CLAS MAGAZINE

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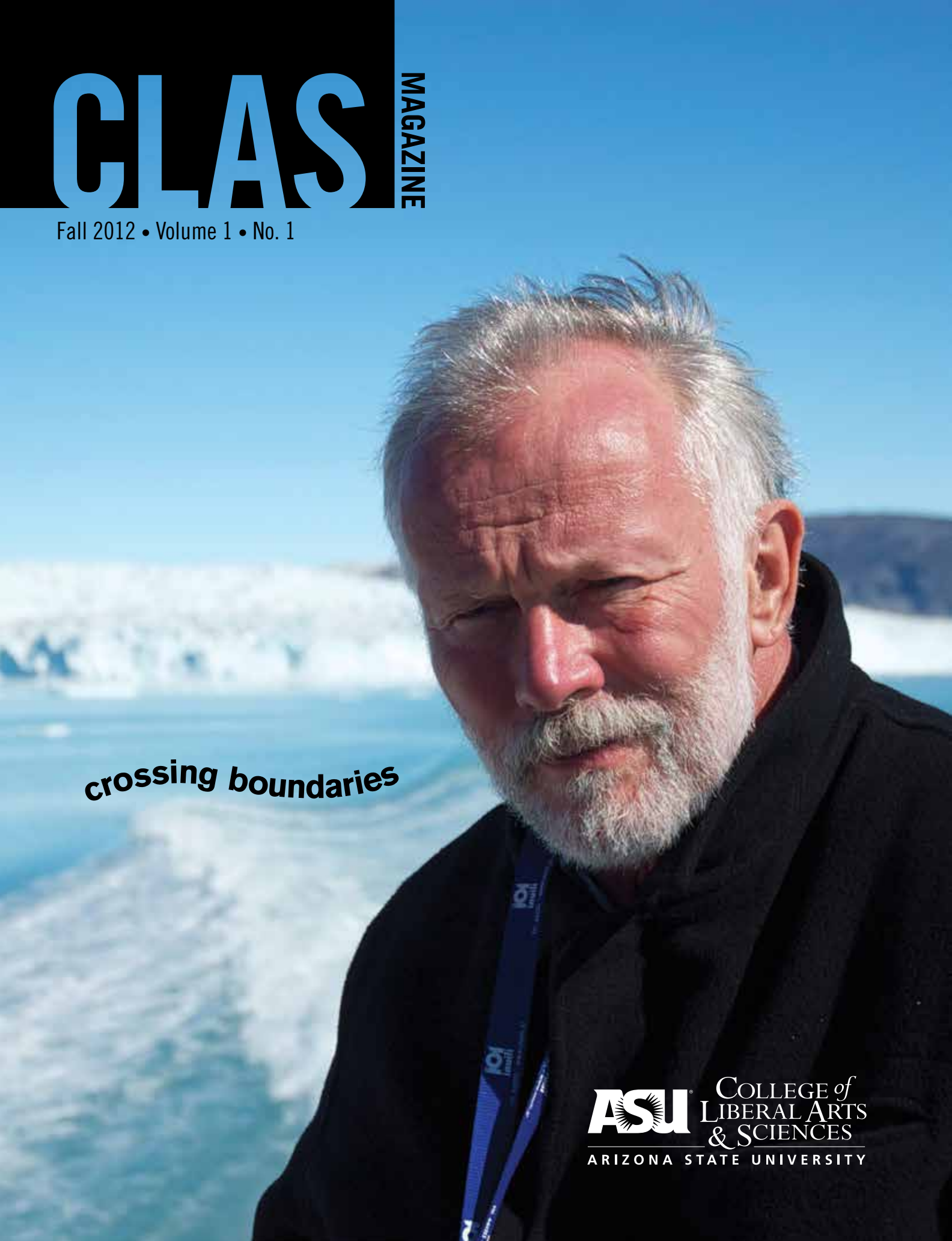

crossing boundaries

ASU College of Liberal Arts & Sciences
Arizona State University

From the Dean

A degree from a liberal arts and sciences college offers students the broadest range of choices and the ability to sculpt a personalized and individually powerful learning experience. This diversity of experience, partnered with access to one-on-one mentoring by ASU's top researchers, scholars, authors, teachers, and creative thinkers, arms our students with more than just a knowledge base from which to build successful careers.

Coming from all walks of life and experiences, our liberal arts and sciences students are eagerly sought after by employers and go on to start non-profit organizations, publish novels, advance scientific fields, and educate youth. They lead companies and enter legal, medical and other professional careers with strong foundations in the humanities, social science and the sciences. More than this, their broad skill sets allow them to negotiate the rapid changes in emerging technologies and society, giving them the core strengths to pursue the careers and opportunities of the future.

In this first issue of the CLAS Magazine, we feature an undergraduate student authoring Young Adult novels and a political science alumna who dances across borders. We also go into our urban neighborhood to examine the linkage between sustainability, community gardening and social justice. Our students also take us into the heart of the use-inspired research being done locally and globally, touching on ethics, religion and music, biological computers and planetary discovery.

Learn how the college and the New American University are changing K-12, undergraduate and graduate education and creating partnerships geared to the 21st century. Along with our donors, alumni, business and institutional partners, we invite you to join in our effort to accelerate opportunities for our students, faculty and staff and to create lives with meaning.

Robert E. Page, Jr.

Vice Provost and Dean of the
College of Liberal Arts and Sciences


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CLAS publication staff

Managing editor: Margaret Coulombe
Art direction and design: Jacob Sahertian
Editorial board: Charles Kazilek
Copy editor: Aida Alagic, Iris Krondorff, Casey Green, Patricia Sahertian
Photography: Tom Story, Jacob Mayfield
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We are interested in connecting with CLAS alumni, emerti and students. If you would like to suggest a topic or contribute an article, please contact the managing editor **margaret.coulombe@asu.edu**. Manuscripts should be less than 1,000 words, photos should be high resolution, and submissions should include all pertinent contact information. You can email or snail mail the content to Margaret Coulombe, CLAS Magazine, P.O. Box 876505, Tempe, AZ 85287-6505.

To learn about the many ways that you can support the college and ASU, please visit the ASU Foundation website: **secure.asufoundation.org/giving**, contact **william.kavan@asu.edu** or call: **480.965.3391**.

We reserve the right to edit all submissions.

Greetings fellow CLAS Alumni and Donors!

I recently left the private sector to join CLAS as a staff member because I was so inspired by ASU's vision of excellence, impact and access. Every day, I speak to students about how their lives are being changed by their studies and experiences. The dedication of the faculty to students and the groundbreaking research being done here also make me feel that I am part of an institution and educational process that is improving society.

As you will see in the pages of this magazine, CLAS is very diverse. With 21,000 students, the college is about the same size as Oregon State and Auburn universities. We have more than 60 schools, institutes and centers, which range from the School of Earth and Space Exploration to the Piper Center for Creative Writing to the Institute of Human Origins – touching on the earth beneath us, the universe that cradles us, our beliefs and the expression of all that makes us human.

