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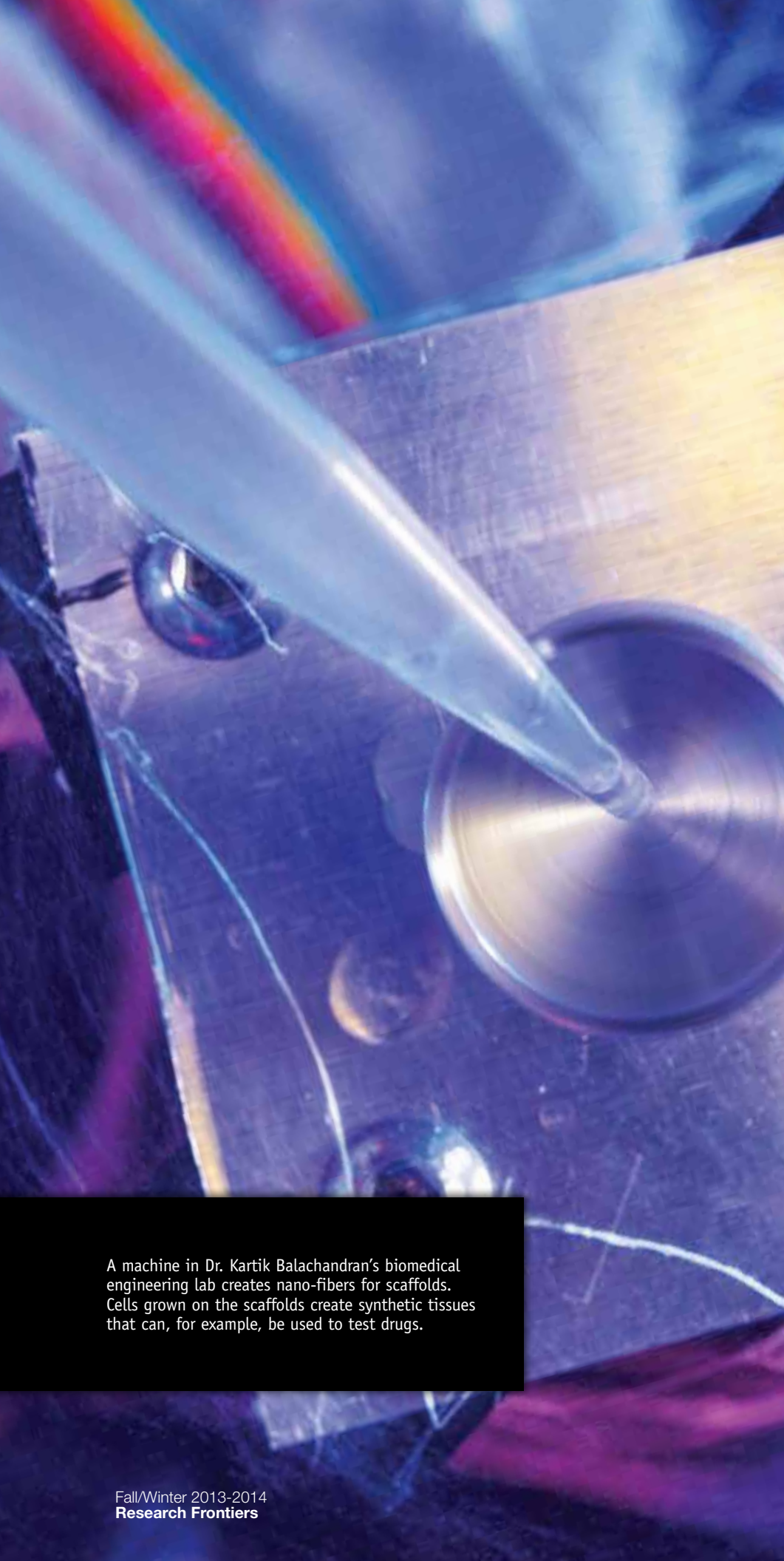
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Tracking Pallas's Fish Eagle



UNIVERSITY OF
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A machine in Dr. Kartik Balachandran's biomedical engineering lab creates nano-fibers for scaffolds. Cells grown on the scaffolds create synthetic tissues that can, for example, be used to test drugs.

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Questions or comments should be sent to:

Editor, *Research Frontiers*

Davis Hall

1 University of Arkansas

Fayetteville, AR 72701

or sent by e-mail to rfeditor@uark.edu

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Features

6 Mind the Gap

Hameed Naseem focuses on reducing the band gap to make solar energy a feasible and affordable alternative.

12 Does it Pay to be Green?

The short answer: a little. Jon Johnson can tell you that the long answer is more complicated.

18 Repetition Pulls Us

Elizabeth Hellmuth Margulis explores the little-studied psychology of repetition in music and finds clues to pleasure and transcendence.

24 Valuing Workers as Much as Machines

Claretha Hughes shows that businesses succeed when they value workers as much as technology.

Departments

2 On the Web

3 Research Briefs

28 Student Research

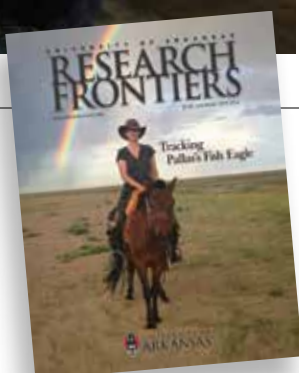
30 Book Reviews

32 UA Q & A

33 Arts & Letters

On the Cover:

Marla Steele rides the plains of Mongolia seeking Pallas's fish eagles. Story p. 32.



Something New in 2014 ►

Research Frontiers has moved into a new Web home in 2014, a space with room for growth. In addition to the on-line version of the print magazine, *Research Frontiers On the Web* is the place for ongoing stories of University of Arkansas research and researchers, with quick updates and story-stretching visuals. Our new blog, a group project of the core *Research Frontiers* staff, offers behind-the-scenes glimpses, out-takes that writers hated to cut from stories or news releases, and quirky tales. We are pleased that on our new website, visitors can comment with a click on stories and videos.

Join us at *Research Frontiers on the Web*. For a heads-up about new additions to the *Research Frontiers* website, follow us on Facebook at University of Arkansas Research or on Twitter at UArkResearch.



Elliott West on Westerns ▼

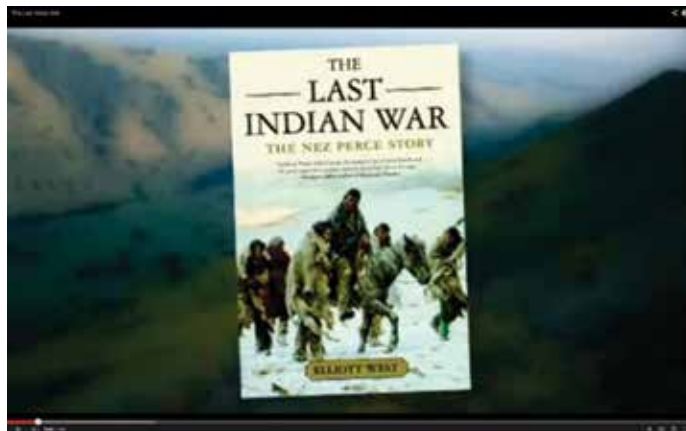
Elliott West, Distinguished Professor of history, examines the myth and reality of the West as portrayed in movies, using examples of accuracy and silliness from “Dances With Wolves.” West reads from his book of essays, *The Essential West*, using excerpts from women’s letters to give voice to those usually unheard in popular culture.



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King: April 7, 1968 ◀

As a companion to his poem, which appears in the Arts & Letters section of this issue, Geoffrey Brock, professor of creative writing and translation, reads his poem “King: April 7, 1968.”



The Last Indian War ▲

A video from 2009 offers another reading by Elliott West from his book, *The Last Indian War: The Nez Perce Story*. At the beginning of war in 1877, the Nez Perce were vilified in the press. During the war they became heroes to the American public, and soon after the war was over they began to become mythic figures in American culture.

Woo Pygsuia!



Photo by Russell Cothran

Researchers at the University of Arkansas have discovered and characterized a new organism which they have named *Pygsuia biforma*. This unicellular anaerobic eukaryote will help scientists understand how animals and fungi were able to evolve into diverse, multicellular life forms.

Jeffrey Silberman, a professor of biological sciences, isolated the organism, which was collected from brackish sediment in a Massachusetts cove. He worked with former graduate student Matt Brown and others at Dalhousie University in Canada on the genomics and description of the organism.

“The importance of this finding is that it helps us decipher how multicellularity evolved,” Silberman said. “It demonstrates that some genes and proteins that most people think are specific to being multicellular in animals are already present in their unicellular relatives. It is as if the genetic toolkit for becoming multicellular was assembled and modified bit by bit in the single-cell lineages that share a common ancestry with animals.”

Genomic analyses of single cell organisms that are specifically related to multicellular lineages often provide

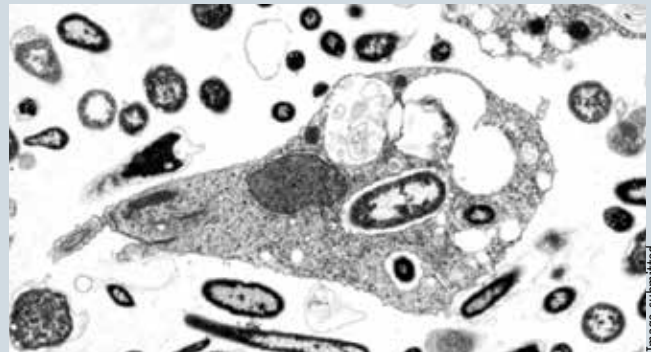


Image submitted

clues to understanding the molecular mechanisms involved in the evolution of multi-cellular life.

The name *Pygsuia biforma* is derived from the Razorbacks’ cheer, “Wooo Pig Sooie,” because the organism has a row of structures resembling the bristles along the backs of razorbacks. “Pyg” replaces “pig” as a play on the Latin *Pygmae*, a mythical race of pygmies, a reference to the small size, and “sui” replaces “sooie” for brevity and as a nod to the animal family to which suids, the ancient biological family of pigs, belong. The species name, *biforma*, refers to the two distinct cell forms in the organism’s life cycle.

A culture sample of *Pygsuia biforma* has been submitted to the Smithsonian Institution. The work was partially funded by a grant from the Arkansas Biosciences Institute.

