.
- **Professor Jay Gallagher** is the UW Foundation Chair Rupple Bascom Professor and was awarded a Jubilee Professorship from the University of Chalmers.
- **Professors Sebastian Heinz** and **Amy Barger** are beginning sabbaticals this fall.
- **Barb Sanford,** newsletter editor and development specialist, retired this winter, and **Mary Farrell-Stieve** joined the department.
- **Professors Matt Bershady** and **Snezana Stanimirovic** are returning from sabbaticals. Professors T**ony Wong,** UI-Urbana-Champaign, and **Karen Lewis,** Wooster College, completed their sabbaticals with us.
- **Dr. Audra Hernandez** has been promoted from postdoctoral researcher to assistant scientist.
- We are delighted to congratulate **Elijah Bernstein-Cooper, Claire Murray, Greg Mosby, Erin Boettcher** on receiving NSF graduate fellowships for the 2014-15 academic year.
- Congratulations to our fall 2013 bachelor's degree recipients **Tenzin Choedak** and **Ryan Shearier** and to the spring 2014 bachelor's degree recipients **Curtis Bartosz, Sarah Bitant, Ryan Bossler, Brian Bottleman, Jordan Falk, Daniel Hesse, Briana Indahl, Linbailu Jiang, Paul Choong-Ho Jung, McKinley Meyer, Catherine Steffel, Jennifer Wunderlin.**
- The new department promotional brochure is enclosed with this newsletter. Help us promote our program by distributing the brochure in your local high schools and community colleges.

Stellar Careers

What can you do with an astronomy degree? Ask our alumni and you will be overwhelmed with the diversity of possibilities. It turns out the combination of quantitative analytical skills, creativity, and problem solving that distinguish astronomy majors is highly sought after not just in academia, but in many leadership positions in the private and public sectors as well. Our alumni have forged successful careers in fields as diverse as patent law, banking, and engineering. They serve as directors at NASA, and hold faculty positions at prestigious universities.

The L&S Career Initiative launched by the Dean of the College of Letters & Science, Karl Scholz, aims to better guide students through their college experience and to further improve the value of their degree when entering professional life.

As an early adopter of the Career Initiative, we held the first ever set of UW–Madison Astronomy Career Events in April 2014.

We invited some of our most visible and decorated alumni to showcase how their degree helped them in their career development and to provide perspective on what our next generation of alumni should focus on when making career decisions. In short presentations and individualized one-on-one counseling sessions, our students learned about everything from interview strategies to making lasting and fulfilling career choices. The event was scheduled alongside the STEM Career Fair held by the College of Letters & Science.

Rich Townsend and his table-mates share lively discussion during a small-group break-out session during a Career Initiative event in April.

And because many of our students do end up taking the academic path through graduate school, our current grad students organized a follow-up event to provide perspective on how to make a successful transition into astronomy Ph.D. programs.

We are deeply thankful to our Board of Visitors for their support in this event and congratulate our grad students for going the extra mile to support our department and the undergraduate student population.

The Washburn Observer is the newsletter of the Department of Astronomy at the University of Wisconsin–Madison.

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Late summer at Washburn Observatory

What's new with you?

Stay in touch. Let us know what's new in your life, especially if you have new contact information. Send news to newsletter@astro.wisc.edu or mail your updates to:
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Eric Hooper

Summer undergraduate researchers—including the REU students sponsored by the NSF and guests from China—visited Space Place to learn about UW–Madison astronomy outreach programming. They tried out interactive displays and got a behind-the-scenes look at the preparations needed to produce the educational programs at Space Place. Eric Hooper coordinated the undergraduate summer research program.