I encourage you to learn more about CLAS and all the great activities that the college's students, faculty, staff, donors and alumni are engaged in throughout our local communities and across the world. Please get engaged and involved by participating in a public lecture, joining a board or attending our Night of the Open Door activities. Additionally, an investment in student scholarships, faculty excellence or program support would be most welcome and appreciated.

To learn more go to **clas.asu.edu** or feel free to contact me directly at **bill.kavan@asu.edu** or **480.965.7546**.

Go Devils!

Bill Kavan '92
Director of Development
College of Liberal Arts and Sciences

P.O. Box 2260
Tempe, Arizona 85280-2260
Phone: 480.965.7546
Mobile: 602.549.2307
Fax: 480.965.0290

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A DREAMer's Journey; More than a dream…

By Margaret Coulombe

Reyna Montoya has had a dream since she was a 10 years old attending Catholic elementary school and performing in a dance studio in Tijuana, Mexico. It was to graduate from college – a wish fulfilled this May at Arizona State University. Montoya graduated with 3,350 of her liberal arts and sciences classmates, earning dual degrees in Political Science and Transborder Studies, with a minor in Dance.

"I always wanted to go to ASU," says Montoya, who was brought to the United States on a visa by her parents when she was in eighth grade. "It was the only school that I applied to. I was so excited when I was accepted. I love Arizona and I love my home here."

Photo: Jacob Mayfield

This young ASU scholar's journey to the podium has been hard won and a crucible for her development. Chosen as the Jose Ronstadt Outstanding Undergraduate Student for the ASU Spring 2012 Hispanic Convocation, she's had to become a leader, fundraiser, performer, organizer, spokesperson and more – she is also living the life of a DREAMer.

The name stems from legislation called the Development, Relief, and Education for Alien Minors or The DREAM Act, first introduced in the Senate in 2001 by Senators Dick Durbin and Orrin Hatch. DREAMers are young people like Montoya, who were brought to the United States when they were younger than 16 years of age. DREAMers are also high school graduates or hold a GED, are characterized by good moral character and are pursuing higher education.

It's important to shine light on these issues. You hear a lot of stereotypes and I've found that people are very misinformed...

A student in politics and transborder studies, Montoya found herself at the center of issues that she was studying.

"The day I was accepted by ASU, I was so excited. My parents were very proud. They had always stressed the importance of education," remembers Montoya, who is a first-generation college student. "The roller coaster started when I was already enrolled in classes and reality hit. I could not apply for most scholarships – most required citizenship or proof of legal residency. Even the ones that I was offered I had to turn down."

Montoya pinned her hopes on private funding through the American DREAM Fund developed by the nonprofit Chicanos por La Causa. In Phoenix, the organization offers a number of scholarships to support economically-disadvantaged youth, including the Thomas Espinoza Scholarship to Arizona State University, which has helped more than 900 ASU undergraduate students complete their degrees since 1998.

"I went to my first two days of classes at ASU, not knowing if I could continue. The material was so awesome and the faculty so cool. They really loved what they were doing," says Montoya. "But my father met me after that second day of class, his eyes were so sad." Without the scholarship in hand, he told Montoya she'd have to leave ASU. He'd already enrolled her at a local community college.

Photo: Jacob Mayfield

"He didn't want any interruption in my education. It had always been a priority," explained Montoya. "So he enrolled me and I started the very next day. But, since I was very naïve, I didn't know that I had to drop my classes at ASU."

Fortunately, as it turned out for Montoya: "I got a call from ASU's financial aid office at the end of the week. The lady asked, 'How is ASU going?', and I burst into tears. I told her, 'I'm not going there. My parents had to take me out. They couldn't afford it.' And she said, 'But you got the scholarship. Didn't you know?'"

Funding became a singular, persistent challenge for Montoya, who was taking between 18-21 credit hours per semester, and unable to work because of her undocumented status: "I didn't know from one semester to the next whether I could continue school."

Then, in her junior year, during the economic downturn, funding provided by Chicanos por La Causa was exhausted. However, Montoya was not alone in her experience. A number of students at ASU and elsewhere were facing similar significant challenges. They came together and created fundraisers to help each other complete their educations. Most also put their political degrees to work, advocating through the Arizona DREAM Act Coalition.

This volunteer-driven organization was founded in 2008 by ASU alumna Dulce Matuz, recently named one of the "100 Most Influential People in the World" by *Time Magazine* (2012). The group advocates for the DREAM Act and immigrant youth rights for the more than 65,000 undocumented students who graduate from high school in the United States each year, according to the Urban Institute. The coalition received the 11th annual Cesar Chavez Legacy Award in April 2012.

"It's important to shine light on these issues. You hear a lot of stereotypes and I've found that people are very misinformed," notes Montoya, "even congressmen."

Her work with the coalition spurred her to lobby congressmen in both Arizona and in Washington, D.C.: "I just go to talk and to offer perspective. I give the facts and let them see that I'm a person, that I am a human being, that I'm not trying to break any laws, that I am always trying to do the best, not only for me, but for my community."

Montoya was able to set up a meeting with Congressman Ben Quayle, a U.S. Representative in Arizona's 3rd Congressional District – to talk about these issues and how she and others might be able to fully contribute to their communities. She also found herself featured in the *Arizona Republic* and nationally on MSNBC News – as a DREAMer.

How does it feel to serve as a role model on an important political issue? "I'm just really proud of graduating this year – being a woman, being Hispanic and being undocumented. There are all those statistics that tell you, 'No, you won't make it.' But, here I am."

Ultimately, Montoya dreams of becoming a lawyer, but for now that dream is deferred. In the meantime, she has been hired as the Civic Engagement Coordinator for Arizona DREAM Act Coalition for the next six months. She has also been elected as the coalition's vice president. After that, her hope is to attend graduate school in dance, marrying her politics and its intricate interplay of ideas, ideologies, perspectives, biases, passions and partnerships with modern contemporary performance.