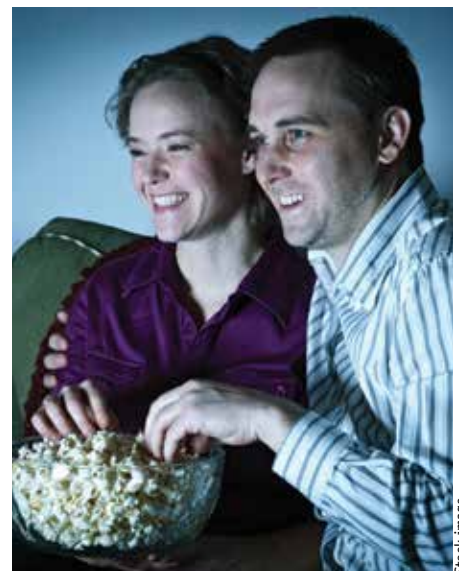
Speaking in Code: Men and Women Differ in Communicating Consent

A study by Kristen Jozkowski, assistant professor of community health promotion, reveals differences in the way men and women communicate consent to sexual relations. Her findings may be used to improve sexual assault prevention programs on college campuses by addressing differences in communication and helping students see the value in direct, verbal communication of consent.

In a survey of 185 students at Indiana University, Jozkowski found that while men rely more heavily on non-verbal indicators when communicating and gauging sexual interest, women use more verbal strategies. Such gender-distinct ways of communicating consent, she concludes, could ultimately lead to unwanted sex.

“They are saying something but meaning something else, and they think the intended message is well understood given other contextual cues,” Jozkowski said, “But what is really going on from our analyses is that men and women have disjunctive views of consent. Both think they understand each other but really the two (men and women) have different understandings of what these codes mean.”

One male participant explained that when he asks a woman to come to his house to watch a movie he is, at times, communicating in code. Depending on the context of the relationship and the timing of the invitation, this could actually be an invitation for sex. Despite defining



Stock image

consent as an explicit communication of agreement, college students often rely on consent signals that are less clear than an explicit “yes.”

Holistic Design for Sustainable Living in Kigali

A collaboration between the University of Arkansas Community Design Center, The Fay Jones School of Architecture, the Kigali Institute of Science and Technology, and Peter Rich Architects has earned the University of Arkansas Community Design Center a 2013 *Residential Architect* Design award.

The designers worked with the Kimichanga neighborhood in Kigali, Rwanda's capital city. The project, which features a proposed holistic design approach, doubles as an instructional manual on hillside development for the Ministry of Infrastructure in Kigali.

"For fragile and severely resource challenged environments like Rwanda, there is no choice. Holistic design thinking is the only option for recovering a sense of prosperity and sustained security," said Steve Luoni, director of the Community Design Center.

He went on to explain that their proposal, *Building Neighborhoods that Build Social and Economic Prosperity: Manual for a Complete Neighborhood*, "features advanced systems for building community resiliency that draws from the resources of the place, allowing residents to readily adapt to unforeseen challenges."

The project's goal was to transition land settlement from informal patterns to formal neighborhood patterns based on closed-loop, sustainable principles responsive to low-resource



Image submitted

environments, alternative energy production, regenerative landscapes, waste recycling and local food production.

Jason McLennan, jury member of the Congress for New Urbanism, concluded that the project exemplifies how developing countries like Rwanda "can transition from informal to formal settlement patterns with an eye towards resiliency, sustainability and local social vitality."

"Supercooled" Water Transforms from Liquid to Liquid

When water is cooled to a very low temperature, well below its normal freezing temperature, it transforms into a new form of liquid, what Feng "Seymour" Wang in the department of chemistry and biochemistry calls "supercooled" water.

Wang and his research team, which included research assistants Yaping Li and Jicun Li, found that when water is cooled to a very low temperature, a "liquid-liquid" phase transition occurs at 207 Kelvins, or 87 degrees below zero on the Fahrenheit scale.

"On a microsecond time scale, the water did not actually form ice but it transformed into a new form of liquid," Wang

said. "The study provides strong supporting evidence of the liquid-liquid phase transition and predicted a temperature of minimum density if water can be cooled well below its normal freezing temperature. Our study shows water will expand at a very low temperature even without forming ice."

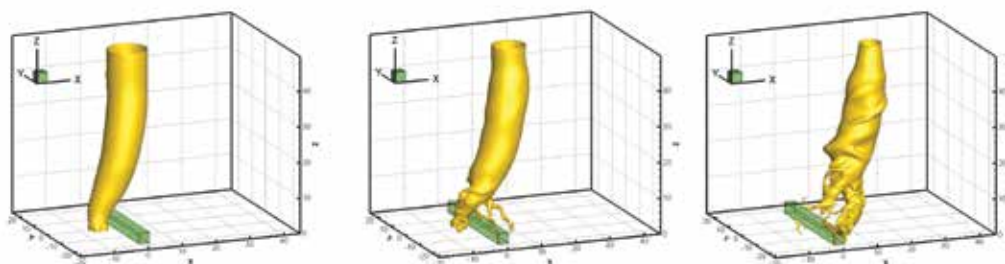
The liquid-liquid transition in supercooled water can be used to explain many anomalous behaviors of water. For example, the properties of supercooled water are important for understanding the processes of cryoprotection, which is the preservation of tissue or cells by liquid nitrogen so they can be thawed without damage.

Computer Models of Tornadoes Suggest Safer Areas for Construction

Using 3-D computer models, civil engineering professor Panneer Selvam and graduate student Piotr Gorecki have demonstrated the influence of hills on tornadoes. Their models revealed that the height of a hill and the size of a tornado's vortex have a significant effect on the tornado's destructive power. The findings could be used to identify safer areas for construction.

"A preliminary observation from this study indicates that there is a region behind a hill where velocities are reduced due to disruption of the tornado vortex," Selvam said. "Of course, this disruption depends on the height of the hill, as well as tornado size and velocity."

The researchers found that lower levels of a tornado's vortex are significantly disrupted if the height of a hill is equal to or



greater than the radius of the vortex. The models also confirmed an important finding from a previous field study – that wind velocities are significantly reduced on the leeward side of hills. In this region, the researchers found, wind speeds were reduced by at least 41 percent compared to the maximum tornado velocity, the speed at which it was traveling when it hit the hill.

Selvam is holder of the James T. Womble Professorship in Computational Mechanics and Nanotechnology Modeling. He directs the university's Computational Mechanics Laboratory.

Athletes: Drink Your Water!

A study by Stavros Kavouras could have implications for the health of Razorback athletes, as well as for young athletes in K-12 sports. The study shows that even when young players have water available, they still become dehydrated.

Kavouras, an assistant professor of exercise science, was the principal investigator for a study that measured the hydration status of 107 boys between the ages of 11 and 16 at a summer sports camp in Greece. He found high rates of hypohydration, a condition of chronic dehydration.

"These kids start training hypohydrated, and they do not drink enough during training, inducing even greater hypohydration," Kavouras said.

The study found that 95 of 107 of the players came to practice hypohydrated. Additionally, nearly 96 percent of the players were dehydrated after the training session on the third day, and about 97 percent were dehydrated after the fifth day.

Dehydration increases physiological strain and perceived effort to perform the same exercise task, and this is accentuated in warm weather. However, the majority of published research has been performed with well-trained adults exercising in the

heat. Little research is available concerning children exercising in similar conditions.

Though the boys were allowed to drink water whenever they wanted, the study suggests that the knowledge of the importance of drinking water was not effective in changing behavior. Accordingly, Kavouras wrote, "Constant efforts must be made by athletic trainers, coaches and athletes to enhance hydration."



Photo by Eric Pipkin

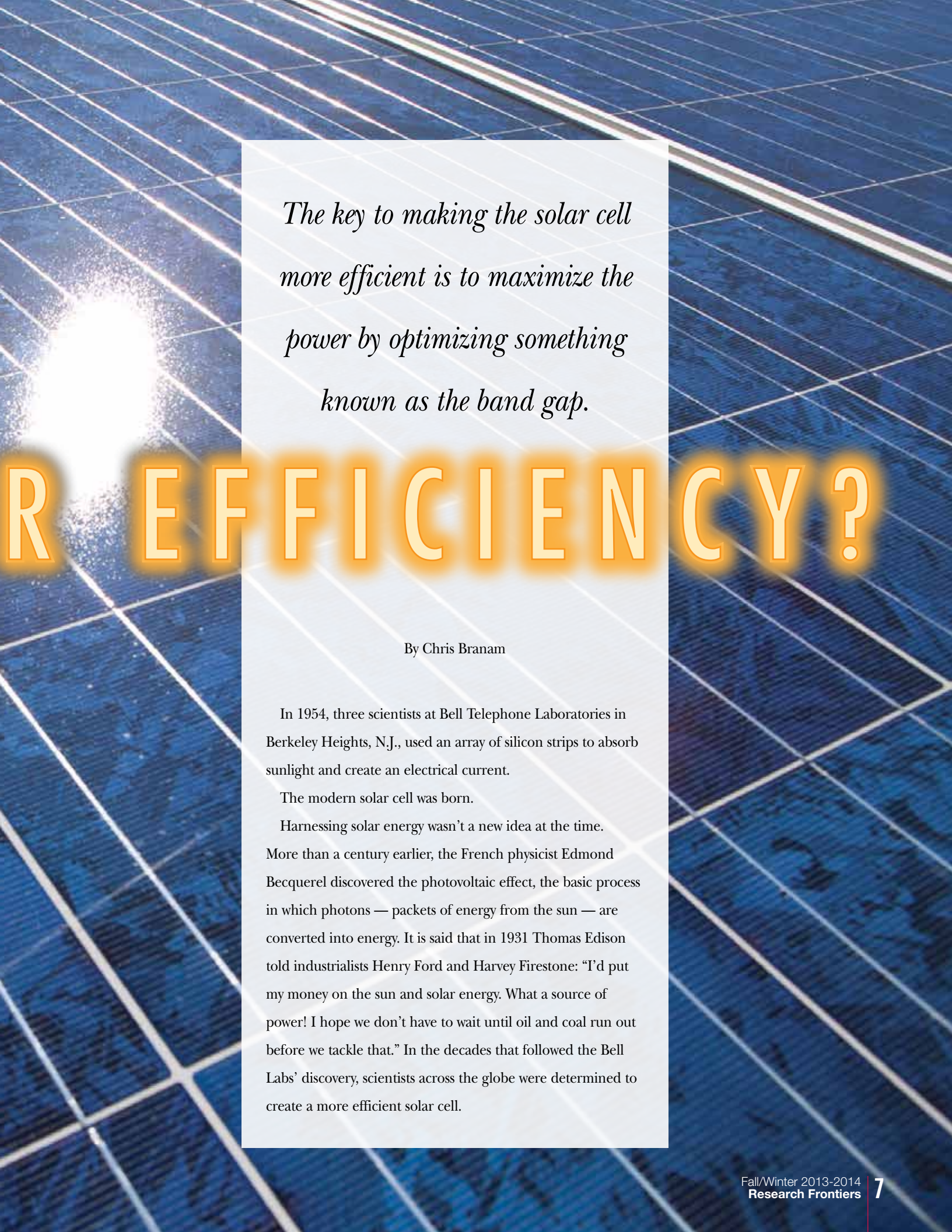


MIND

SEEKING SOLAR

THE

GAP



The key to making the solar cell more efficient is to maximize the power by optimizing something known as the band gap.

