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The Best and the Brightest

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Several UNLV astrophysics faculty members and students conduct research on enormous stellar explosions called gamma ray bursts (GRBs), such as the one depicted here in a NASA illustration. This GRB, which was detected March 19 in the constellation Boötes by NASA's Swift satellite, was seen worldwide by observatories and even with the naked eye. Image by NASA/Swift/Mary Pat Hrybyk-Keith and John Jones



The Best *and* *The* Brightest

BY GIAN GALASSI

Of all the intellectual pursuits of our species, perhaps the most venerable is our quest to comprehend the cosmos and our place within it. For millennia, we have fixed our eyes on the stars as part of this quest. Though our gaze has become increasingly sophisticated in the past half century – with billions of dollars spent on powerful telescopes and other space exploration technologies – our wonder only seems to deepen with each new discovery, revealing just how far we have to go.

Yet, we continue the quest. Some of us reserve our stargazing for clear nights in our own backyards while others devote their entire careers to the endeavor. This is a story about a subset of the latter group of individuals – a small number of highly accomplished UNLV astrophysicists who have achieved remarkable status in the scientific community in a very short time.

You may not have heard of them, but that's about to change.

If we know anything about astronomy, it's that the brightest stars have a way of capturing our attention. Their energy and influence are undeniable.

Like their counterparts in the night sky, the stars of UNLV's astrophysics program are irrefutably brilliant and have gained the notice of scientists throughout the world.

Although they are small in number – five full-time faculty members and one part-time professor – and their program is relatively new, they have not escaped the eye of the National Science Foundation and NASA. Both agencies now actively fund the group's research and rely on their expertise to ensure mission success.

What's more, institutions around the country and the world are starting to take notice, too, not only because of the way in which UNLV has grown the program in recent years, but also because of the caliber of researchers who have chosen UNLV over more established programs.

In the Beginning

UNLV has offered astronomy courses for more than 30 years. The early astronomy faculty, including former professor Ed Grayzeck (who is largely credited with founding the astronomy program) conducted their research quietly and effectively and provided solid instruction in both physics and astronomy.

As the faculty and its achievements continued to grow over time, the small program began to receive noteworthy acclaim. In the mid-1990s, now-retired professor Donna Weistrop gained recognition for her work on NASA's Hubble Telescope. At the same time, professors Steve Lepp, George Rhee, and Diane Pyper Smith were building research programs of their own in molecular astrophysics, dark matter, and galaxy formation – strong research that continues today.

If the astronomy group needed validation of how well-respected their program had become, it arrived in 2004. After soliciting applications to fill a position vacated by Weistrop's retirement, the group was overwhelmed by the quantity and quality of candidates.

"We had a remarkable pool of applicants," says Rhee, an associate professor of astrophysics who chaired the search committee. "Although Bing Zhang was the obvious choice, we could have thrown darts at our list of top 10 applicants and come away with a top-notch individual. It was that good."

Hiring Bing Zhang was nothing short of a coup. He arrived at UNLV with a superb resume citing a host of impressive accomplishments, including a distinguished record of research

success at NASA's Goddard Space Flight Center and Penn State University, both considered bastions of astrophysics research.

It was while working at Penn State that Zhang became a member of the NASA SWIFT Team – a collaborative group of scientists that oversees the first-of-its-kind multi-wavelength observatory dedicated to the study of gamma ray bursts (GRBs).

Zhang has since become one of the most well-known researchers on the topic of GRBs – considered the most brilliant explosions in the universe – and continues to publish on research that advances knowledge about dying stars.

Then, in 2005, a paper on which he collaborated with his SWIFT colleagues was ranked by *Science* magazine as one of the most important scientific breakthroughs of the year. Later that same year, Zhang's GRB group at UNLV was the first to identify five major components of GRBs, an accomplishment that he ranks among his proudest at UNLV.

But Zhang was only getting started. In 2006, he wrote a column for *Nature* magazine in which he redefined how astrophysicists should classify GRBs. Shortly thereafter, *Essential Science Indicators*, a publication that compiles science performance statistics, identified Zhang as one of the most widely cited authors in the field of space science for an article he authored in *The Astrophysical Journal*.

In 2007, the High Energy Astrophysics Division of the American Astronomical Society awarded Zhang and the rest of the SWIFT team the Bruno Rossi Prize for major contributions to the field of astrophysics.