"Because of some very good-hearted people along the way, I've been able to make it. I am a perfect example of what happens if you try hard enough, if you do the right thing, if you stay true to following what your heart tells you and believe that you can actually make it. The statistics might be true, but not all the time." ▼

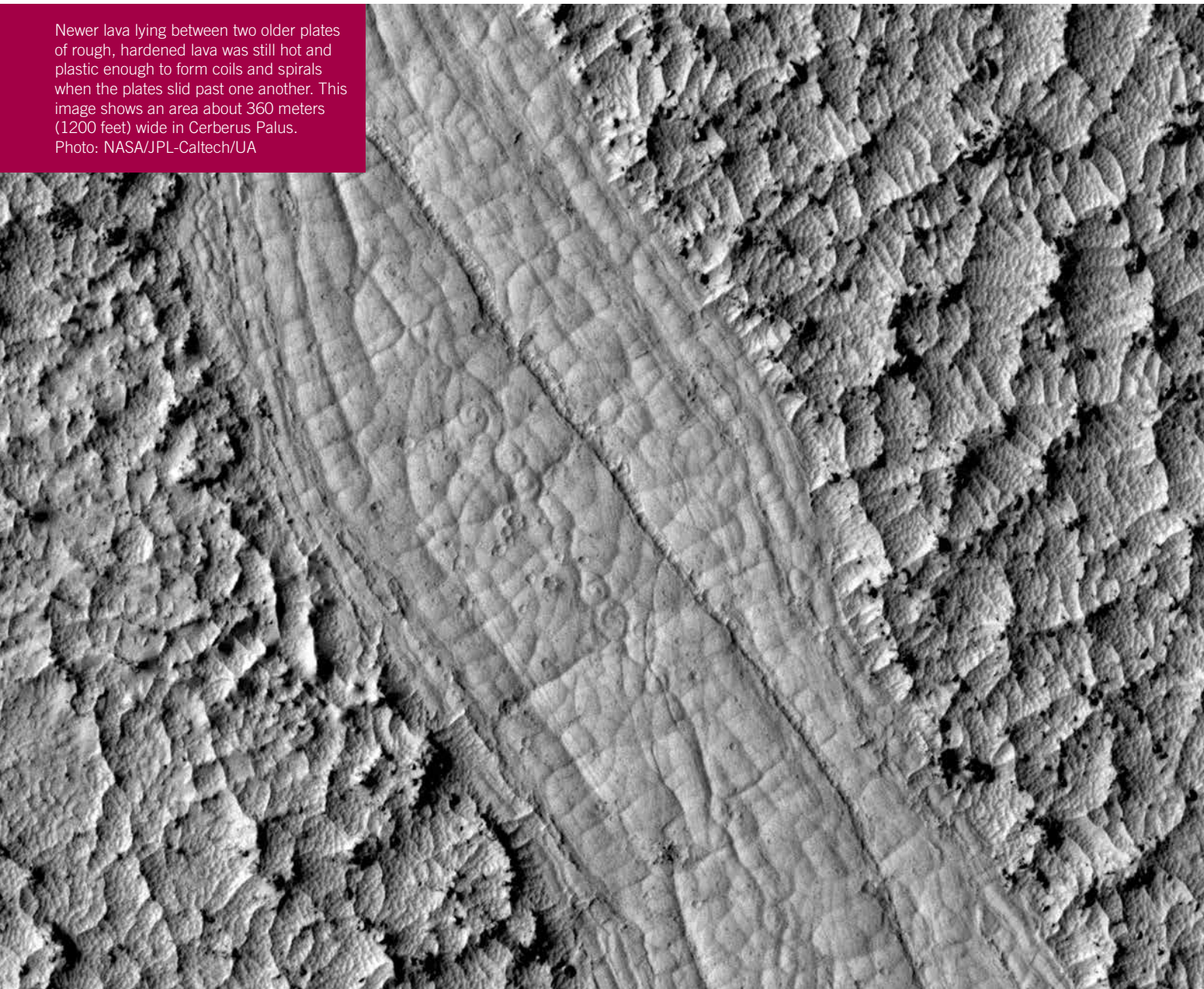
Graduate student discovers spiral lava flows on Mars

By Robert Burham

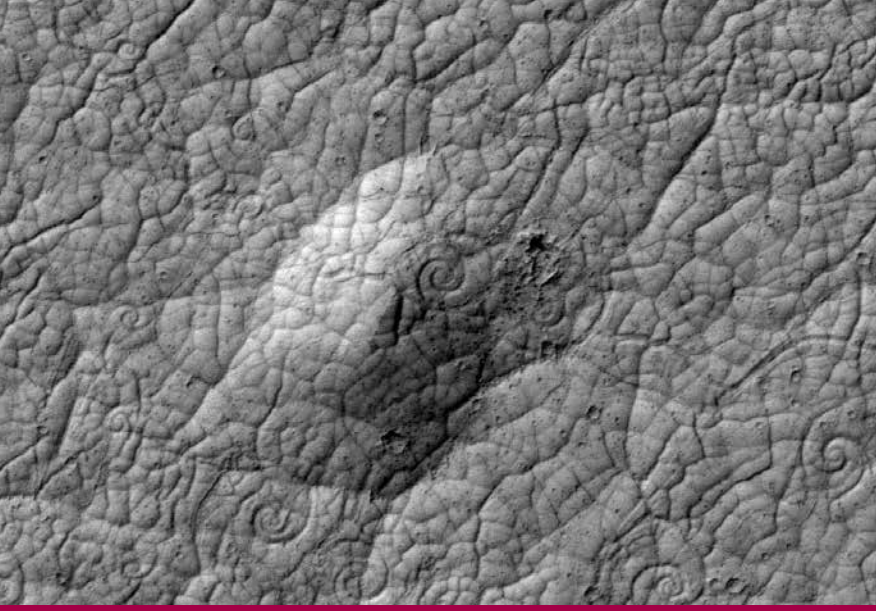
High-resolution photos of lava flows on Mars reveal coiling spiral patterns that resemble snail or nautilus shells. Such patterns have been found in a few locations on Earth, but never before on Mars. The discovery was made by Arizona State University graduate student Andrew Ryan and ASU Regents' Professor Philip Christensen.

Their finding grew out of research into possible interactions of lava flows and floods of water in the Elysium volcanic province of Mars.

"I was interested in Martian outflow channels and was particularly intrigued by Athabasca Valles and Cerberus Palus, both part of Elysium," says Ryan, who is a first-year graduate student in ASU's School of Earth and Space Exploration in the College of Liberal Arts and Sciences.



Newer lava lying between two older plates of rough, hardened lava was still hot and plastic enough to form coils and spirals when the plates slid past one another. This image shows an area about 360 meters (1200 feet) wide in Cerberus Palus. Photo: NASA/JPL-Caltech/UA



Cooling lava on Mars can form patterns like snail shells when the lava is pulled in two directions at once. Such patterns, rare on Earth, have never before been seen on Mars. This image, with more than a dozen lava coils visible, shows an area in a volcanic region named Cerberus Palus that is about 500 meters (1640 feet) wide. Photo: NASA/JPL-Caltech/UA

"Athabasca Valles has a very interesting history," Ryan says. "There's extensive literature on the area, as well as an intriguing combination of seemingly fluvial and volcanic features."

Among the features are large slabs or plates that resemble broken floes of pack ice in the Arctic Ocean on Earth. In the past, a few scientists have argued that the plates in Elysium are in fact underlain by water ice.