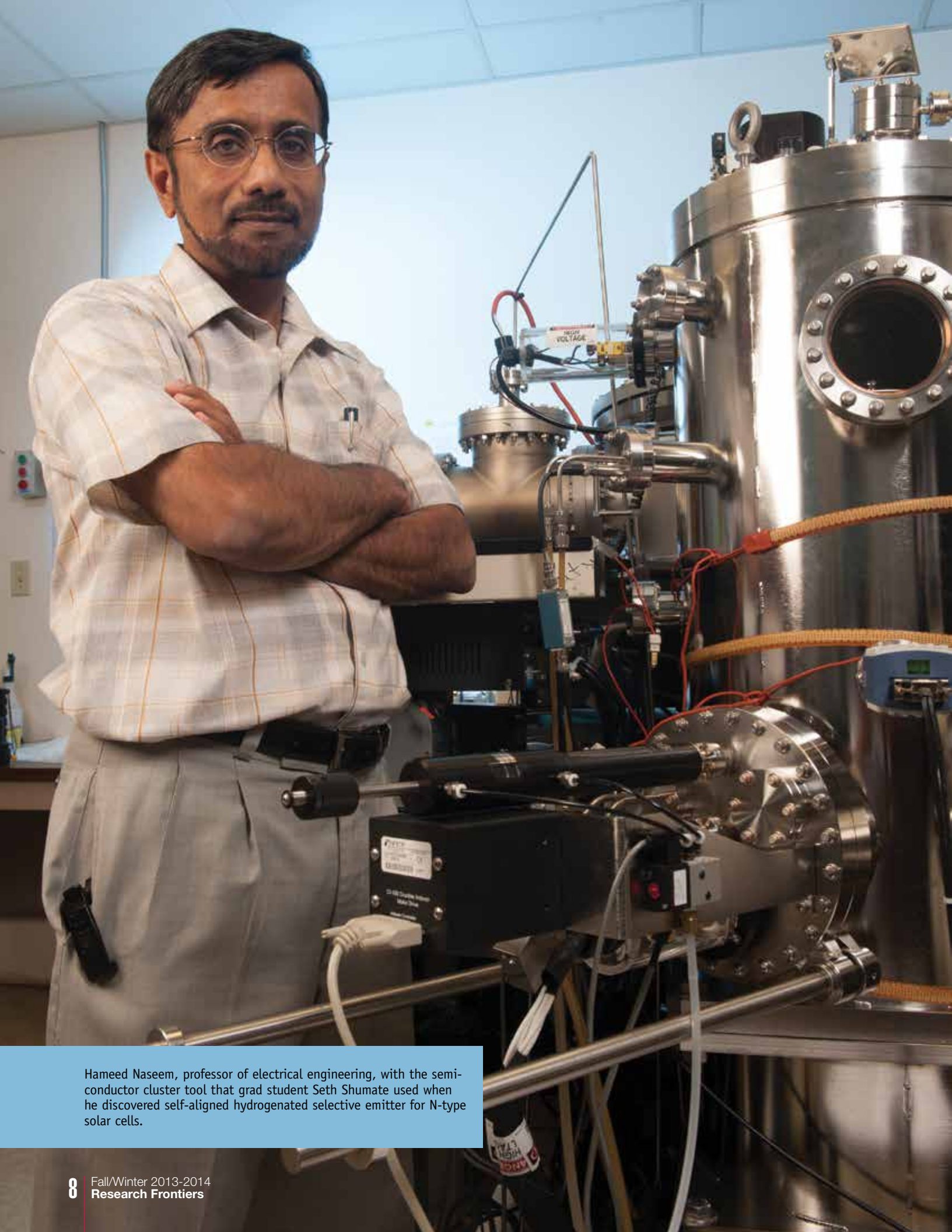
EFFICIENCY?

By Chris Branam

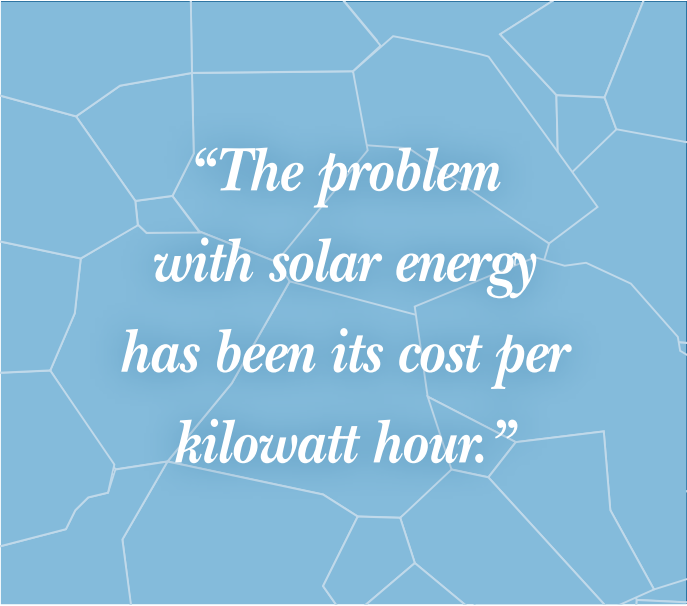
In 1954, three scientists at Bell Telephone Laboratories in Berkeley Heights, N.J., used an array of silicon strips to absorb sunlight and create an electrical current.

The modern solar cell was born.

Harnessing solar energy wasn't a new idea at the time. More than a century earlier, the French physicist Edmond Becquerel discovered the photovoltaic effect, the basic process in which photons — packets of energy from the sun — are converted into energy. It is said that in 1931 Thomas Edison told industrialists Henry Ford and Harvey Firestone: "I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait until oil and coal run out before we tackle that." In the decades that followed the Bell Labs' discovery, scientists across the globe were determined to create a more efficient solar cell.



Hameed Naseem, professor of electrical engineering, with the semiconductor cluster tool that grad student Seth Shumate used when he discovered self-aligned hydrogenated selective emitter for N-type solar cells.



*“The problem
with solar energy
has been its cost per
kilowatt hour.”*

In the late 1970s, Hameed Naseem was one of them. The young physics student at Panjab University in Chandigarh, India, was enthralled by the notion that humanity’s future energy source could come from the sun. He carried that enthusiasm to his studies at Virginia Polytechnic Institute and State University, where, after receiving a master’s degree in physics, he switched to materials engineering science for his doctorate.

“Back then there was a lot of hoopla about solar energy,” Naseem said. “There was a lot of excitement and an emphasis on research in photovoltaics. I was part of that wave. The field became hot, and then super hot, and then very cold. Most people got out of it, but I never did. I believe it is where the future of humanity is in terms of energy. It’s a free source of energy. You don’t have to wait for millions of years for nature to convert wood or living matter into oil or gas, which we then consume in a short span of time.”

Because of the problems of global warming and the limited supply of fossil resources, future energy resources are expected to be sustainable and renewable. The U.S. Energy Department’s SunShot Initiative offers a roadmap for solar to provide 14 percent of America’s electricity by 2030 and 27 percent by 2050.

Naseem, professor of electrical engineering, believes that by the year 2100, a large portion of the world’s energy will come from solar. Right now, it stands at less than 1 percent.

“Despite so many years of singing songs about photovoltaics as a better alternative to coal, petroleum and natural gas, only a small fraction of the world’s energy is produced this way,” Naseem said. “The problem with solar energy has been its cost per kilowatt hour. We have to beat the prevailing rate of producing electricity. As long as the electricity you produce by photovoltaics is more expensive than that, people are not going to adopt it because they look at their financial bottom line.”

Naseem has spent the better part of the last four decades trying

to make solar energy practical and feasible. He focuses on the refinement and improvement of solar cells for a process called photovoltaic power generation, which uses semiconductors and solar cells constructed of silicon, the second-most abundant material in the earth’s crust.

INCREASING EFFICIENCY, REDUCING PRODUCTION COSTS

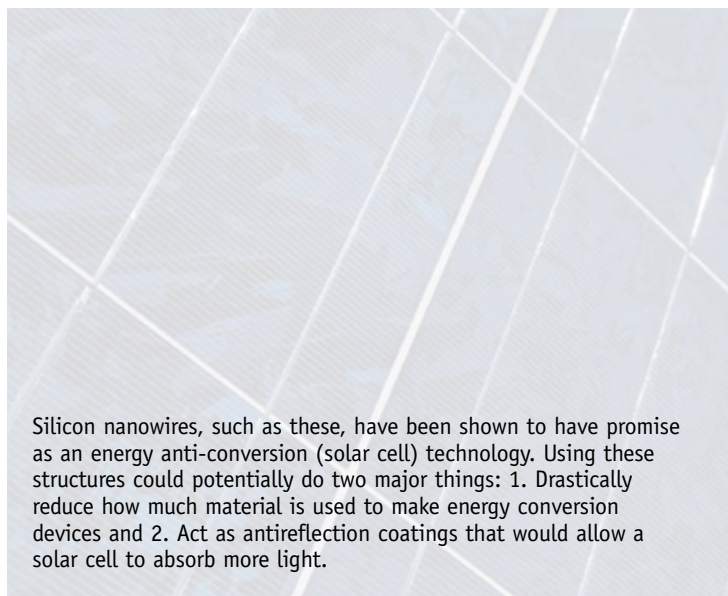
The photovoltaic effect is the method for generating electric power by using solar cells to convert energy from the sun into a flow of electrons. Solar efficiency is measured by how much power enters the solar cell (light) versus how much power comes out of it (watts), so if 100 milliwatts of light power enter a 1 by 1 centimeter solar cell and 30 milliwatts of electricity is produced, then the cell is considered 30 percent efficient. For maximum efficiency, the solar cell material must be of a dark hue, which is why solar panels almost always are black or dark blue.

Solar cells are made out of materials called semiconductors, and in each semiconductor there is a small energy range in which no electron states can exist. That range is known as a band gap, and light with energies less than the band gap escapes the device and is not converted into current.