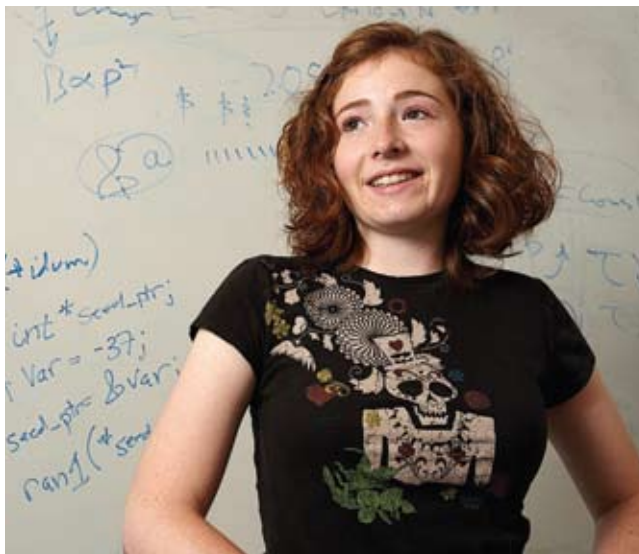
"There is a very supportive research environment at UNLV," Zhang says of his colleagues in the physics and astronomy program. "And, in terms of creativity, our group has now surpassed some of the higher-ranked institutions in terms of research activity."

This growth in activity can, in part, be attributed to Zhang, but it also mirrors the expansion of the program, which included the hiring of acclaimed young researchers Daniel Proga in 2005 and Kentaro Nagamine in 2006.

"We knew that if we could attract that same caliber of candidates as we did with Bing that we should go for it," says professor Steve Lepp. "Injecting three young researchers into a program of our size really raised the bar. While we may not be the size of larger, more well-known programs, we are incredibly active. People in this field are taking notice that UNLV is a place where things are really happening."

The Nevada System of Higher Education took notice as well. New master's and doctoral degree programs in astronomy were approved, and a name change for the department – now called

A small number of highly accomplished astrophysicists have achieved remarkable status in the scientific community in a very short time.



Clockwise from bottom left: Physics and astronomy professors Steve Lepp, Diane Smith and George Rhee, and astrophysics student Tesla Birnbaum.

the UNLV Department of Physics and Astronomy – reflected the mounting prestige of the faculty and the growing interest in the discipline from undergraduate and graduate students alike.

A New Generation of Stars

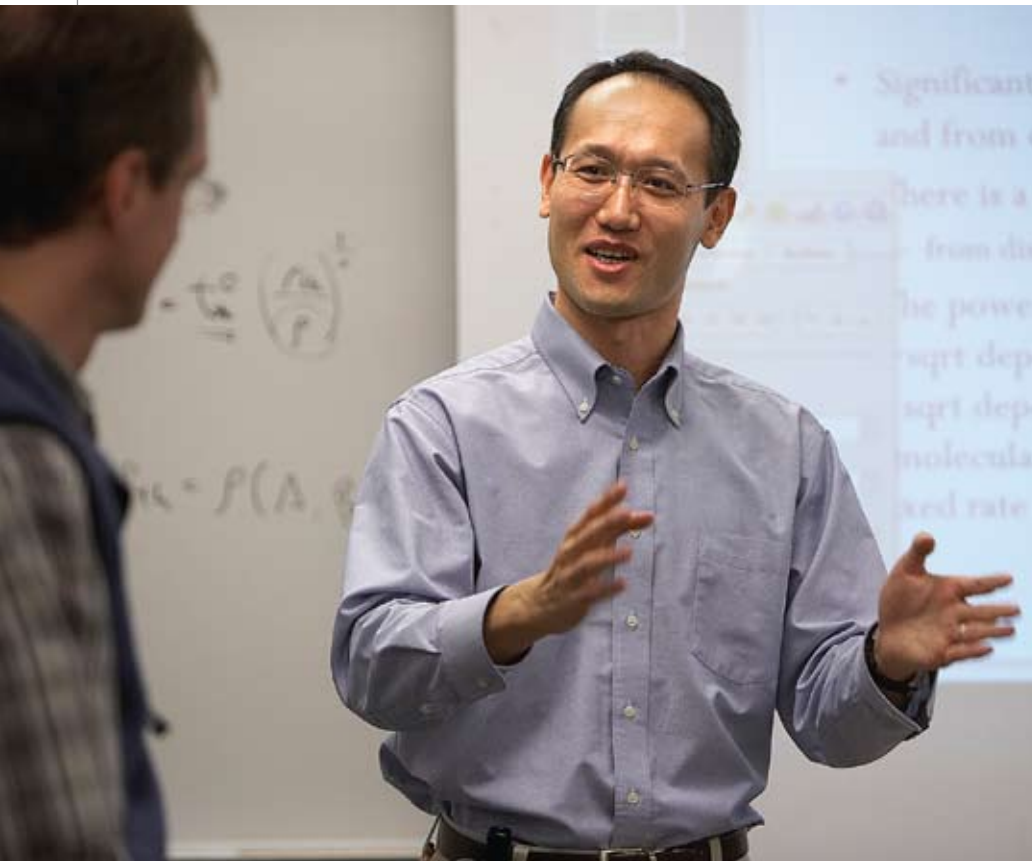
In 2004, Tesla Birnbaum was a precocious high school freshman, raised on Carl Sagan books and the PBS series *NOVA*, when she contacted Bing Zhang. She was interested, she told him, in becoming an astrophysicist and asked his advice about which universities she should consider. He recommended UNLV's growing program and provided the names of several