Looking below

Assessing those claims that ice was present today beneath the lava plates drove Ryan to study the area. "My initial goal," he says, "was to model the nighttime infrared temperatures of the plates. Then I became fascinated by the terrain lying between the plates and the high-centered polygonal patterns found there." This led him to look closely at every available image of the region.

"I examined probably 100 HiRISE images of the area," he says, referring to the High Resolution Imaging Science Experiment camera on the Mars Reconnaissance Orbiter. In addition, he pored over daytime and nighttime infrared and visual images from the Thermal Emission Imaging System (THEMIS) camera on Mars Odyssey orbiter. (Christensen is THEMIS' principal investigator.) Images taken by the Context Camera (CTX) on Mars Reconnaissance Orbiter, the High Resolution Stereo Camera (HRSC) on Mars Express, and the Mars Orbiter Camera (MOC) on Mars Global Surveyor were all studied as well.

Picture this

"One evening," Ryan recounts, "I was making a second pass over the HiRISE images when I first noticed puzzling spiral patterns in an image near the southern margin of Cerberus Palus. I actually nearly overlooked that particular frame, thinking that it might not be too useful, being so far away from the main study area farther north."

He notes, "The coils become noticeable in the full-resolution HiRISE image only when you really zoom in. They also tend to blend in with the rest of the light-gray terrain – that is, until you stretch the contrast a bit.

"I don't find it surprising that these were overlooked in the past. I nearly missed them too."

Curling lava

On Earth, lava coils can be found on the Big Island of Hawaii, mainly on the surface of ropey pahoehoe lava flows. They have also been seen in submarine lava flows near the Galapagos Rift on the Pacific Ocean floor.

As Ryan explains, "The coils form on flows where there's a shear stress – where flows move past each other at different speeds or in different directions. Pieces of rubbery and plastic lava crust can either be peeled away and physically coiled up – or wrinkles in the lava's thin crust can be twisted around."

Similarly, he notes that scientists have documented the formation of rotated pieces of oceanic crust at mid-ocean ridge spreading centers: "Since the surface of active lava lakes, such as those on Hawaii, can have crustal activity like spreading centers do, it's conceivable that lava coils may form there in a similar way, but at a smaller scale."

The size of Martian lava coils came as a surprise. "On Mars the largest lava coil is 30 meters across – that's 100 feet. That's bigger than any known lava coils on Earth," he says. Ryan and Christensen's work has inventoried nearly 200 lava coils in the Cerberus Palus region alone. ▼

Photo: Kelly O'Brien

The Center at the intersection of what's moral and legal

By Margaret Coulombe

In 1998, Joan and David Lincoln founded the Lincoln Center for Applied Ethics at Arizona State University

ASU's Center for Applied Ethics offers education and guidelines for first responders, cyberwarfare, emerging technologies, public health, policy-makers and families like mine.

I remember the day that my family decided my 90-year-old grandmother needed to be moved from the house she'd lived in for 10 years to my parents' home for care. She was angry, confused and resistant, but the onset of Alzheimer's had already meant years of mounting care from me, from visits to fill out insurance paperwork and pay bills to shared dinners of roast beef from Arby's. Grandma had amassed hundreds of coupons for beef, thousands of feet of string, basketballs of rubber bands, and library stacks of neatly collapsed boxes. These habits had helped her survive the Great Depression and two world wars, but what tools did we have besides legalities to help us to make the right choices for her and us during this change?

Such ethical dilemmas are faced daily by families like mine. They touch on the way that we hold each other accountable for what is fair and reasonable, and what it means to be a human being. Doctors, social workers, lawyers, teachers, corporations, governments, international human right groups and crisis managers face such complex situations, needing guidelines to build solutions, from first-responders to end-of-life decision making.

Offering direction for personal and emerging global challenges is Arizona State University's Lincoln Center for Applied Ethics. (LincolnCenter.asu.edu)

"Applied" is the key word here and what sets the ASU center apart from all others, says the Lincoln Chair in Ethics Peter French, the center's director. French, a philosopher and author, has examined moral responsibility – specifically criminal liability, corporate responsibility and ethics and legal theory – for more than 47 years.

"We don't argue over which principles or moral theories are better, but consider how to manage responsibly the changes and issues that arise within the society at large and how that will determine the environment in which we and our descendants will live. We work where the rubber-meets-the-road, across the whole spectrum of human activities."

The center became a reality under French's direction in 2000, with an endowment and the pledge of an annual donation by David and Joan Lincoln. "The Lincolns wanted to found a center that worked across disciplinary boundaries in areas where emerging ethical challenges could be addressed with actionable approaches." The center's expanding cohort

of Lincoln Professors and Fellows (currently 24 affiliated with colleges and schools on the ASU campuses), focus on seven challenging areas: Ethics and the Emerging Technologies; Biomedical, Public Health and Health Care Ethics; Human Rights, Global Issues and Ethics; Ethics Education; Sustainability Ethics; Ethics in Government and Public Policy and Ethics and Mass Communications.

These challenge areas have spawned a master's degree program in Applied Ethics and the Professions and more than a dozen projects, such as the Consortium on Emerging Technologies, Military Operations and National Security (CETMONS), led by Braden Allenby, a Lincoln Professor of Engineering and Ethics. The consortium combines teaching, outreach, public service and participation in policy development and offers a platform for battlefields and boardrooms' "consideration of ethical, rational and responsible management of the issues raised by emerging technologies and their use in military operations and their broader implications for national security."

"Imagine combat that only involves robots and machines, but no American troops – what are the implications of that?" says Allenby. "How do new technologies impact what we consider a 'just' war and the laws of warfare? And what are the ethics of moving technologies like unmanned aerial vehicles out of the battlefield and into our own backyards? What happens to your notions of privacy?"

Consortium members include the Inamori International Center for Ethics and Excellences at Case Western Reserve University, The John J. Reilly Center at Notre Dame, the Center for Ethics and Technology at Georgia Tech, the Ethics + Emerging Science Group at California Polytechnic (CalTech), the Center for the Study of Interdisciplinarity, University of North-Texas, and more than 45 other academic and military representatives including the Navy Postgraduate School and the Naval Academy. (CETMONS.org)

The Lincoln Center also sponsors professional conferences, such as that recently offered by the Arizona Bioethics Network "Ethics at the Bedside: Making Hard Decisions," student symposia, and exhibits, including a display from the Holocaust Museum in Washington, D.C. that addresses the deadly medicine as used by the Nazis in World War II.

Undergraduate students are privy to a unique learning atmosphere at the center, says French. One in which they encounter and engage across three cross-cutting curricular themes – ethics, sustainability and entrepreneurship – with the potential to identify where applied ethics can impact how rewarding a future is for an individual, a society or the global community. The center helped students establish ASU's chapter of Triple Helix, which publishes the student research journal *Science and Society* and which won ASU's 2011 Hall of Fame award for best academic/educational program (asutriplehelix.org).