“As you decrease the band gap, the electrical current goes up because more photons get absorbed,” Naseem said. However, electric power is the product of output current and output voltage, and the voltage produced increases the band-gap energy of the semiconductor. This can cause a decrease in solar-cell efficiency. The key to making the solar cell more efficient is to maximize the power by optimizing the band gap.

“It’s a tricky thing,” Naseem said. “It’s a balancing act.”

Through the past 25 years at the University of Arkansas, Naseem and his graduate students have found ways to increase



Silicon nanowires, such as these, have been shown to have promise as an energy anti-conversion (solar cell) technology. Using these structures could potentially do two major things: 1. Drastically reduce how much material is used to make energy conversion devices and 2. Act as antireflection coatings that would allow a solar cell to absorb more light.

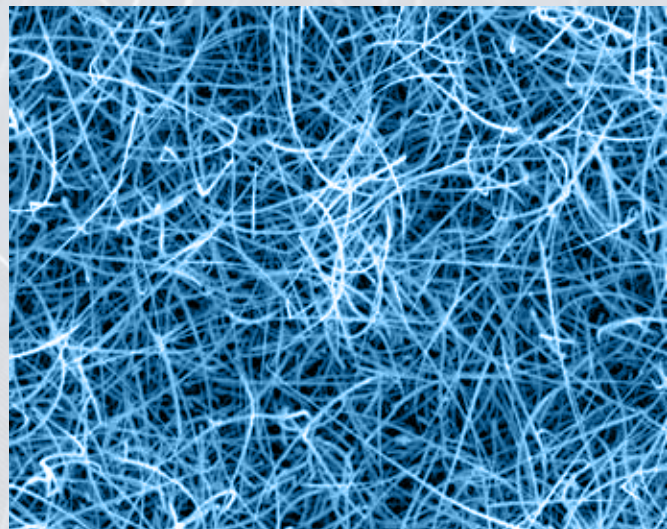


Image submitted

sunlight-to-electricity conversion efficiency and reduce the cost of expensive materials needed for solar-cell production. These technological breakthroughs will decrease cost-per-watt production of solar electricity to a point at which it can compete with traditional, fossil-fuel-based methods.

Most solar-cell technology is silicon based, and there are three primary types of silicon solar cells, each named after the crystalline structure of the silicon used during fabrication:

- Mono-crystalline silicon, which has a single and continuous crystal lattice structure with practically zero defects or impurities.
- Poly-crystalline silicon, also called poly-silicon, comprises discrete grains, or crystals, of mono-crystalline silicon that create regions of highly uniform crystal structures separated by grain boundaries.
- Amorphous silicon is an entirely non-crystalline form of silicon that can be thought of as grains the size of the individual atoms.

Many commercialized solar cells incorporate amorphous silicon and poly-silicon, which have acceptable conversion efficiency and cost much less than mono-crystalline silicon.

The process developed by Naseem, known as top-down aluminum-induced crystallization, creates poly-silicon with crystal grains 30 times larger than grains currently produced in the photovoltaic industry. Standard poly-silicon contains grains of 0.5 to 1 micrometer, which is one-100th the diameter of a human hair. Naseem's process yielded a grain size up to 150 micrometers, which is important because the performance of a photovoltaic device is limited primarily by defects at the boundaries of crystal grains. Increasing the size of crystal grains decreases the number of boundaries.

Further, traditional processing of silicon-based cells requires a heating temperature of 1,000 degrees Celsius to cause the silicon to reach a crystalline state. Naseem's method of converting

amorphous silicon into poly-silicon can be done at temperatures between 100 and 300 degrees Celsius, which saves time, materials and energy.

In November 2009, Douglas Hutchings, a doctoral graduate of electrical engineering, partnered with Naseem and students in the Sam M. Walton College of Business to start a company, Silicon Solar Solutions LLC, which is commercializing a process to crystallize amorphous silicon into large grain poly-silicon with unparalleled grain size and ease of processing. The company holds the licenses from the university to five patents on which the technology is based. Silicon Solar Solutions has produced prototype solar cells that meet or exceed some performance metrics of cells made by major manufacturers.

STEPS TOWARD SUCCESS

The Photovoltaics Research Lab comprises two rooms at the Arkansas Research and Technology Park in south Fayetteville. Naseem's laboratory is part of the Green Renewable Energy Efficient Nanoplasmonic Solar Cells Center, which is comprised of five institutional partners: the University of Arkansas campuses at Fayetteville, Little Rock, Pine Bluff and Fort Smith and Philander Smith College in Little Rock.

A device sitting on a table in the corner in one of the rooms is the original vacuum deposition chamber built under Naseem's supervision after he came to the university in 1985. Freddy Goh, the first doctoral student to study under Naseem, built the deposition system in 1987. Since then, Naseem and his students have been fabricating thin films of materials such as silicon in these chambers to observe how the materials react under different environments.

"Within a six-month period, we were able to get 7-percent efficient amorphous silicon solar cells," Naseem said. "That was

the top of the line at that time.”

Goh, after earning his doctorate, worked for Texas Instruments then founded a solar energy company in his native Singapore. A member of the Arkansas Academy of Electrical Engineers, Goh is now the chief technology officer for one of Europe’s largest solar firms.

A few feet away from the original deposition system is the stainless steel semiconductor cluster tool. A circular array of extending vacuum chambers makes the device look like a silver mechanical octopus.

“We have one, two, three, four and five,” Naseem said, counting off the vacuum chambers. Motioning toward the front of the machine, Naseem points out a chamber called the hydrogenation chamber. That is the one in which Seth Shumate, one of Naseem’s doctoral students, discovered the self-aligned hydrogenated selective emitter for N-type solar cells. The chamber has a tungsten filament, similar to a light bulb, which heats to 1,900 degrees Celsius. When hydrogen is introduced to the chamber, it hits the surface of a tungsten filament, separating the hydrogen atoms. The single-step method increases solar power conversion efficiency and reduces the amount of silver needed to produce high-efficiency solar cells, thereby lowering material costs.

Shumate is chief technology officer for Silicon Solar Solutions.

If it is successful, the emitter would represent the single largest technology leap in solar-cell efficiency since 1974, Hutchings said. Picasolar, a graduate business plan competition team built around Shumate’s invention, took the MIT NSTAR Clean Energy Prize in Boston in May, winning \$250,000. Picasolar won \$313,500 in spring 2013 in graduate business plan competitions. The team is using the winnings to transform into a start-up company that will market the hydrogen selective emitter to solar cell manufacturers.

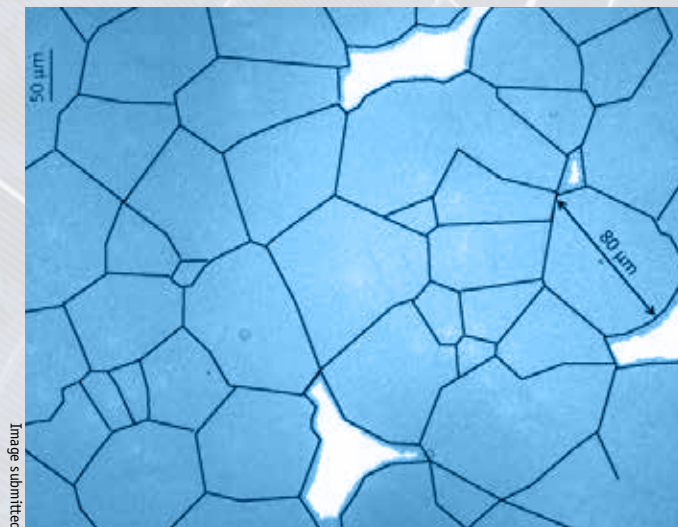
Silicon Solar Solutions shares equipment with Naseem in the Photovoltaics Research Lab, and the professor is “definitely very much involved” with the company, Hutchings said.

“As more people become aware of the problems associated with greenhouse-gas emissions, the demand for sources of clean energy goes up.”

“I have always referred to him as the ‘Head of R&D,’” Hutchings said, referring to research and development. “He has some tremendous ideas for improving solar cells in a variety of ways and it can be a challenge to focus on those that are nearer to commercial viability. He is a very good complement to the rest of the team.”

Each advancement in his lab is a step closer to making the widespread use of solar energy a reality, Naseem said.

“As more people become aware of the problems associated with greenhouse-gas emissions, the demand for sources of clean energy goes up,” he said. “It’s very important that you continue to develop a technology that is sustainable. We have to find alternatives. This is where we are now. Now is a good time to develop solar. I predict it will take off and become a prolific and essential contributor to the nation’s power grid.” ■



The process developed by Naseem creates poly-silicon with crystal grains up to 150 micrometers, roughly 30 times larger than grains currently produced in the photovoltaic industry.



When Does it Pay

By Matt McGowan

to be Green?

Protecting the environment is good for reputation and public perception. Who doesn't want to be known as someone who cares about preserving the planet? But for many corporate executives, the real question is: Does it make money? Does it even save money? These are the people who are scrutinized by and held accountable to governing boards and thousands or even millions of shareholders. They get paid handsomely to get it right on the big decisions.

"I get these questions all the time," says Jon Johnson, professor of management in the Sam M. Walton College of Business. "A lot of people ask about the relevance of sustainability, especially environmental performance and business performance. Is it a distraction? Does it cost business? Is it neutral? Is it good for business?"

Johnson founded the Walton College's Applied Sustainability Center and co-founded the Sustainability Consortium, a partnership between the University of Arkansas and Arizona State University that provides science-based information about the impact on a firm's bottom line of sustainability and innovative environmental strategies.

There are many competing hypotheses, he says, about whether an environmental strategy is good or bad for business. Over the past decade, many academic disciplines – management, finance, economics, accounting and marketing – have attempted to answer this question. Most of these studies found a positive relationship, but others have found a negative relationship or no significant relationship. So the issue remains controversial.

The controversy and persistent questions from executives motivated Johnson and several colleagues to reexamine the relationship. They knew there was an abundance of studies, so they decided to do a meta-analysis. Meta-analysis is a statistical method that focuses on aggregating and synthesizing results from different, even diverse, studies to identify patterns and reduce measurement and other sources of error.

The researchers sought studies that show a correlation between some indicator of financial performance and an indicator of environmental performance. By statistically aggregating many studies, meta-analysis produces a sophisticated averaging of the relationship and increases the statistical robustness of the analysis.

"That's the theory," Johnson says. "The reality is that meta-analysis is an inexact method. It is not something that should be over-interpreted, which is to say that it's a great way to draw general conclusions about well studied relationships."

