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The Arkansas Catalyst

December 2012

Researcher Lands NSF, NASA Grants

Daniel Lessner, assistant professor of biological sciences

Daniel Lessner, assistant professor of biological sciences, studies methanogens, ancient anaerobic microorganisms that live in extreme environments, including the human gut. In these organisms, he looks at RNA polymerase, a protein that "reads" DNA and produces RNA, which contains codes to build proteins.

This process is found in most of the things we think of as "living."

It's important to understand how these ancient microscopic creatures work, and Lessner has been able to secure a total of $1.2 million in current funding as a principal investigator of methanogens. He received a three-year, $613,796 grant from the National Science Foundation that started in September 2011 and a four-year, $670,633 grant from NASA in April. He's also a co-investigator on a three-year, $435,196 NASA grant to study methanogens and whether they could survive on Mars.

"I do feel very fortunate in this funding climate," said Lessner, who came to the University of Arkansas in 2008 after six years as a postdoctoral fellow at Pennsylvania State University. "Our success in receiving these grants has to do with the significance of the projects and the questions we are trying to address, and also the importance and utility of our model. We have done a good job demonstrating that we have the expertise, the facilities and the capabilities of carrying out what we hope to be a significant project that will provide meaningful results."

Learn More

Staffing Changes

Jeff Amerine

October and November saw several major staff changes under the office of vice provost of research and economic development.

Jeff Amerine became director of technology licensing for the university on Nov. 19. The office will now be known as Technology Ventures.

The office, under the supervision of the vice provost for research and economic development, works in cooperation with the University of Arkansas's office of research support and sponsored programs and the University of Arkansas Technology Development Foundation.

The university and Division of Agriculture had shared the office since 2006. Officials at both the university and the division decided to separate the office into two entities.

"A serial entrepreneur, Jeff Amerine continues to implement effective strategies and methods that will lead to commercialization of the U of A's world-class research," said Jim Rankin, vice provost for research and economic development.

Dennis W. Brewer, who had served as associate vice provost for research and director of research support and sponsored programs, was appointed associate vice chancellor for information technology and director of information technology services, effective October 22. He had been serving as interim director of ITS since July 1. Brewer will report to both the provost and vice chancellor for finance and administration in his permanent post.

Cynthia Sagers was appointed interim associate vice provost for research and economic development, effective Nov. 12. Sagers, who will retain her faculty status in the department of biological sciences, will help promote faculty in research positions by identifying funding opportunities and working with them to develop grant proposals, among other things.

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HELPFUL LINKS

The Arkansas Catalyst
Sign up for Listserv information on high performance computer networks, the environmental sector, the Health Research Initiative, nanoscience and nanoengineering, NASA related research, and sustainability funding.

GRANT AWARD WINNERS

The following is a sampling of grants awarded to faculty in December, with the principal investigator, the award amount and the sponsor. An asterisk (*) indicates the continuation of a previous award.

* Vasundara V. Varadan, $658,477, Arkansas Science and Technology Authority
* Alan Mantooth, $473,336, Arkansas Science and Technology Authority
* Kenneth L. Korth, $385,840, Arkansas Science and Technology Authority
* Daniel Lessner, $193,164,

Jacobs publishes 'Opening Doors'

Lynn Jacobs, University of Arkansas

Art historian Lynn Jacobs looks at triptychs as "paintings with doors."

Her study of triptychs produced in present-day Belgium and the Netherlands during the 15th through the 17th centuries examines the relation between artistic format and meaning.

In her book *Opening Doors: The Early Netherlandish Triptych Reinterpreted*, Jacobs analyzes the meanings that arise from the thresholds and boundaries of the triptych format, while focusing on the implications of divisions and interconnections within the pieces. Her research was funded by a fellowship from the National Endowment for the Humanities, as well as financial support from the University of Arkansas and grants from the Fulbright College.

Learn More

RazorGrant Training

The office of research and sponsored programs is now working live in its new RazorGrant electronic routing and approval system. RazorGrant electronic routing and approval allows the researcher to electronically route their proposal information to the appropriate department chair and dean for digital signature. RazorGrant training has begun with the College of Engineering and the Fulbright College of Arts and Sciences.

To ensure successful use of RazorGrant routing and approval, the research and sponsored programs team will provide training. You will want to include all research faculty and staff who may assist with proposal development or review. Once your department and department chair have been trained, your department will be officially live with RazorGrant routing and approval for future proposal submissions.

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National Science Foundation
* Jeanne C. Miller, George Washington University, $157,721

University of Arkansas Arkansas Newswire

Oxygen 'Sensor' May Shut Down DNA Transcription

Change in key ingredient changes protein shape in methanogen

Tuesday, June 19, 2012

FAYETTEVILLE, Ark. – A key component found in an ancient anaerobic microorganism may serve as a sensor to detect potentially fatal oxygen, a University of Arkansas researcher and his colleagues have found. This helps researchers learn more about the function of these components, called iron-sulfur clusters, which occur in different parts of cells in all living creatures.

Daniel Lessner and his colleagues have taken the first step towards showing that iron-sulfur clusters in an ancient microorganism may serve as sensors to detect oxygen, which can be fatal to the anaerobes.

Daniel Lessner, assistant professor of biological sciences, and his colleagues report their findings in the *Journal of Biological Chemistry*.

Lessner studies methanogens, ancient anaerobic microorganisms that live in extreme environments, including the human gut. In these organisms, he looks at RNA polymerase, a protein that “reads” DNA and produces RNA, which contains codes to build proteins. This process is found in most of the things we think of as “living.”