The center also launched the Barrett Initiative, led by Ted Humphrey, a Lincoln Professor of Ethics with the Barrett Honors College, and Janet Burke, associate dean of the Barrett Honors College and Lincoln Fellow of Latin American Studies. The project partners Lincoln Professors and Fellows with ASU's top honor students seeking major national scholarships, such as Rhodes, Marshall, and Fulbright awards. "We've received feedback from awards' examination boards and discovered that, while our applicants excelled in most areas, we needed to bolster their ability at interviews to apply ethics to questions about what's happening in the world," says Kelly O'Brien, Lincoln Center's programs director. "Questions like where people draw lines, about who should take responsibility or why things don't get done."

"There are lots of things that we say are moral responsibilities that are not codified in law," notes French. "Moral responsibility is much broader. It is not just what you have to do to not violate the law. Our goal is to offer real-world guidelines and help people achieve a higher order of responsibility to themselves and each other." ▼

UNCHAINED

young alumna launches nonprofit to fight sex trafficking

By Maureen Roen

When it came time to choose a community internship project as part of her major in the School of Social Transformation, Jamie Roberts, an Arizona State alumna (2011 B.A.), approached Catholic Charities Community Services with the expectation she might be assigned to an after-school program working with kids. When Roberts learned about "Dignity House," a residential program for victims of sex trafficking, she was immediately drawn in.

"Like many people, I thought sex trafficking was something that mostly happened in other parts of the world," says Roberts, who majored in justice studies with combined minors in women and gender studies and political science. "I had no idea that Phoenix was near the top of the list nationally and that some 300,000 kids in this country are at risk for being trafficked each year."

When Roberts graduated from ASU, she enthusiastically accepted a full-time professional position as a case manager with the Dignity program. Known nationally for its outreach efforts and diversion programs for those arrested for prostitution and solicitation, Dignity boasts impressive success rates: 89 percent of those who complete their jail diversion program do not re-offend and 93 percent who go through the year-long residential program at Dignity House break the cycle of prostitution for life.

"As much as we're able to do for our clients, it's heartbreaking that by the time many victims are even eligible for Dignity House at age 18, they've already suffered years of emotional damage," observes Roberts.

The average age of entry into prostitution is 12.8 nationally and between 13 and 15 in Phoenix.

Recognizing that there was enormous unmet need for services and rehabilitation programs for sex trafficking's youngest victims, Roberts and colleague Rachel Irby were moved to start their own non-profit to fill this gap. "Unchained" is committed to using education to build recognition and awareness of this growing problem among youth and to offer hope for prevention and recovery.

Roberts says her entrepreneurial efforts were emboldened by her work as a research assistant with justice and social inquiry professor Vanna Gonzales her junior year, helping to create socialeconomyaz.org. This online resource is a goldmine for those looking to launch nonprofits, cooperatives and sustainable businesses.

Like many people, I thought sex trafficking was something that mostly happened in other parts of the world...

"All the paperwork and legal forms can be overwhelming, but Vanna connected me to great resources," explains the young entrepreneur, "including an attorney who would do all our tax and incorporation forms for a flat fee. It was at her urging that we applied for and got accepted into the Technical Assistance Partnership of Arizona, a part of St. Luke's Health Initiative which helps incubate non-profits."

Now, less than a year from its official launch in Phoenix, Unchained has presented nearly 30 awareness events at six university and college campuses around the country. They have also developed a mobile interactive "walk through" event that uses video and actors to give participants a first-hand look at how sex trafficking takes place, how society normalizes trafficking, and how trafficking effects those who become victims. They also started a fundraising campaign working to establish a juvenile residential safe house and treatment program.

"In addition to educating young people, we want to reach out to teachers, to those working in law enforcement and social agencies, even in associated areas like the hotel industry, to teach them to recognize sex trafficking and make them aware of the resources available to get victims the full range of treatment they need," Roberts says.

"Runaway teens are running away from something – from domestic violence, or drug use in the family, or sexual abuse," she emphasizes, "and within 48 hours of being on the streets, a third of runaways are contacted by pimps. Sending a minor back home or to a foster home or arresting or labeling someone as a prostitute or drug addict doesn't address the complexities that led them to that life. But getting these kids into appropriate therapeutic and healing programs, we can turn their lives around."

"Jamie is a fabulous example of the deep commitment and initiative that School of Social Transformation students bring to their lives and their careers," observes Professor Mary Margaret Fonow, director of the school. "Recognizing they have the power to bring solutions to community challenges, they are determined to be the change – stepping forward as social innovators and changemakers." ▼

Learn more about Unchained's efforts and the issue of domestic sex trafficking at **unchainedmovement.org** or email the co-founders directly at **Jamie@unchainedmovement.org** or **Rachel@unchainedmovement.org**.

◀ Passionate about helping sex trafficking's youngest victims, Jamie Roberts launched the nonprofit Unchained just a few months after graduating from ASU's School of Social Transformation and starting her career. Photo: Laura Segall

DNA computing: ASU scientist optimizes the future

By Viviane Callier

Many important problems that society needs to have solved are ones that require optimization and speed. For example, when hurricane Rita approached the Gulf Coast in 2005, soon after hurricane Katrina devastated New Orleans, panicked residents of Houston tried to evacuate. The result were traffic jams that stretched for miles and gas stations without gasoline. Designing an optimal plan to evacuate thousands of residents in the hours before a storm makes landfall is not trivial, especially in cities such as Houston that are experiencing rapid growth and development.

Wayne Frasch, a professor in the School of Life Sciences and recipient of the 2012 Faculty Achievement Research Award from the ASU Alumni Association, has been harnessing the power of biology in search of faster and more accurate ways to solve such optimization problems. Using DNA molecules synthesized chemically in the lab, his research team has built a computer that uses the ability of one DNA to bind to its complementary strand as a means of making mathematical computations. Using this approach, they have constructed a massively parallel computer that makes thousands of computations simultaneously – in a small vial of liquid.

