

Comet Research Soars at UMD

Ground zero in the effort to understand the building blocks of our solar system and life on Earth is right here at the University of Maryland, where the Department of Astronomy's Small Bodies Group—one of the world's leading comet research groups—is tracking these speedy visitors from the edge of interstellar space.

The group's scientists have led some of the most spectacular missions to explore comets with spacecraft, and continue to have a hand in many other space- and ground-based telescope studies.

"We have the best and maybe the largest comet group, certainly in this country—maybe in the world," says **Stuart Vogel**, astronomy department chair. "We have just a tremendous concentration of researchers and research being done here."

The study of comets has been a Maryland specialty for decades, but a 2005 high-profile mission thrust the group squarely into the public eye.



Michael A'Hearn Jessica Sunshine

"Deep Impact really put us on the map," says **Michael A'Hearn**, a distinguished university professor emeritus and current research professor who started at Maryland in 1966. A'Hearn, who has trained many of the world's top comet

researchers, guided the group for years and was principal investigator for the first mission to the surface of a comet.

In a follow-up mission to Deep Impact also led by A'Hearn, the same spacecraft flew by comet Hartley 2 and noted curious features on the surface of the comet. Those features are the target of a proposed \$450 million NASA Discovery Program mission, for which **Jessica Sunshine**, planetary scientist and astronomy professor, is principal investigator. If approved, the mission known as CHagall (Comet Hartley Analyses to Gather Ancient Links to Life) would blast off in 2021 and reach Hartley 2—nearly a billion kilometers from Earth—in 2026.

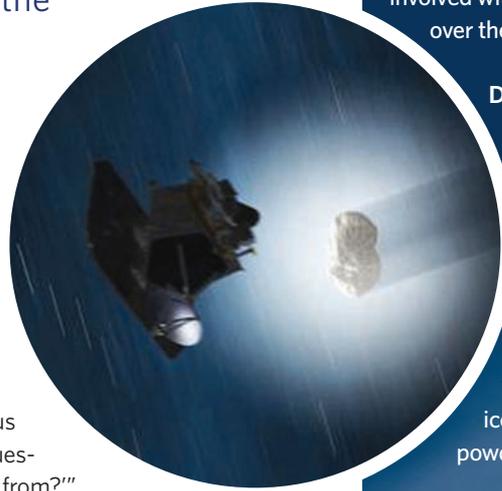
If successful, Sunshine says, CHagall would return "an abundance of essential scientific insights into comets, the ancient organic- and water-rich building blocks of our solar system, thereby bringing us closer to answering the question, 'Where did we come from?'"

It'll have a bag of tricks up its sleeve when it arrives. The spacecraft will trail Hartley 2 for about half of its orbit, exploring the cometary environment closer than ever—mostly staying within 2 kilometers and occasionally descending near the surface. It will move slowly through Hartley's mysterious gas jets to measure their force and composition, and fire subsurface probes in different locations that will take measurements and then detonate, exposing the primitive interior.

The spacecraft will map the comet several times as it nears the Sun, documenting changes and helping determine which surface features reflect a comet's evolution in a close orbit of the Sun, and which ones harken back to the solar system's origins.

Comets are like time capsules from when planets began to form, Sunshine says.

"They formed with the solar system four and a half billion years ago and have been largely unprocessed since then," she says. "They really serve as windows on the conditions that prevailed in the primeval solar system."



Deep Impact approaches comet Hartley 2 in an artist's conception of the DIXI (Deep Impact Extended Investigation) mission.

Catching up with Comets

Maryland's comet researchers have been involved with some jaw-dropping missions over the years:

DEEP IMPACT - The \$330 million mission launched in 2005; an "impactor" portion hit comet Tempel 1 on the Fourth of July with the force of several tons of TNT, digging a crater. Scientists for the first time analyzed the interior of a comet nucleus, and were surprised that Tempel 1 contained more dust and less ice than expected and consisted of powdery, porous material.

DIXI - The spacecraft that launched the impactor continued on to comet Hartley 2. The \$40 million mission in 2010 revealed strange gas jets and unexplained surface features that would be the target for future Maryland missions. Starting in 2028, CHagall will document changes in the four orbits since 2010.

★ **ROSETTA** - Maryland astronomers are active participants in the European Space Agency's current mission examining comet Churyumov-Gerasimenko, using two orbiter instruments—the ultra-violet spectrometer to study gas composition in the coma and the surface and the camera to understand gas distribution in the coma.

★ **INTERNATIONAL HALLEY WATCH** - Led by A'Hearn, Maryland scientists tracked photometry and polarimetry observations from the 1986 pass of Halley's comet, and later compiled and archived the data from European, Japanese and Russian spacecraft missions.

IMAGE COURTESY OF NASA

THE FEDERAL CORNER

UPDATE FROM THE OFFICE OF FEDERAL RELATIONS

White House Pushes Budget Growth for Research

Though the Obama administration's proposed 2016 budget remains below pre-sequestration levels, nearly all departments and major agencies would see increases. The **National Science Foundation's** budget would grow 5.2 percent, the **National Institutes of Health's** would grow 4.3 percent, and **NASA** funding would rise 2.9 percent from 2015. Many proposed increases are for programs addressing climate change, an administration priority. The **National Oceanographic and Atmospheric Administration's** budget grows 6.3 percent, with the Office of Oceanic and Atmospheric Research, the agency's main research arm, getting an additional \$485 million.