The lead author for this study is Heather Dixon-Fowler, assistant professor at Appalachian State University and a former Walton College doctoral student. In addition to Johnson, other authors are Alan Ellstrand, Walton College management professor; Dan Slater, assistant professor of management at Union University; and Andrea Romi, assistant professor at Texas Tech University and also a former Walton College doctoral student. Johnson is holder of the Walton College Professorship in Sustainability. He serves as academic director and chairman of the board of The Sustainability Consortium. Alan Ellstrand is holder of the Charles C. Fichtner Chair.

Does It Pay to Be Green?

The researchers found 72 studies from 1970 through 2009 from multiple disciplines. Through further statistical analysis, they settled on 39 usable studies with 202 samples that examined the relationship between corporate environmental performance and corporate financial performance. By crunching data from these studies, their goal was to answer two fundamental questions: Does it pay to be green, and, if so, *when*?

The answer to the first question came easily enough. The meta-analytic results demonstrated a positive and robust – that is, statistically significant – relationship between corporate environmental and financial performance. But this overall finding simply confirmed results from the bulk of published work. It wasn't surprising, Johnson says, and there were many caveats.

"So the story is yes, it does pay to be green, but this is a modest relationship no matter how you cut it," he says. "I can't over-emphasize this enough. Most companies will experience only minor positive financial performance based on environmental programs. We're not talking about huge increases in profitability.

"On the other hand, there are very few single predictors of financial performance, so managers should be interested in any positive correlate of performance. You won't beat the competition based on progressive environmental performance alone, but on average, your company will benefit from it."

No matter how you cut it. What Johnson alludes to here is the second question: If it indeed pays to be green, if companies benefit from adopting or following some kind of environmental strategy, then *when*? Exactly how does this work for them? To answer this question, the researchers delved into the literature and identified a list of moderators, various factors that influence the relationship.

When Does It Pay to Be Green? Proactive vs. Reactive

First they focused on different types – or perhaps degrees – of environmental strategies. The literature brims with descriptive words for these types, which include – in a more or less progressive order – noncompliance, beginner, reactive, defensive, conformance, accommodating, modern and proactive. For their study, the researchers grouped all strategies into two categories, proactive and reactive.

A proactive environmental approach embraces and integrates environmental issues into the corporate business strategy. It is focused on the front end of processes and operation, on preventing problems by dealing with the source. Proactive strategies view responsible management of the environment as important for business. They encourage employee involvement and receive significant support from top management. (At Wal-Mart, for example, a senior vice president heads up sustainability.) These strategies emphasize efficiency, waste reduction and, perhaps most importantly, continuous innovation.

Reactive strategies focus on compliance. Their objective is to meet legal requirements, and they generally lack significant

"You won't beat the competition based on progressive environmental performance alone, but on average, your company will benefit from it."

involvement from top executives. These strategies include the traditional "end-of-the-pipe" methods for trapping, storing or treating carbon emissions. They do not include employee environmental training or involvement. Rather than preventing problems by dealing with the source, reactive strategies solve environmental problems when they arise.

Next, the researchers asked this essential question: Does the additional investment in proactive environmental practices, such as process innovation and redesign, positively influence the financial bottom line to a greater extent than reliance on traditional, reactive, end-of-the-pipe solutions? And what happens when both strategies exist?

The answers to these questions surprised Johnson and his colleagues. They found that the influence of proactive versus reactive strategies produced no significant moderating effect on financial performance. In the other words, no matter which tack firms pursue, they appear to benefit similarly. Contrary to expectations, proactive strategies did not appear to lead to greater financial returns than reactive strategies.

"Firms that go beyond regulatory requirements and focus on prevention by integrating environmental concerns into things like process innovation, stakeholder collaboration and employee involvement may not necessarily expect greater financial returns than firms focusing on mere compliance or end-of-pipe methods," Johnson said. "In some ways, I'm almost disappointed to report this, because a lot of what I do is press the case for leading-edge sustainability. But research doesn't work that way, and the results were clear, that both proactive and reactive approaches were equally beneficial."

The researchers drilled deeper and looked at various firm characteristics – large versus small, public against private, U.S. firms compared international firms and so-called "worst offenders" versus a broad set of companies in less environmentally impactful industries – or at least do not have a reputation for harming – the environment. Would these moderators influence the relationship between environmental and financial performance?



Photo by: Mick Garratt

Proactive environmental planning would prevent dumping of untreated pollutants in streams, a small step that has a small positive effect on corporate bottom line.

When? Large vs. Small

Simply put, large firms were those found on the list of Fortune 500 companies. Firms not on the list were considered small. Previous research in this area has not squelched varying opinions about the influence of small versus large when it comes to the adoption an environmental strategy designed to cut expenses or generate additional profits. Some researchers have argued that small firms are not burdened by the endemic bureaucracy and inertia of large corporations and are therefore more flexible and better able to respond to environmental challenges and organizational change. But at least as many, if not more, studies have argued that large firms have an advantage here because they have the resources to invest in innovative programs that will yield long-term savings. In this milieu, the researchers asked this basic question: Are the benefits of environmental performance the same or different for large versus small firms?

Their results revealed that there was a significant statistical difference between samples of large firms only and samples of large firms versus small ones. While both groups benefitted, small firms appeared to benefit more.

Proactive environmental approach

- Encourage employee involvement
- Receive significant support from top management

These strategies emphasize efficiency, waste reduction and, perhaps most importantly, continuous innovation.

Reactive strategies focus on compliance

- Meet legal requirements
- Lack significant involvement from top executives

These strategies include the traditional “end-of-the-pipe” methods for trapping, storing or treating carbon emissions.

“Again, it’s modest,” Johnson says, “but this is actually good news because one of the arguments out there right now is that large firms are the only ones that benefit from environmental performance because they are the only ones who can afford it. So now you can’t really say that, that it works only for Wal-Mart and other Fortune 500 companies.”

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When? Public vs. Private

What about organizational form? Does public or private influence the relationship between environmental and financial performance? Here too, opinions have varied. Because public firms, those whose shares are traded on a stock exchange, receive greater media attention, they may reap some reputational benefits by being perceived by the public as concerned about the environment. On the other hand, private firms have more freedom and discretion to implement innovative and progressive environmental initiatives.

The findings revealed no real difference between public and private firms in terms of each type of firm’s relationship between environmental and financial performance. In other words, the correlation between private firms’ environmental/financial performance did not significantly differ from that of public firms. Both types of firms benefit similarly.

When? U.S. vs. International

There was, however, a statistically significant difference between U.S. and international firms. The question here was: Does corporate environmental performance matter more or less for firms that are based in the United States than for international-based counterparts? The answer was more. U.S. firms appear to benefit more than international firms, the researchers found. Johnson says this could be a function of a more stringent regulatory environment in the United States than in many parts of the world, that international firms may be held to lower standards. On the other hand, the finding may explain a sort of trickle-down effect, suggesting other firms want to do business with compliant producers.

When? Worst Offenders vs. Non-impactful Companies

And then there are the bad boys. Completing their exploration of firm characteristics, the researchers wanted to know if the so-called “worst offenders” – firms that have been hard on the environment or at least perceived by the public as high polluters – benefit more or less than a broader set of industries by adopting some kind of environmental strategy. They do not. Again, contrary to expectations, the meta-analysis showed that studies examining a broad set of firms found no significant differences in the relationship between environmental and financial performance, when compared to studies that investigated the same relationship in industries that are considered worst offenders.

As a final analysis, the researchers lumped all sample studies into one category and studied the effect of environment performance on profitability, market-based firm growth, cost efficiency and other outcomes. These measures indicated that



Environmental performance is just one factor in financial performance, but on average companies benefit from it.



Credit: U.S. Coast Guard photo

Whether reactive or proactive, large or small, public or private – there is a positive, yet modest, relationship between corporate environmental behavior and profit.

corporate environmental performance influences market-based financial performance greater than other indicators.

“The financial performance measures are interesting,” Johnson says, “because they give you at least a clue as to the kind of effect this has. The market measure of performance – we’re talking about stock performance here – was positive and significant, and I think this is encouraging. It shows that the market recognizes and rewards environmental performance.”

Johnson and his colleagues were not surprised by the overall message, that a modest, yet statistically significant and positive relationship exists between corporate environmental performance and corporate financial performance. Their meta-analysis supported the argument that it does pay to be green. But they were at least mildly surprised by what they found beneath the surface, by the answers that explained *when* and *how* this process works.

“When we drilled down into the moderators,” Johnson says, “we found some contextual factors that affect the relationship. But, by and large, there were actually fewer contextual variables than we would have expected to see. And so the overall story is it doesn’t matter whether is reactive or proactive, large or small, public or private. Whatever the sub-sample, there is a positive, yet modest relationship.” ■

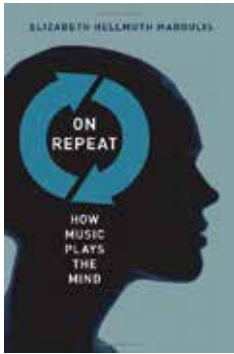
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Repetition Pulls Us In and Pulls Us Together

Music is alive with repetition. Sounds within a piece repeat, and listeners anticipate and smile. People play the same piece of music over and over, not to drive their loved ones crazy, but to enjoy its ever-more-familiar shape and sound.

And then, there's the dark side. There's that scrap of sound that gets caught, the annoying earworm of notes and rhythm that enters the brain and just won't leave. How many of us have strode down the street to the tune "Pretty Woman," a song we might hate, yet it somehow becomes our personal soundtrack on a sunny day?



In her book, *On Repeat: How Music Plays the Mind*, Elizabeth Hellmuth Margulis explores the psychology of repetition in music, across time, style and cultures. Hers is the first in-depth study of repetitiveness in music, which she calls "at once entirely ordinary and entirely mysterious" and "so common as to seem almost invisible."

"Music is a fundamentally human capacity," Margulis says. "It's present in all known cultures and important to

intellectual, emotional, and social experience."

Across cultures, repetition is an element that both pulls us into the musical experience and pulls us together as people. Not only is music a cultural universal, but so is musical repetition. Yet, musical repetition has been understudied, in part because of its ubiquity, and in part because of its negative associations. Historically, people have often looked at repetition as childlike, embarrassing, or nonsensical.

In her research, Margulis drew on a range of disciplines, including music theory, psycholinguistics, neuroscience and cognitive psychology, to examine how listeners perceive and

respond to repetition. She worked with ethnomusicologists to understand the place of music and its repetitive features in cultures around the world.

Ubiquity

Replication of standard tunes is not exclusive to our species—whales, gibbons, and half of the 900 known bird species produce sound sequences that repeat. Animal vocalizations develop within particular populations and regions and change with time and movement. They're traditionally used for mating and learning rituals—where oral transmission and song evolution represents a demanding cognitive task.