An organic computer made of DNA? While it seems like science fiction, especially with the increase in the speed of modern computers in recent years, solving complex problems where many parameters must be optimized

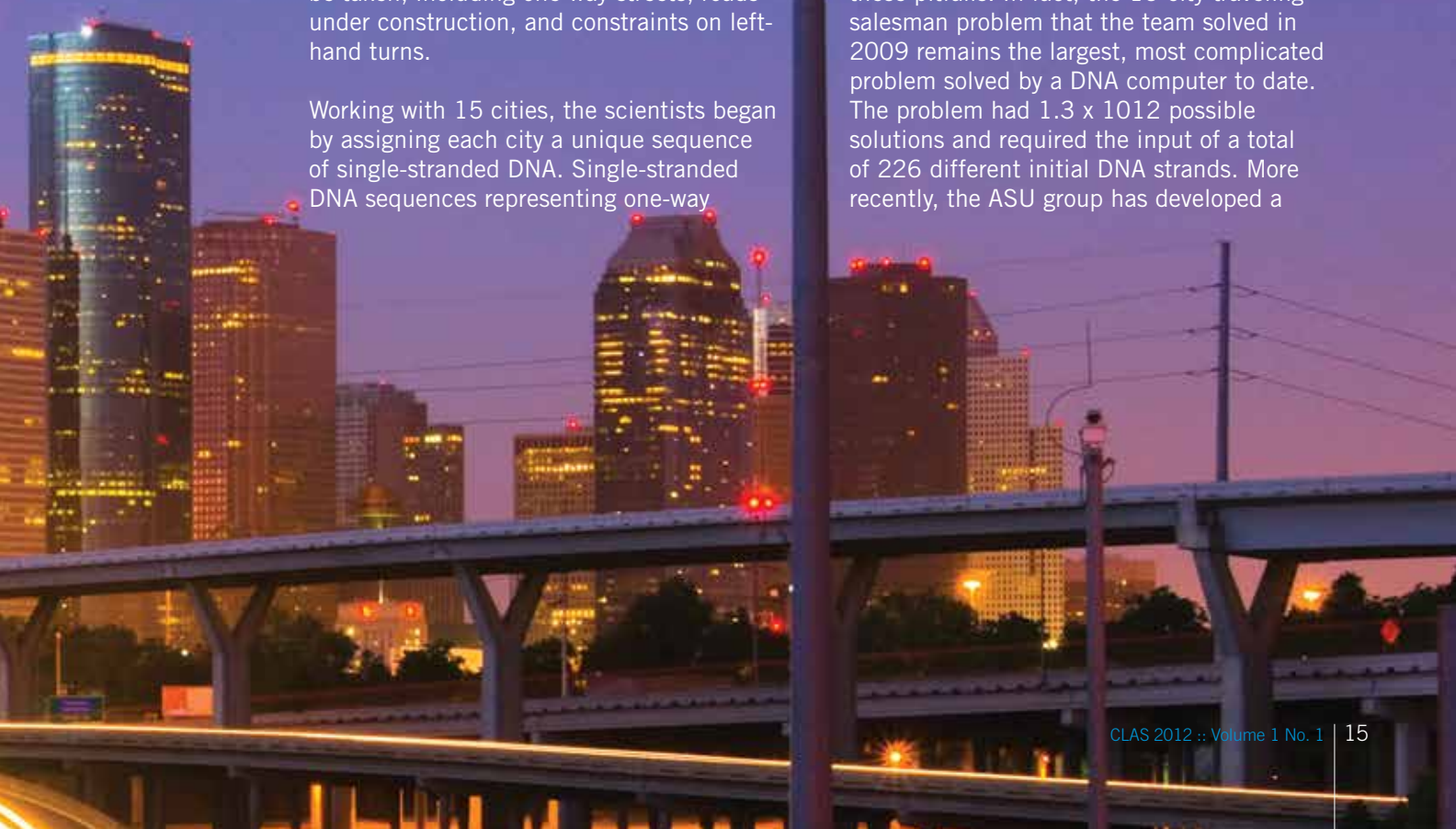
remains a difficult, relatively slow process. Standard computers can only execute one process at a time. First, they must compute all potential answers; then, they must compare each answer to every other answer before choosing the best one. Doing these operations one at a time can take a long time, even for a very fast computer, because the number of potential answers increases dramatically with the size of the problem and number of parameters to be optimized.

With funding from the Defense Advanced Research Projects Agency (DARPA) and the Air Force Office of Scientific Research (AFOSR), Frasch and his team, which included Fusheng Xiong, a faculty research associate, and David Spetzler, a postdoctoral scholar who is now vice president of Discovery Research with Caris Life Sciences, Inc., worked to enable their DNA computer to solve a classic optimization problem known as the "Traveling Salesman Problem." It requires the salesman to find the shortest path from his home city to a set of cities that he must visit once (and only once) before coming home. This is the problem that the United Postal Service and Federal Express must deal with every day: find the optimal route for delivering packages, with various constraints on the paths that can be taken, including one-way streets, roads under construction, and constraints on left-hand turns.

Working with 15 cities, the scientists began by assigning each city a unique sequence of single-stranded DNA. Single-stranded DNA sequences representing one-way streets were then designed to link the cities in a directional manner. Binding of the sequences resulted in millions of long DNA strands that each contained an ordered sequence of the cities on one strand and paths on the complementary strand. Since the problem being computed involved 15 cities, the length of the DNA strands which comprised the correct answer was of a length specific to the sum of each city – with the start city at the beginning and at the end. After permanently linking the cities and paths in each long strand using an enzyme, the optimal path was revealed: the one with the highest probability of forming and the one present in highest abundance.

Although the use of DNA for computing was first proposed by Leonard Adelman, a professor of computer science and molecular biology at the University of Southern California in 1994, many technical impasses had prevented any real progress in using DNA to solve traveling salesman problems for the next 15 years.

Ultimately, Frasch and his team devised novel, yet relatively simple modifications to the standard molecular biology procedures of electrophoresis, magnetic bead purification and the polymerase chain reaction (PCR) to enable them to move past these pitfalls. In fact, the 15-city traveling salesman problem that the team solved in 2009 remains the largest, most complicated problem solved by a DNA computer to date. The problem had 1.3 x 1012 possible solutions and required the input of a total of 226 different initial DNA strands. More recently, the ASU group has developed a



new approach that has the potential to cut the time required for the optimal answer identification step from several days to 25 minutes, thereby dramatically increasing the speed of the computer.

It is clear from the work in the Frasch lab that science fiction has become science fact. Such techniques will be able to be applied to a range and variety of important complex optimization problems, like finding the most efficient way to deliver packages, evacuating cities and saving lives in the face of an impending hurricane. “We are just at the beginning of what we will be able to do,” says Frasch. ▼