other institutions well known for astronomy research. She explored his leads thoroughly; shortly after her high school graduation, Birnbaum, a National Merit Scholarship finalist and high school valedictorian, enrolled at UNLV.

"Three years after she initially contacted me, she showed up at my door and said, 'I'm here, and I want to work with you,'" Zhang recalls. "I told her that was great, and she has turned out to be an excellent student."

Birnbaum chose UNLV because of the research opportunities available to her right out of high school; most astronomy students must wait for graduate school for such opportunities.

"I got the feeling from touring other institutions that there



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was not a lot of focus on the students,” Birnbaum recalls. “UNLV has a much smaller program, but the faculty have so much research going on, and they involve students every step of the way. I think that really works to their advantage ... and mine.”

Birnbaum has already participated in the National Science Foundation’s Undergraduate Research Opportunities Program, where she studied the afterglows of GRBs with Zhang. She is also one of two undergraduate members of his GRB group, where she works as part of an international team of post-doctoral fellows, research associates, graduate students, and visiting scholars from the U.S., China, Poland, and India.

UNLV doctoral candidate Amanda Maxham knows how important experiences like Birnbaum’s are for undergraduates. Maxham earned dual bachelor’s degrees in physics and astronomy, as well as a master’s degree in astronomy, all from much larger, better-known universities. But it wasn’t until she arrived to pursue her doctoral degree at UNLV that she realized what she’d been missing.

“UNLV has provided me with a completely different perspective than I had as a student at my previous schools,” says Maxham, who also works closely with Zhang. “I am treated with a level of respect here that I don’t think you can expect at bigger universities. The faculty here really value students’ opinions, which is more conducive, I believe, to having a creative research program and for generating new ideas.”

Arriving in 2005, Maxham has seen firsthand how the program’s growth has benefited students directly. She says

astronomy student activities have increased dramatically, citing as examples the creation of the unit’s active Journal Club, a group of faculty and students who meet weekly to discuss the latest research publications, and Astro Coffee, a more informal gathering designed to spark discussion about the discipline.

Maxham, Birnbaum, and their peers agree that the supportive and friendly environment within the department facilitates serious academic accomplishment and encourages professional success among students.