Human children have a special passion for repetition, a passion that might have helped earn repetition a bad rap. Historically, repetition has often been linked with regression, childishness, and even insanity.

"It's no surprise, then, that music scholars have often sought to emphasize other aspects of musical structure, largely neglecting the ubiquity of musical repetition," Margulis says. "Perhaps it's also no surprise that some contemporary composers have sought expressly to avoid repetitiveness in their music, aiming to reach not the everyday listener, but rather a subgroup of individuals with specialized formal training and particular listening attitudes."

In Western culture today, musical expertise is often thought to be the property of people with formal training in performance and those who can play an instrument or sing at a comparatively high level.

"Music is a fundamentally human capacity, It's present in all known cultures and important to intellectual, emotional, and social experience."



“We’ve become so sure that we don’t know anything about music unless we’ve learned it in a university classroom,” Margulis says. “But how could you possibly be an avid listener, visit George’s Majestic Lounge twice a week, walk around wearing ear buds the rest of the time, and not become a musical expert? In reality there’s an incredible amount of expertise being gained by ordinary listeners.”

Relatively few studies have been done on ordinary listening. In her research in her Music Cognition Lab at the University of Arkansas, Margulis has found that ordinary listeners may still have a high receptive competence, whether or not they have learned the specialized vocabulary to describe what they hear. And, she has found that both trained and untrained listeners are specially moved by music that repeats.

Pleasure

Repetition can drive attention to different aspects of the sound. In the same way that excessive repetition of a word can cause its meaning to dissolve and be replaced by a heightened awareness of the sounds that make up the word, repetition of a musical phrase can make new aspects of the sound available

to hearing. Sometimes, it takes a few repetitions before this process can guide listeners to the most rewarding aspects of the music. Listeners are normally not explicitly aware of this shift in orientation but are aware mainly of its effect: the music seems more pleasurable.

Across multiple hearings, individual notes in a piece can come to seem so closely related to one another as to be inevitable. If someone hears the part of the familiar Muppets tune that goes “mahna-mahna,” it is almost impossible not to imagine it continuing “doo-doo-dee-doo-doo.” In these kinds of imagined continuations, there is a sense that the listener is actively predicting what will happen next and executing it internally. By generating a strong auditory image of what will happen in a piece of music before it happens, a listener is actively and creatively engaging with the sound, rather than passively receiving it.

Margulis brings evidence from neuroimaging to bear on the claim that repetition enables listeners to feel as if they are inhabiting external sounds. She contends that repetition encourages embodiment of music, which contributes to the pleasure listeners experience.

“Repetition makes it possible for us to experience a sense of expanded present, characterized not by the explicit knowledge that x will occur at time point y, but rather a déjà-vu-like sense of



In research in the Music Cognition Lab at the University of Arkansas, Margulis has found that ordinary listeners have a high receptive competence.

orientation and involvement,” Margulis writes.

Listeners, in other words, orient to time differently when they are hearing repeated music rather than hearing music for the first time. Work in Margulis’s lab has used behavioral methods to trace this shift in orientation.

“My claim is that part of what makes us feel that we’re a musical subject rather than a musical object is that we’re endlessly listening ahead, such that the sounds seem almost to execute our volition, after the fact,” she writes.

One common experience that represents a negative flipside of musical repetitiveness is the earworm. Songs that get stuck in your head often entail a short fragment of a tune, somewhere between 5 and 15 seconds long, that loops repetitively. There are very few cases of involuntary and non-pathological mental imagery that involve this degree of repetitiveness. Margulis explores the circuitry that underlies earworms in an effort to understand what distinguishes the mental representation of music from other types of mental representations.

New music technologies have allowed for the repetition of songs and sounds across various channels and media that enable listeners to become familiar with pieces prior to a live performance. These technologies have also created new capacities to loop and repeat specific sounds within a single production—


such as a background track in pop or hip hop music. Margulis explores the way that these new technologies intersect with a basic psychological propensity toward musical repetition.

Involvement

Repetition elicits involvement. It creates shared experiences between individuals during specific listening events, such as concerts, and through the recognition of songs that are widely popular or involved in rituals or traditions. Though a song may elicit different feelings and memories according to our distinct experiences, the fact that we can each identify the song is a function of repetition.

“Repeatability is how songs become the property of a group or a community instead of an individual, how they come to belong to a tradition, rather than to a moment,” Margulis says. “Sometimes it’s the kinds of cases where there’s not overt participation that can seem most powerful, mysterious, and bonding.”

She points to what participants describe as the “collective, transcendent experience” of Taizé music. Each year thousands of young people of all denominations make pilgrimages to the Communauté de Taizé in southern France. It is an ecumenical



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community of 100 monks who conduct religious services that emphasize repetitive song. In Taizé practice, a short musical phrase is repeated over and over by the congregation.

“The part that people describe as the most powerful is not the part where they are all singing and repeating the song together, but it’s the part where they stop,” Margulis writes. “Then they have this palpable feeling that the music is continuing to ‘sing them,’ as if while they sit silently they are actually being sung.”

Participation

Researchers in music have made a distinction between presentational and participatory styles. There are places where participation is not condoned and places where it is expected.

Think of a concert hall – a place constructed with an obvious performance space on the well-lit stage and obvious listening space in the darkened rows beyond – ordinarily held up as the epitome of a presentational context. Yet even there, people in seats don’t merely sit. Some tap feet, bob heads or wave fingers like little conductors’ batons. A few even furtively hum along.

In a straightforwardly participatory context, such as a bluegrass jam or around a campfire, participation is an expected part of the experience with clapping and singing along from everybody. Participatory music often relies especially strongly on repetition, which makes it easier for newcomers to learn how a piece goes and join in.

“What I would like to propose is that notions of participatory and presentational are imaginary poles, with substantial residue of the participatory clinging to much music that appears to be strictly presentational,” Margulis writes. “When these elements of the participatory occur in presentational styles, although they don’t ordinarily trigger overt participation, they elicit a kind of

imagined, virtual presentation that can seem to powerfully involve an audience.”

Listeners’ involvement with a musical episode through memories and vivid mental imagery blurs the line between participation and performance. Repetition creates the potential for presentational music to also be participatory in its creation of a powerfully imagined involvement.

Ultimately, Margulis finds that repetition illuminates many aspects of what it means to listen musically. Margulis writes, “repeated encounters with a particular music can alter what it is to listen to that piece, choreographing a different sense of subjectivity, facilitating an engagement with structural features at a different level than those initially apprehended, and assimilating the external sounds into a sense of a broadened, even transcendent self.” ■



Elizabeth Hellmuth Margulis is associate professor and director of the Music Cognition Lab at the University of Arkansas. Her research uses theoretical, behavioral, and neuro-imaging methodologies to investigate the dynamic, moment-to-moment experience of listeners without special musical training. She was also trained as a concert pianist.

On Repeat: How Music Plays the Mind, is published by Oxford University Press.

For more information:

<http://www.elizabethmargulis.com/>.

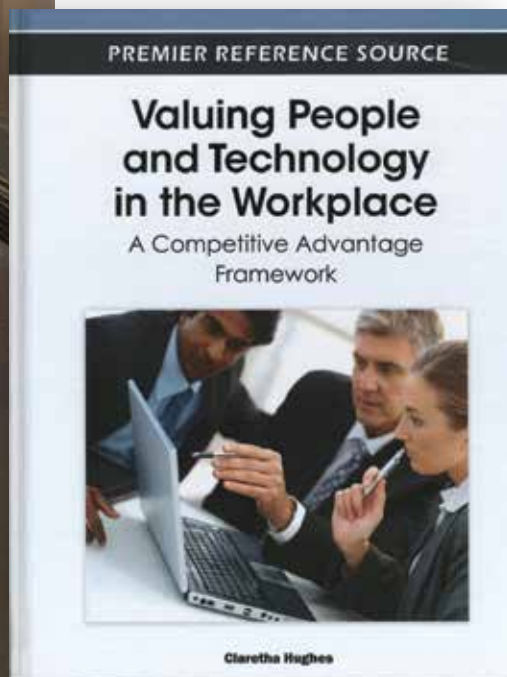


Photos by Russell Cochran

A Model for Valuing Workers at Least as Much as Technology

By Chris Branam

Claretha Hughes used to live near a town called Hurt, a whistle-stop in southern Virginia with a population of about 1,300 at last count. Within a two- to three-mile radius of the small town were plants for four major manufacturers: fabric maker Burlington Industries; Timken, which makes ball-bearings and alloy and steel components; the pharmaceuticals giant Abbott Laboratories; and Lane Furniture, which was founded in nearby Altavista.



As technology and machines became a continually growing part of the workplace, the people who worked around the machines, operated the machines and performed maintenance on the machines became undervalued.

In a scene repeated across America in recent decades, Burlington and Lane closed shop. But as the companies left, the corporate heads placed a value on their inventory before it was liquidated or transferred. Not so for the employees who were left behind with no other training, according to Hughes, an expert in organizational development and workforce development.

“Organizations sell or relocate their equipment after going out of business, yet undervalued employees are often left without a severance or anything else,” Hughes said. “The employees should have transferable skills to seek employment as opposed to having to go back to school. I believe that companies should value their technology. But they need to raise the level of how they value their people, as well. It’s about humans.”

Hughes, an associate professor of human resource and workforce development, spent 20 years working in corporate America and consulting for corporations. She noticed that as technology and machines became a continually growing part of the workplace, the people who worked around the machines, operated the machines and performed maintenance on the machines became undervalued.

“I’m arguing that businesses should value their employees to the extent that they value their equipment,” Hughes said. “They can probably keep employees longer if they understand their value to the organization.”

Her 2012 book, *Valuing People and Technology in the Workplace*, proposes a framework that will allow managers to get the most out of their workers by valuing them on the same level they value technology.

“This book focuses on the other 99 percent of workers who do not fit into the executive or board member ranks within organizations,” Hughes writes in the introduction to the first chapter. “Where does their value within the organization reside? As economies around the world sit at the precipice of collapse, younger workers are beginning to rebel against excessive unemployment and what they perceive as unfair distribution of wealth. Technology in the workplace that is valued more than people is the true culprit. Technology has been displacing workers for generations.”

The book details what she calls the “Hughes Value Creation Model for Organizational Competitive Advantage,” which is based on five values: location, use, maintenance, modification and time, as well as three organizational perspectives: cognitive, behavioral and cultural.