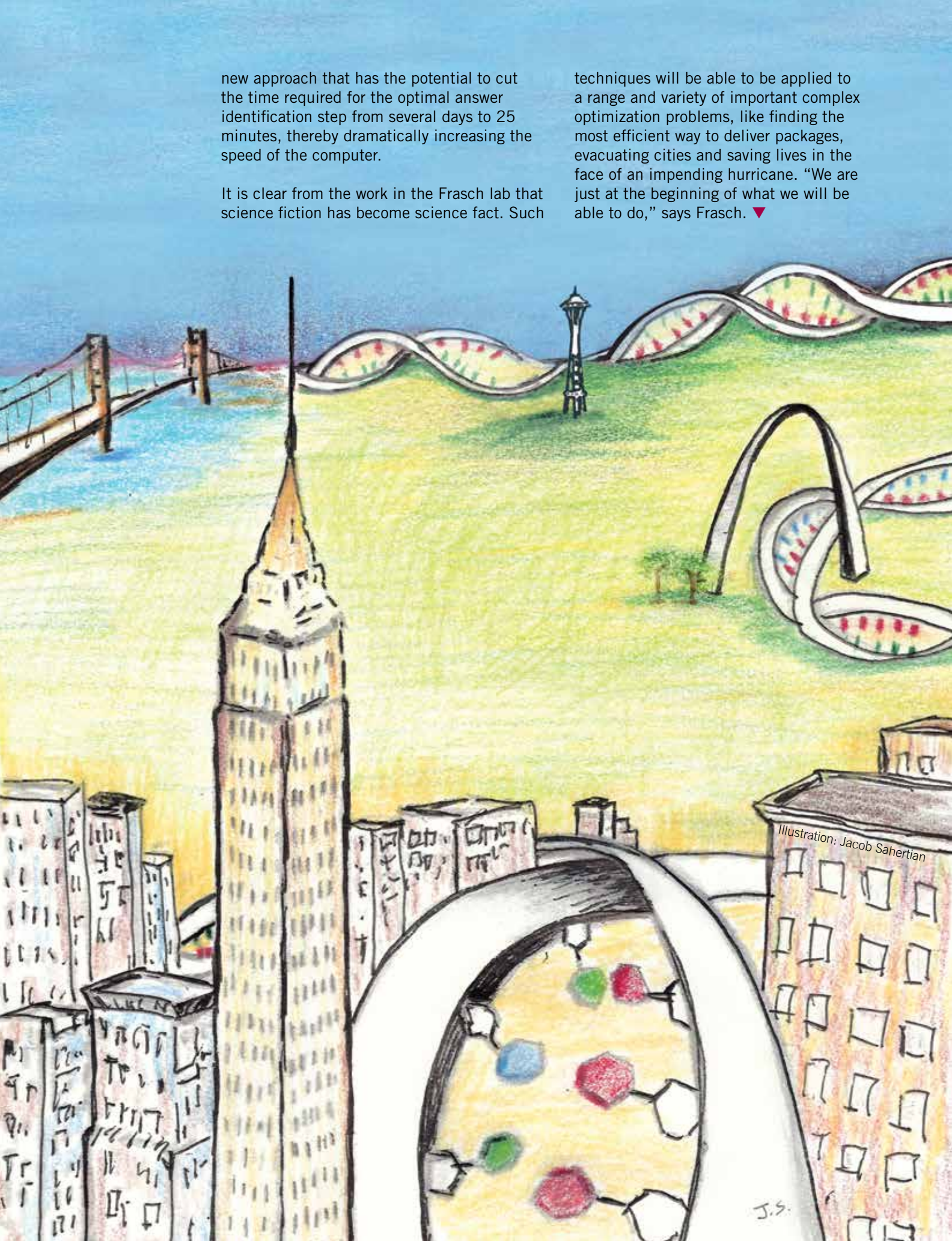
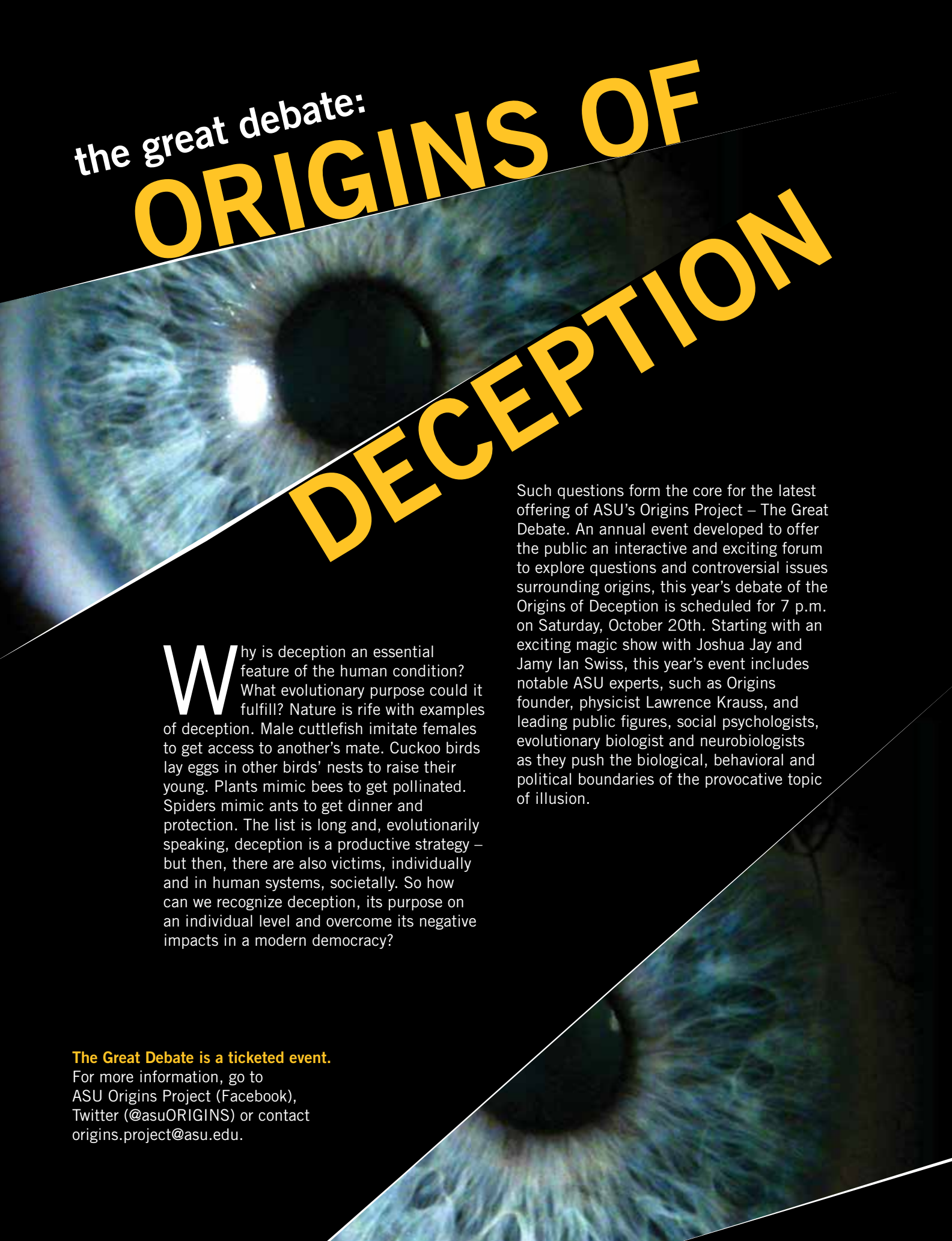


Illustration: Jacob Sahertian

the great debate:

ORIGINS OF DECEPTION



Why is deception an essential feature of the human condition? What evolutionary purpose could it fulfill? Nature is rife with examples of deception. Male cuttlefish imitate females to get access to another's mate. Cuckoo birds lay eggs in other birds' nests to raise their young. Plants mimic bees to get pollinated. Spiders mimic ants to get dinner and protection. The list is long and, evolutionarily speaking, deception is a productive strategy – but then, there are also victims, individually and in human systems, societally. So how can we recognize deception, its purpose on an individual level and overcome its negative impacts in a modern democracy?