The president's budget increases support for the **Department of Energy's** Office of Science, with funding for the computing research program jumping 14.8 percent, facilitating development of cutting-edge exascale computers for climate and biomedical research. The **Food and Drug Administration** would receive a 9 percent increase, but the **Department of Defense's** basic research budget would shrink 8.3 percent despite overall growth in Pentagon funding—something critics argue could harm national defense. The proposed budget, a signal of administration priorities, must pass Congress, where it's likely to undergo major changes.

Look to the Federal Corner for information on higher education and the federal government. If you have a specific topic you'd like to see discussed, contact Rae Grad, director of federal relations, at rgrad@umd.edu.



Center Directors Meet

From across campus, 65 lab and center directors met at the Clarice Smith Performing Arts Center in late January to discuss challenges and opportunities. The meeting was convened by the Office of the Vice President for Research's **Future of Information Alliance**, which promotes transdisciplinary dialogue and research on evolving issues related to the role of information in our lives.



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Federal Budget Prioritizes Research Funding

Future of Information Alliance Convenes Campus Leaders to Focus on Opportunities

Science Meets Theater in "An Experiment"

The process that led to "An Experiment," a new play by **Jennifer Barclay**, assistant professor in the School of Theatre, Dance, and Performance Studies (TDPS), began with a question.

Drew Baden, chair of the physics department, had been wondering how unintended bias against women plays out in the male-dominated physical sciences. Instead of just discussing it, Baden approached TDPS Director **Leigh Wilson Smiley**. "I said, 'Wouldn't it be great if we could figure out a way to hold up a mirror to ourselves to see what others see?'" he says. "What about using theater as the tool to do that?"

That's where Barclay came in. Starting in 2014, she interviewed dozens of scientists at Maryland and around the country. Baden and Professor of Physics **Elizabeth Beise** helped Barclay get the details right, and a first reading was held in the Physical Sciences Complex in February.

A comedy set during a faculty search meeting, "An Experiment" isn't meant to target the phys-

ics world for special criticism, Barclay says. Throughout academia and beyond, women face obstacles both obvious and hidden because of gender bias.



Jennifer Barclay

"It's common for women to ask, 'What just happened—was that about gender?'" she says. "Am I the only person experiencing this?"

As with her previous plays, the intense research that preceded the writing let Barclay inhabit a new world.

"It's really interesting to me to write about topics that are beyond my immediate expertise," she says. "That's one of the great powers of theater—we have the opportunity to build bridges and understand other cultures and people and points of view empathetically."

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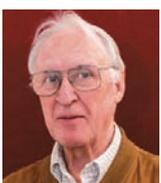
FACULTY AWARDS & HONORS



MICHELLE M. ESPINO, assistant professor of student affairs, is the 2015 recipient of the Hispanic Research Issues Special Interest Group Early Career Scholar Award from the American Educational Research Association. She studies access and retention in higher education.



The International Astronomical Union has named an asteroid after **CHRISTINE HARTZELL**, assistant professor of aerospace engineering, for her contribution to planetary sciences, including research on the properties of dust on asteroid surfaces. 9319 Hartzell is a main-belt asteroid about 2 kilometers in diameter.



CHARLES MISNER, professor emeritus of physics, was awarded the 2015 Einstein Medal for his contributions to the study of general relativity. In 1959, Misner and colleagues Richard Arnowitt and Stanley Deser published the ADM formalism, a new approach to Einstein's theory that is key to the study of quantum gravity and numerical relativity.

NEW FACULTY

We introduce you to new faculty and research scientists in the Maryland research community.

Typhanye P. Dyer is an assistant professor of epidemiology and biostatistics. She researches the behavioral, social and structural determinants of racial and gender disparities for infectious diseases, particularly HIV/AIDS and sexually transmitted infections.

Xuhua He is a professor of mathematics. He researches representation theory and arithmetic geometry, which use linear algebra to understand the symmetries of algebraic structures and geometry of numbers.

Birthe V. Kjellerup is an assistant professor in environmental microbiology and the Pedro E. Wasmer Professor in Engineering. She researches biofilm interactions, focusing on enhanced bioremediation of contaminants in complex environments like soil and urban water systems.

Thayse Leal Lima, assistant professor of Brazilian literature, studies how transnational literary circulation and intellectual exchange between Brazil and Hispanic America challenge essentializing notions of national and regional identities.

UPCOMING EVENTS & CONFERENCES

WORKSHOP

Writing a Successful Fulbright Application

Andy Riess, Assistant Director for Outreach, Council for International Exchange

Wednesday, April 1, 2-4 p.m.

3105 Susquehanna Hall
RSVP by Monday, March 30
to vpr@umd.edu

8th Annual Universitywide Celebration of Scholarship and Research

This informal reception illustrates the breadth of our faculty accomplishments over the past year.

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Atrium, Art-Sociology Building

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