“In all organizations you have people using technology and you want your people to be the most efficient and effective, and produce your product in the least amount of time so that you make the most amount of money,” Hughes said. “It’s a dilemma to determine their inspiration.



This book is trying to figure out ways that you can look at the entire organization — both the technology and the people, using those five values.”

Hughes used the model successfully for over a decade in industry. She hopes it will help companies improve their productivity by emphasizing the importance of the human worker in the company. This is not a book about how people should be more like machines, she said. Rather, the book provides guidance that can help employers and managers value their employees the same as they value the machines, instruments and tools that make up their company.

Each value relies on the fact that no matter what technology is brought into the workplace, people must interface with it, Hughes said. In her book, the five values represent “opportunities for examining the similarities between technology development and human resource development,” Hughes writes.

Regarding the “location value,” businesses carefully consider where they house equipment in order to keep it running efficiently. Managers must think the same way for people, because if a person is comfortable in the workplace, his or her performance improves, providing value to the organization, Hughes said.

“For example, before hiring someone, start thinking the same way you do with technology. Put them in a right place and they may take off immediately,” she said. “That increases your company’s efficiency and effectiveness.”

In terms of the “use value,” Hughes stresses the importance of employees effectively using their knowledge, skills and abilities on the job. The value relates to the quality factor in a worker’s productivity.

The “maintenance value” encourages companies to maintain optimal job performance by their employees. Further, as the expectations of both workers and managers are better understood, modifications to knowledge, skills, abilities and performance are made to better achieve those expectations. This is the “modification value.”

Finally, the “time value” is the most important of all the values, according to Hughes, and understanding how to manage time makes an organization more effective and builds the morale of team members.

Michele Halsell, director of the Applied Sustainability Center at the University of Arkansas, said she finds the book valuable in two significant ways. First, it provides a comprehensive review of education and management theory and integrating these as they relate to human resource development in organizations. Second, it provides a new perspective for looking at human resources as an investment that enhances organizational competitiveness.

“What I appreciated about the book is that she has a pretty exhaustive



Hughes' book offers a framework that will allow managers to get the most out of their workers by valuing them on the same level as they value technology.

set of management theories as well as adult-education and human-resource-development theories. It's all in one place," said Halsell, who prior to coming to the university worked in marketing at Tyson Foods Inc.

Hughes makes it abundantly clear that organizations that value employees the same way as technology will be successful, Halsell said.

"Companies routinely invest in software upgrades. They really think they give a lot of thought to deployment of software and hardware," Halsell said. "What she is suggesting is that companies need to invest at least as much time and resources into the development of people as an asset of the organization. It sends a strong signal to people about their value. A machine doesn't have any feelings, but people who feel valued and feel that they are making a contribution to the organization usually try to do their best."

It's been several years since Hughes lived in southern Virginia, outside the little town of Hurt. Hurt grew to more than 1,400 residents in the 1990s but now has dropped to an estimated 1,290. Hurt's population is at its lowest level in four decades. Hughes was no longer living near there when the plants closed but she knew many of the workers who were laid off, who had never been taught other skills

that could help them get jobs elsewhere. A community college was established in Lane Furniture's former corporate headquarters. Hughes wonders what the students there are being taught in terms of career and technical education because jobs are much fewer in the area.

"When the facility closes, where do they go with their skills?" she asks. "A person shouldn't have to move to take their skills. When the business is gone, the former employees have nothing. My idea about undervaluing employees was established years before the companies left. I just noted the difference in the investment in technology versus what was being invested in the uneducated and undereducated employees."

For *Valuing People and Technology in the Workplace*, Hughes received the R. Wayne Pace Book of the Year Award from the Academy of Human Resource Development. The award is presented to the author of the outstanding human resource development book that advances the theory or practice of the profession. The book also has been nominated for George R. Terry Book Award, given by the Academy of Management to a book judged to have made the most outstanding contribution to the advancement of management knowledge. ■

Tracking an Asian Raptor Before It is Gone

By Chris Branam

On the morning of January 1, 2012, Marla Steele stood on a mountaintop on the outskirts of Jim Corbett National Park in northern India. There she saw a Pallas's eagle for the first time.

"I had never heard these birds' call," Steele said. "I had never seen them outside of pictures. The nest was so well concealed by the side of the river it took me a moment to find it. I hear this wonderful, obnoxious cry that sounds like a combination of creaky fishing tackle and a laughing seagull. There it is. I could see this Pallas's fish eagle just gliding right over the river and coming straight to the nest."

Steele, a biological sciences graduate student in the J. William Fulbright College of Arts and Sciences who is researching the endangered eagle, described the day as a "huge success" in her field notes. She also wrote:

9:30 am, ~10-15 C, Adult flew into nest with reported two chicks (one confirmed so far). Nest is located in the apex of three large branches out from the main trunk of the red silk cotton tree, alongside the Kosi River. A single call was heard. No clear indication of chick's age, but natal down can be seen.

But the Asian raptor continues to disappear, and Steele wants to know why. She is one of a handful of people in the world who are studying the Pallas's fish eagle, a large fishing eagle that is mainly dark brown, with a light brown to white head and neck. It breeds in Central Asia.

The eagle is classified as "vulnerable," by the International Union for Conservation of Nature. Fewer than 10,000 adults are known to exist.

It is the most poorly studied eagle in the northern hemisphere, Steele said.

"There have not been any detailed migration studies, there is almost nothing known about what their non-breeding habitat requirements are, and from what I have seen, there hasn't been a complete survey for that species conducted in the last 30 years," she said.

Steele hopes to fill those gaps with her fieldwork in India and

Mongolia, which she will use for her dissertation. This spring she traveled to India for a second time, where she studied the birds for a month in addition to collecting fish on which the eagles feed. Local farmers may be polluting the wetlands with pesticides, causing a precipitous drop in the eagle's population there, she said.

"We need to see what's in the fish," she said. "It's a bioaccumulation. The eagle is an apex predator, so when the eagles die off that's an indication that something is wrong."

Steele traveled to Mongolia in the summer of 2013 to continue her fieldwork and also to trap two Pallas's fish eagles. She attached electronic tracking units to them that will transmit data to Steele's computer.

"The goal right now is to provide a baseline study from which future researchers can take information," she said. "We can't work on conserving a species that we don't know anything about. The bird used to be one of the most common raptors along waterways

about 100 years ago. Their range extended from Russia to Myanmar, from the Caspian Sea to the middle of China. They've been extirpated in almost all those countries. We really don't know what happened."

Douglas James, a University Professor of biological sciences, said Steele's research concerns a "very important topic."

"Knowing where the eagle overwinters is essential to conserving the species," he said. "Marla Steele is an amazing person because of her enthusiasm, determination and inexhaustible energy."

Steele came to the U of A in 2010 after earning a bachelor's degree in natural resource ecology and management from Oklahoma State University. As an undergraduate, she presented a paper on Japanese raptor migration at the Asian Raptor Research and Conservation Network's annual meeting in Ulaanbaatar, Mongolia. She came to the University of Arkansas to study under James, an expert in ornithology.

"I was looking for somebody who would be crazy enough to take on a graduate student who would come in and say, 'I want to do this research and by the way, I want to do it on the other side of the world,'" Steele said. "It's a pretty tall order." ■



“We can’t work on conserving a species that we don’t know anything about. The bird used to be one of the most common raptors along waterways about 100 years ago. Their range extended from Russia to Myanmar; from the Caspian Sea to the middle of China. They’ve been extirpated in almost all those countries. We really don’t know what happened.”

– Marla Steele



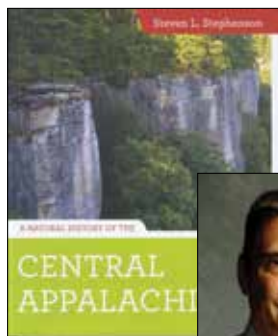
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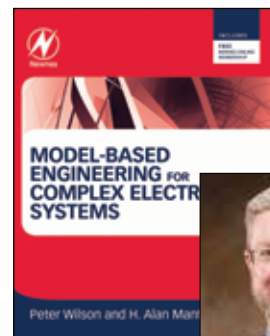
Facing page: Steele rides the Mongolian plain in search of Pallas’s fish eagles. Above right: a Pallas’s fish eagle surveys for dinner. Left: An eagle is outfitted with a tracking instrument.



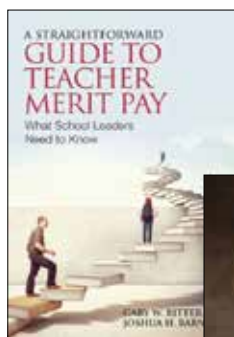
Cached: Decoding the Internet in Global Popular Culture, by Stephanie Ricker Schulte, was published by New York University Press. Schulte argues the Internet should be considered a cultural location, not simply a piece of technology. She details how policy decisions shaped the Internet and how popular understanding of the new technology shaped policy decisions.



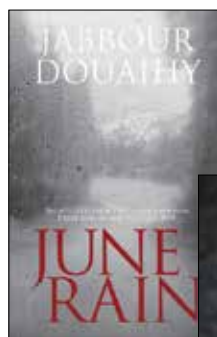
Featuring more than 120 color images, **A Natural History of the Central Appalachians**, by Steven L. Stephenson and published by West Virginia University Press, examines the ecology of the plants, animals and other organisms of the region. It also touches on the history of humans in the Central Appalachians, beginning with the arrival of the first native peoples.



Alan Mantooth co-authored, with Peter Wilson, **Model Based Engineering for Complex Electronic Systems**, published by Elsevier Publishing. It provides a complete guide to the methods, techniques and technologies of model-based engineering design for electrical systems. It shows how to adopt various methods for integrated circuit design using actual industrial examples.



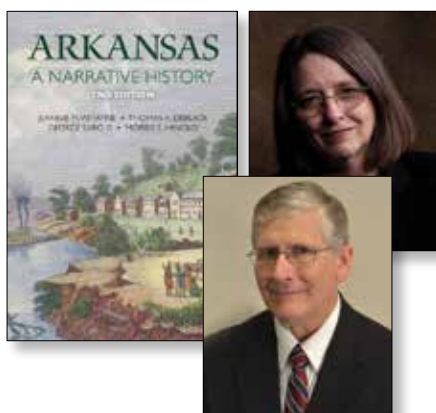
A Straightforward Guide to Teacher Merit Pay: Encouraging and Rewarding Schoolwide Improvement was co-authored by Gary W. Ritter and Joshua H. Barnett and published by Corwin Publishing. It explores the strengths, weaknesses, and myths of merit pay programs, and offers guidance for designing a successful merit pay system in a school district.



