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## State's title as capital of astronomy is eroding

### Science leaders seek to protect \$250M annual benefit for Arizona

By Dan Sorenson By Dan Sorenson

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A supergroup of Arizona science leaders is calling for immediate action to protect and expand the \$250 million-plus it says the state's economy gets each year from non-commercial astronomy and space and planetary science research.

The group recommends expanding Arizona's public- and private-sector strengths in astronomy and space sciences by having the state's congressional delegation go after federal funding, further reducing light pollution in the face of rapid population growth, and creating a more welcoming atmosphere for observatories.

The Arizona Arts, Sciences and Technology Academy's committee report tallies only the economic impact of the non-commercial part of Arizona's astronomy and space sciences sector. It doesn't quantify the economic impact of astronomy and space science "spin-off" or related industry and business.

"That's just institutional, no commercial activity, just the observatories, universities, U.S. Geologic Survey, National Optical Astronomy Observatory, U.S. Naval Observatory, National Solar Observatory, no companies at all," said Patrick J. Burkhart, the academy's president. Burkhart worked in funding and development at Arizona State University before founding the group.

By the report authors' definition, that annual \$250 million-plus impact comes from:

- Spending by employees of those institutions, agencies and observatories.
- Purchases of goods and services by those employers.
- Spending by visitors attracted to institutions, whether as tourists or as visiting scholars or conference attendees.

The economic portion of the study was done by the University of Arizona's Eller College of Management.

Statewide, astronomy, planetary and space sciences research organizations employed 1,830 people with a payroll of \$84 million in 2006, the report says.

The recommended efforts to protect what Arizona already has and expand it should be seen as an investment in a massive, proven valuable asset, said Burkhart. "The other thing that's particularly stunning, we have nearly \$2.1 billion in land and instruments invested here. The survey also found in the neighborhood of \$635 million in capital projects under way in those fields," he said.

"The most important thing is getting the attention of the Legislature," said Michael Drake, director of the University of Arizona's Lunar and Planetary Lab.

### By the numbers

The report says Arizona's astronomy, space and planetary science sector provides:

3,300  
jobs, direct and indirect

\$138.6 million  
in earnings

\$114.2 million  
in other value added

Drake said the UA's Lunar and Planetary Lab, whose latest victory is leading the science on NASA's Phoenix Mars Mission, "gets a little under \$3 million a year, primarily for faculty salaries. But if you average how much we bring in competitively (in federal grants) we're spending about \$30 million — a 10-to-1 investment."

The Lunar and Planetary Lab leverages that state money to bring in NASA grants. The UA has faculty scientists and staff researchers, particularly in the area of imaging, who can devise winning proposals that fit NASA programs.

Part of those grants, in turn, is used to fund jobs on specific projects, such as the lab's High Resolution Imaging Science Experiment and the Mars lander mission. Drake said about \$60 million of the \$400 million Phoenix Mars Mission will come through the UA over the project's five years.

"Not chump change," said Drake. "When you're spending \$60 million over five years, you're a small business yourself. The LPL and Steward Observatory are a small business in themselves."

"We're trying to get the attention of the Legislature that the university is not like the state prison system, but a high (return) rate investment — you invest a dollar, you get something like \$10 back."

"The state is not pouring money down the drain. We teach kids. We create new knowledge and we create new jobs. But what most people don't pick up on — that money is spent primarily in the local economy."

ASU's School of Earth and Space Exploration is also coming on strong, and ASU planetary scientists have strong NASA ties, including recent work on the twin Mars rovers Spirit and Opportunity.

The academy's report urges congressional members from Arizona to maintain and increase funding for related federal agencies already here and for highly competitive research funding used by the state's universities and institutions.

While the state has a number of federal operations connected with astronomy and space, it has only one large federally funded research and development center — the National Optical Astronomy Observatory.

The report notes that competition for federal labs is vigorous and that the efforts in other states are often more organized. It urges protecting what Arizona already has from possible take-over attempts by other states.