Methanogens interest space scientists because they can survive in extreme temperature conditions and in hostile environments. They interest health researchers because some species found in the human gut may influence digestion. They also interest energy producers because they are the only life form that

produces methane gas. Because of this, it's important to understand how these ancient microscopic creatures work.

The iron-sulfur clusters also are important because they exist in most life forms, including humans – in fact, you could not survive without your iron-sulfur clusters. "It is likely that life evolved at the interface of iron and sulfur minerals," Lessner said. In some methanogens and other single-celled organisms, the protein RNA polymerase contains iron-sulfur clusters. However, these iron-sulfur clusters are not typically found in this protein, except in certain species, including methanogens.

Better understanding of the role of iron-sulfur clusters in this simple organism will help scientists understand and perhaps control production pathways in these microorganisms to produce methane gas as a biofuel.

The researchers decided to see if they could figure out why these organisms contain iron-sulfur clusters in their RNA polymerase. They found that without the clusters, a part of the protein changed its shape, which would in turn change its interactions with other parts of the protein. The clusters might serve to regulate the assembly of the parts of RNA polymerase.

The researchers believe that the iron-sulfur clusters serve as a sensor to shut down the creation of RNA from DNA in the presence of oxygen because oxygen reacts with iron-sulfur clusters to destroy them. This in turn would help the methanogen survive.

"This may be a way to conserve energy," Lessner said. "Organisms may have retained these clusters to serve a similar role in diverse species so that organisms can respond to changes in the environment.

"This is the first step in figuring out the protein properties and seeing how it works," he said. Next the researchers will genetically modify the protein to change the number of iron-sulfur clusters and see what happens.

This paper was made possible by a National Science Foundation grant.

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University of Arkansas Arkansas Newswire

Opening Minds Through 'Opening Doors'

Art historian explores the form and meaning of triptychs

Wednesday, November 28, 2012

FAYETTEVILLE, Ark. – Art historian Lynn Jacobs looks at triptychs as "paintings with doors." Her study of triptychs produced in present-day Belgium and the Netherlands during the 15th through the 17th centuries examines the relation between artistic format and meaning.

Lynn Jacobs, professor of art history, University of Arkansas

A triptych is an artwork that is divided into three separate panels. Triptychs were commonly used in churches as altarpieces, although they also served a variety of functions, including as grave markers and devotional objects within the home.

In her book *Opening Doors: The Early Netherlandish Triptych Reinterpreted,* Jacobs analyzes the meanings that arise from the thresholds and boundaries of the triptych format, while focusing on the implications of divisions and interconnections within the pieces. In the triptychs Jacobs studied, panels are hinged together and can either be shut or displayed open. It is a practical format: side panels or wings protect the center of the triptych from damage.

In addition, the structure allows for changing imagery and the multiplication of panels permits greater narrative elaboration as well as the creation of different pictorial worlds. She found that the panels not only were called “doors” in the documents of the period, but also acted as doors that create thresholds between zones, often between holy and earthly spaces.

For example, in one of the best-known Netherlandish triptychs, Robert Campin’s, “Mérode Triptych,” the center panel depicts the Annunciation with Mary the virgin and the angel Gabriel. In the left panel, there are two donors — a man and a woman at an entry door — with a messenger in the distance; in the right panel, Joseph is shown in his workshop.

In this painting, the frames around the left and center panels separate the representation of an opened door on the left panel, and a barely visible doorframe shown within the center panel, to the left of the angel Gabriel. However, the door frame in the center panel is positioned too high to line up with the door in the left panel, thereby creating an ambiguous relation between the two spaces. In this way, Jacobs argues, the artist is raising questions — which are deliberately left unanswered — about the connection between the profane and sacred realms. This spatial arrangement offers the donors the promise of transcendence into the holy, while still keeping the sanctity of the virgin mother and the angel Gabriel, intact.

Jacobs’ research on early Netherlandish painted triptychs was influenced by her trip to the Prado Museum in Madrid. There, she had the opportunity to visit the museum when it was closed to the public and view the triptychs in their open and closed states, a rare and, she said, “life-changing” opportunity. This experience gave her more clarity and understanding of the triptych format and compelled her to begin a full study of this once-popular art form.

“It wasn’t until I was studying the iconography of “The Garden of Earthly Delights” by Hieronymus Bosch and wasn’t making any headway that I started to become interested in the work’s format,” Jacobs said. “One of the most important advances in my thinking came from getting a chance to go to the Prado and see three of Bosch's major triptychs — which usually are displayed only with the wings opened — both in their closed and opened states. It was then I realized that there was a lot to be said about this particular format that had not yet been said.”

Jacobs recalls an experience from the beginning of her research: “I had just had my son, and was driving with my husband and his brother to the Cloisters Museum in

New York to take a quick look at the "Mérode Triptych." I told my husband to just stay in the car with the baby and that I wouldn't be long," Jacobs said. "Little did I know, I started talking to my brother-in-law about what I was working on and everyone jumped in on the conversation, from the public to the museum guards. We all got into a deep conversation and then I see my husband, an hour and a half later, carrying my son and steaming mad. I had totally lost track of the time because it was so exciting to me that I wasn't the only person who was interested in the questions raised by this triptych."

Jacobs is a professor of art history in the J. William Fulbright College of Arts and Sciences at the University of Arkansas. Her research was funded by a fellowship from the National Endowment for the Humanities, as well as financial support from the University of Arkansas and grants from the Fulbright College. *Opening Doors: The Early Netherlandish Triptych Reinterpreted* is published by the Pennsylvania State University Press.

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