Paula Haydar's translation of **June Rain**, a novel by Jabbour Douaihi, and published by Bloomsbury Qatar, tells the story of a mass shooting in a village church in northern Lebanon that left two dozen people dead and turned friends into enemies. The 2006 novel was shortlisted for the prestigious International Prize for Arab Fiction.



Irene McMullin's **Time and the Shared World: Heidegger on Social Relations**, published by Northwestern University Press, challenges the view that Heidegger offers few resources for understanding humanity's social nature. By identifying unrecognized resources, McMullin offers an account of the inter-subjective origins of normativity based on Heidegger's characterization of self as fundamentally social.



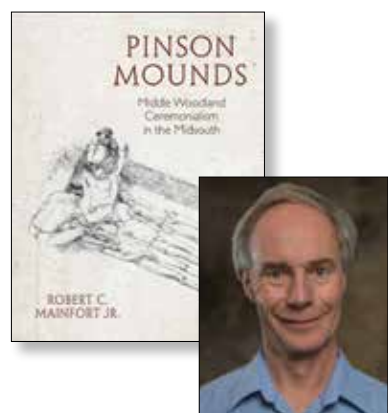
The second edition of **Arkansas: A Narrative History**, co-authored by Jeannie M. Wayne, Thomas A. DeBlack, George Sabo III, and Morris S. Arnold and published by The University of Arkansas Press, provides a comprehensive history of the state, from prehistoric Arkansas to 2012 and includes enhanced maps by Joseph Swain and a foreword by Ben Johnson.



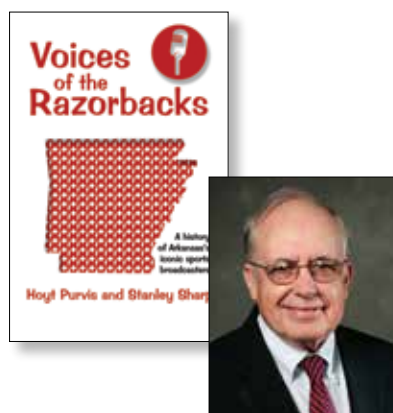
Integrated Risk Management for Leisure Services, co-authored by Merry Lynn Moiseichik and Robert Kauffman and published by Human Kinetics, uses a four-phase integrated risk management model to offer a systematic approach to safety. It also includes a unique approach to risk management for those in the parks and recreation field.



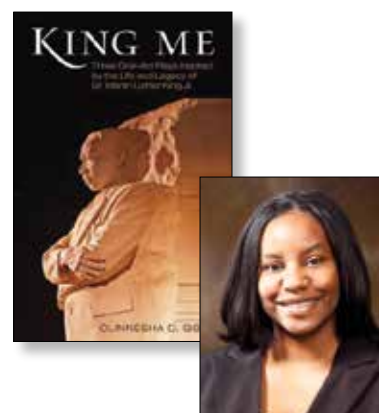
All In: Expanding Access Through Nationally Competitive Awards, edited by Suzanne McCray and published by The University of Arkansas Press, uses the insights of scholarship foundation leaders and experienced advisors to guide readers through the ultra-competitive world of national and international scholarships.



Robert C. Mainfort Jr.'s **Pinson Mounds: Middle Woodland Ceremonialism in the Midsouth**, published by The University of Arkansas Press, presents a comprehensive overview and reinterpretation of the largest Middle Woodland mound complex in the southeast that, around AD 100, existed as a pilgrimage center, drawing visitors from well beyond the local population.



Co-authored by Hoyt Purvis and Stanley Sharp and published by The University of Arkansas Press, **Voices of the Razorbacks: A History of Arkansas's Iconic Sports Broadcasters** recounts the creation and development of the Razorback Sports Network, highlighting the kinship that developed between the audience and the broadcasters who became "voices of the Razorbacks."



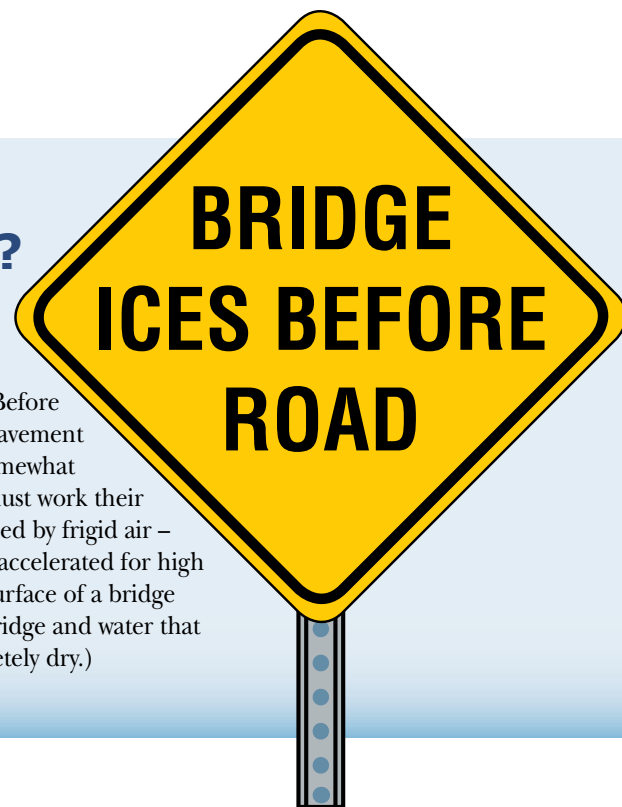
King Me: Three One-Act Plays Inspired by the Life and Legacy of Dr. Martin Luther King Jr., by Clinnesha D. Sibley, was published by the University of Arkansas Press. This trio of short dramas contributes to our ongoing understanding of Dr. Martin Luther King Jr., offers creative methods for teaching history and social studies and prompts readers to examine current civil rights issues in light of his legacy.

Question:

Why do bridges ice in winter weather?

Kevin D. Hall, chair of the department of civil engineering, explains:

We've all seen them – the highway signs just before a bridge saying “Bridge Ices Before Roadway.” This phenomenon mostly boils down to insulation. A typical highway pavement has only one face exposed to weather – the top. The bottom of the pavement is somewhat insulated by the base and soil beneath it. Temperatures that freeze the pavement must work their way down through the structure from the top. A bridge deck, however, is surrounded by frigid air – so that all faces exposed to the air begin to freeze at the same time. This process is accelerated for high bridges, which have greater airflow underneath. The water that forms ice on the surface of a bridge comes typically from a couple of main sources: any precipitation that falls on the bridge and water that has soaked into the concrete slab. (Rarely are any pavements in our climate completely dry.)



Question:

What are five things anyone can and should do to stay mentally and physically fit as they age?

Ro DiBrezzo, University Professor of kinesiology and vice provost for academic affairs, answers:

- 1) Move
- 2) Move
- 3) Move
- 4) Play
- 5) Move some more

That may have been a bit too simple but, unfortunately, the truth. Let's try this:

The human body is designed to be dynamic, and moving is a big part of that. We learn about our environment as newborns by moving, and we express ourselves by moving, dancing and negotiating space. In some very exciting studies conducted at the University of Arkansas and other places, it has been demonstrated that there is a strong correlation between exercise and cognitive fitness, another reason to keep moving.

In fact, the single most important thing anyone can do – at any age – to remain healthy and cognitively fit is to move. Most individuals think of exercise as hard, boring or just time consuming. But the sheer joy that comes from moving is invigorating and the healthiest thing we can do for ourselves. Exercise shouldn't be painful or exhausting.

The goal is to integrate moving into our daily life. Parking the car away from the store entry and walking a bit further, taking the stairs instead of the elevator, walking a memo down to a colleague

instead of using e-mail – all are easy ways to increase our activity level. There should be a progressive overload involved in all activities, and we have to consider muscle fitness and heart fitness independently. Walking is a terrific exercise and will help heart health, but for muscle and bone fitness, we have to do some resistive exercises.

The second thing we should do for physical and mental fitness is to rehydrate. Most of the body is made of water. Although there are many commercial drinks on the market, and each day there are millions of dollars spent trying to get us to drink the different brands, nothing is more important, better for us and easier than drinking water.

The third thing that we should do to remain healthy and vibrant is to make sure we get enough sleep. In a recent study conducted at the University of California, Berkeley, it was estimated that as many as 65 percent of Americans do not get enough sleep each night. Sleep helps to restore both the physical and mental aspects of fitness.

The stress of work, family and relationships can eventually take a toll on individuals. Exercise, proper diet and a good night's sleep can help us sustain some sense of balance.



Photo by Russell Cothren

King: April 7, 1968

We had wanted, at least, to touch your sleeve.
We brought both babies as to a christening.
—Van K. Brock, “King”

We stood in line for hours to see his body.
My parents said they knew the line would be long.
They took turns carrying my brother I walked beside them.

They say twelve hundred people filed past each hour.
They say the casket was African mahogany lined with white silk.
His face looked waxy women bent to kiss it.
His moustache was perfectly trimmed I have seen pictures.

My parents said they knew the line would be long.
President Johnson had declared it a national day of mourning.
My brother was one and a half I was three and a half.
My brother was crying my brother was hungry.

I don't know how I felt probably scared.
I don't know how I felt about the endless stricken faces.
I know they were stricken I have seen pictures.

That day riots were everywhere people were dying but not here.
That day in Washington hundreds of fires were burning.
They say it looked from the air like it had been bombed such smoke.

That day our planes were bombing North Vietnam.
And that day the bodies were rotting unburied in My Lai.
And that day King's brother was giving a sermon at Ebenezer Baptist
called “Why America May Go to Hell.”

That day that day they say they said.
My parents knew the line would be long.
My parents taught us there's no such thing as Hell and there's not.
There's nowhere for America to go.

Carmichael said it was white America that did it.
Get your gun he said some did but not here.
Hoover said the FBI would prevent the rise of a black messiah.
He didn't say how that was a month ago.
King said longevity has its place that was four days ago.

I have no memory of the day in question.
Closing my eyes won't bring it back pictures won't either.
I could squint like this forever what's the point.
There is no witness without memory.

My parents knew the line would be long but not this long.
My brother was crying my brother was tired and hungry.
If only he could have held out a while longer if only then what?
I wish I could say at least that we touched his sleeve.

We never even made it to the casket.

—Geoffrey Brock

Hear Brock read his poem at researchfrontiers.uark.edu.



The mission of the World Trade Center Arkansas is to connect Arkansas to the world by providing international trade services to Arkansas companies, agricultural producers and entrepreneurs, and by educating students in global commerce.



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3300 Market Street • Suite 400 • Rogers, Arkansas 72758
Phone: +1-479-418-4821 • Website: www.arwtc.org



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