"For example, the National Solar Observatory, with staff and facilities in Arizona and New Mexico, plans to consolidate its staff at a single headquarters site during the next five years." New Mexico, Colorado, Hawaii and other states have already expressed strong interest.

The authors also urge stronger efforts to reduce light pollution, cited as a major threat to the usefulness and future of the state's mountaintop observatories despite a long-running dark-skies policy that resulted in local light ordinances in much of the state.

Tucson and Pima County have enforced their laws well, said Buell Jannuzi, director of the Kitt Peak National Observatory.

But he said astronomers want to extend that level of dark-skies commitment to greater Phoenix and northern Pinal County area, where growth is booming.

Light pollution all the way from Phoenix is already a concern on Kitt Peak. And the Phoenix night glow has even begun to degrade viewing at Lowell Observatory's Anderson Mesa site outside Flagstaff.

The true impact of astronomy and space sciences is not measurable in dollars, the size of telescopes or private sector spinoffs, said Peter Strittmatter, head of the UA's department of astronomy and Steward Observatory.

"It's not just economic impact in terms of dollars of grant money. It's the whole spirit of scientific investigation, the education and inspiration for young people; they all add up into a strong benefit for the state," Strittmatter said.

Erosion of Arizona's title as the astronomy capital of the world has already begun.

In recent years, sites outside Arizona have been increasingly chosen for world-class and major telescopes.

National Optical Astronomy Observatory, the parent group of the Kitt Peak and National Solar observatories located about 50 miles southwest of Tucson, is still headquartered on the University of Arizona campus.

But most of the latest and greatest U.S.-funded telescopes are being located in Hawaii and Chile.

A simmering dispute between Kitt Peak and the Tohono O'odham tribal government over NOAO's lease on Kitt Peak has cast a shadow over the future of observatories there.

But the exact reason for site choices is not always specified, and there may be combinations of factors.

Hawaii was chosen for the National Solar Observatory's latest instrument.

The UA's Mount Graham International Observatory was once hoped to have seven telescopes.

It's been stopped with three by a combination of real or perceived problems and potential hang-ups.

And some siting factors are outside anyone's control. Computer technology and the Internet have made it possible for astronomers to do much of their observation remotely — at a computer screen thousands of miles away from a mountaintop telescope.

That makes high-altitude, excellent viewing sites in the Andes, much higher than Arizona's mountaintops, more useful than they would have been in the past.

Observatories on the highest peaks, in Chile and even Hawaii's snowy mountaintops, require astronomers to get used to the thin air and make long, arduous trips.

That's no longer a factor in Arizona's favor, although Peter Strittmatter, head of the UA's department of astronomy and the Steward Observatory, says Arizona's observatories still have the advantage in accessibility.

Even when astronomers are able to work remotely, he said, observatories must be serviced and staffed by technical experts, both of which functions are more easily done here.

Despite the trend toward siting most of the world's new large telescopes outside the state in recent years, Strittmatter says it's far from over for astronomy in Arizona.

He points to the in-progress Large Binocular Telescope on Mount Graham as proof of Southern Arizona's viability.

Southern Arizona still has a strong role in astronomy, with significant work being done at its existing observatories and in leading or collaborating on development of new telescopes outside the state.

The \$400 million Large Synoptic Survey Telescope, better known as the LSST, will be located in Chile, but had its start here and is headquartered here.

The UA's Steward Observatory Mirror Lab is building mirrors for many of the world's greatest new telescopes, including the LSST.

The UA's "other mirror lab," in the College of Optical Sciences, is polishing the mirror for Lowell Observatory's new \$42 million Discovery Channel Telescope, a collaboration with the science TV and publishing firm to be sited near Flagstaff in 2010.

And, building on a 50-year-old relationship with the U.S. Space Program, the UA's Lunar and Planetary Lab is usually a heavyweight in any competition for participation, or even the lead, in new NASA missions.

Bob Millis, the director of Flagstaff's Lowell Observatory, Arizona's oldest observatory, is optimistic — "if we can control light pollution and if we can somehow come together as a community to avoid the kind of environmental and cultural impasses that have delayed or even stopped some past telescope projects."

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