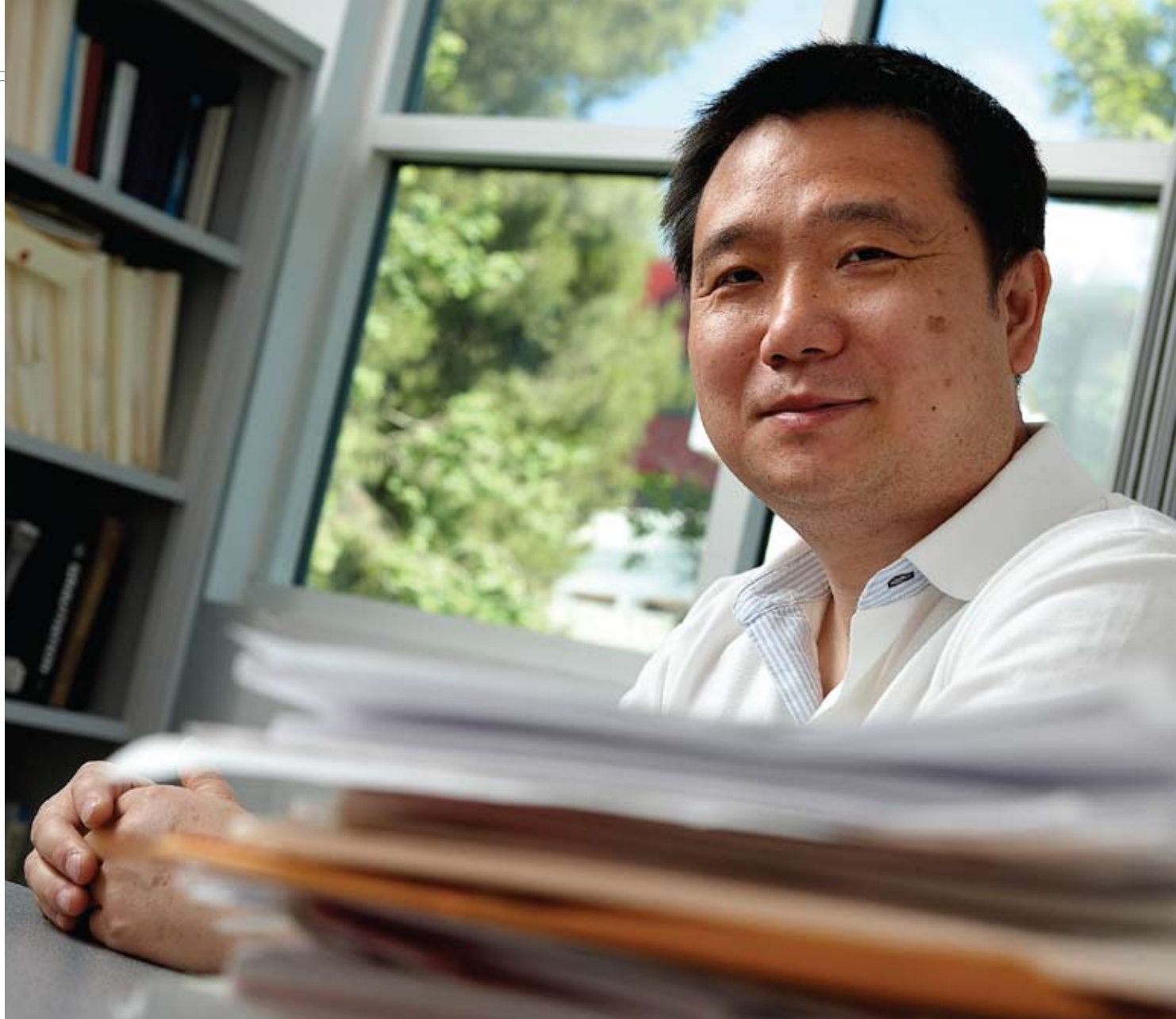
“To think that I can make even a small contribution to the body of knowledge in astronomy is really exciting,” says Birnbaum. “And it’s very rewarding to help answer questions that humans have always had about where we live and how we fit into the universe.”

Down to Earth

College of Sciences Interim Dean Wanda Taylor couldn’t be happier with the success of the astrophysics program.

“This group is one of several on campus that are putting UNLV on the map in the world of research,” Taylor says. “The acknowledgement they’ve received in the scientific community has a wonderful impact on our recruitment efforts as well as our academic reputation.”

While she acknowledges that subject matter such as black holes, dark matter, or the afterglows of gamma ray bursts may seem far removed from today’s most pressing earthly



Astrophysics professors Kentaro Nagamine (far left, facing page) and Daniel Proga (left) joined the UNLV faculty shortly after Bing Zhang (above).

concerns, Taylor says she still believes in the commitment to discovery that guides university research.

“Pure research can and does create the foundation upon which all other ‘applied’ research builds,” Taylor notes. “The innovations born out of pure research could very well create principles or inventions that we’ll need down the road, whether it’s in 20 minutes or 100 years from now.”

Take, for example, a lesson from the past: Four hundred years ago, the first telescope was used by Galileo to begin exploring the heavens. This led to discoveries of vast consequence, but no one at the time had the remotest understanding of their significance. Yet, the sum of all knowledge of the cosmos rests on the foundation of one man’s decision to turn a then-newly devised invention to look at the night sky.

This fact is not lost on astronomy faculty members like George Rhee.

“We don’t necessarily remember who the local tradesmen

were in Florence at that time, but we do remember that there was someone there who did something remarkable – something that is remembered and celebrated 400 years later,” says Rhee. “These types of discoveries – some of which may be made right here at UNLV – resonate with people. Down the road, people may ask, ‘How did we find out about this or that?’ Well, maybe the answer will be that Zhang or Nagamine or Lepp or Proga did something remarkable, too.”

While such acknowledgement would clearly be a welcome byproduct of their research, this stellar team of UNLV astrophysicists clearly didn’t enter the discipline to make headlines – even if they happen to do so along the way.

“It’s a natural human desire to learn about the universe,” says Nagamine. “People have been asking these questions since ancient times. We are just beginning to find answers, so it is important that we continue the search and continue to educate the next generation of scholars who will carry on.”