Such questions form the core for the latest offering of ASU's Origins Project – The Great Debate. An annual event developed to offer the public an interactive and exciting forum to explore questions and controversial issues surrounding origins, this year's debate of the Origins of Deception is scheduled for 7 p.m. on Saturday, October 20th. Starting with an exciting magic show with Joshua Jay and Jamy Ian Swiss, this year's event includes notable ASU experts, such as Origins founder, physicist Lawrence Krauss, and leading public figures, social psychologists, evolutionary biologist and neurobiologists as they push the biological, behavioral and political boundaries of the provocative topic of illusion.

The Great Debate is a ticketed event.
For more information, go to ASU Origins Project (Facebook), Twitter (@asuORIGINS) or contact origins.project@asu.edu.

ASU undergrad flourishes with 'Zero' success

By Margaret Coulombe

Author and Phoenix native Tom Leveen says that none of his novel's characters are him, but all have a part of him in them. So what qualities fueled this 37-yr-old's compelling 17-yr-old lead, Amanda, better known to her friends as Zero?

Leveen says that his own young adulthood growing up in Arizona, wandering on Mill Avenue and going to Camelback High School was great: "It was filled with drama and trauma and all the usual trappings, but I had a blast. Writing about that time of life just came naturally."

"Young Adult Fiction is all about origin stories, like you see in comics and superhero movies. Origin stories are the best," explains Leveen. "It's where so much change takes place, and change is at the heart of storytelling."

"Zero," his second novel for young adults, also reflects Leveen's experiences as an actor and the former co-founder and artistic director of the now defunct nonprofit Chyro Arts Venue, which was an all-ages music and theater venue in Scottsdale.

"You can't write about teens without hanging out with them, and we did that regularly at Chyro during band nights, in particular.
Those young musicians definitely helped shape 'Zero'."

"His skill in accessing both the wonder and horror of teen years is magical," says Arizona State University English professor James Blasingame, who interviewed Leveen for the *Journal of Adolescent & Adult Literacy* in 2012. "Tom was a student in my ENG 471: Adolescent Literature class, and we also enlisted him to give a workshop at our summer writing program for teens in 2011. He was so engaging. The kids loved him!"

"He is going to be a huge star!!!" adds Blasingame, who has authored more than 100 book reviews, interviews and books and was named ASU Parents Association's Professor of the Year for 2008.

"Zero" is set in Phoenix, with this strong sense of place adding much to the authenticity to Leveen's creation. In his tale, young aspiring artist Amanda Walsh – aka Zero – looks forward to her summer before going away to School of the Art Institute of Chicago. Her plans were simple: "Hanging out with her best friend Jenn, going to clubs, painting, and counting down the days until her escape." But Zero's expectations change, in the face of challenges at home, old friends, and the beginnings of new relationship with a punk skater. Will her prospects become "as bleak and surreal as a painting by her idol Salvador Dali. Will life truly imitate art? Will support from the unlikeliest of sources show Zero that she's so much more than a name?"

"I put these characters down on paper because I felt that they had a story and I wanted to know what it was and what they had to teach me about myself," says Leveen. He completed his first draft of "Zero" in 1993, but even before then – "waaaaaay back" as he puts it – he wrote a "weird little scene between a guy named Skater and a girl

Tom Leveen at Changing Hands bookstore in Tempe for the launch of Zero. Photo: Alecia Brouwer

Our professors are so knowledgeable and experienced, and are able to put things into a context that's not quite possible working on your own...


Photo: Alecia Brouwer

named Zero. It didn't go anywhere, but I fell in love with the characters and put them into this contemporary setting to see where they'd take me."

"Art and music, which is such a part of that time of life, came to the fore. I was living it as I was writing it, which is what makes 'Zero' so different from [my first book] 'Party,'" says Leveen. "There was an immediacy to the writing."

Classwork at ASU, writing conferences and focus on his writing helped create Leveen's platform for success. Majoring in family and human development, offered online by the School of Social and Family Dynamics, and working with the faculty in the Department of English, such as Blasingame, expanded the tools and resources Leveen needed to publish.

"Our professors are so knowledgeable and experienced, and are able to put things into a context that's not quite possible working on your own," says Leveen. "The thing about writing is, no one ever knows it all. I've taken rapid, copious notes in my classes because these instructors have been around blocks I didn't even know existed. Different ways of mapping out a plot, how to hone in on character development, how to use language effectively, how the authors of years past or from different cultures can teach us about ourselves and our own writing...I mean, these are just the tip of the iceberg for the things I've come away with from ASU. I've also got about 10 different manuscripts in various stages of disarray right now, so I'm trying to get those in order to begin the submission process again."

What's coming up next? Leveen has two more Young Adult novels that will debut in 2013: "One is with Random House again, titled 'Manicpixiedreamgirl.' Then my first horror novel called 'Monsters' comes out with Amulet/Abrams Books... about a group of kids trapped in their high school drama department by zombies. That one may be my most autobiographical." ▼

ASU's UN 'Champion of the Earth'

By Carol Hughes

Sander van der Leeuw is by training an archeologist and historian. He speaks five languages, has traveled the globe in scholarly pursuit and was the founding director of the college's School of Human Evolution and Social Change. He also is among the six winners of the 2012 United Nations Champions of the Earth award. Van der Leeuw, who is now dean of ASU's School of Sustainability and an external professor at the Santa Fe Institute, was recognized in the science and innovation category for his research in human-environmental relations and the scientific study of innovation as a societal process. He is one of 51 champion laureates who have received the UN award since it was launched in 2005.

The Champion of the Earth honor is the UN flagship environment award that recognizes outstanding visionaries and leaders for their inspiration and action on the environment. The list of previous champion laureates includes former U.S. Vice President and Nobel Peace Prize winner Al Gore, Mexican President Felipe Calderón, Chinese actress and environmental advocate Zhou Xun, Biomimicry Institute President Janine Benyus and former Soviet leader and Noble Peace Prize winner Mikhail Gorbachev.

Photo: Anick Coudart

This year's recipients include Mongolia's President Tsakhia Elbegdorj, Brazilian banker Fábio C. Barbosa, renewable energy entrepreneur Sultan Ahmed Al Jaber, renowned Swiss aeronaut Bertrand Piccard and Kenyan Maasai conservationist Samson Parashina.

"Each of these six winners has stood up to be counted – often in the face of opposition from those not championing change but championing the status quo," said Achim Steiner, UN Under-Secretary General and the executive director of the United National Environment Programme (UNEP). "In doing so, these winners have and continue to display the political will, fresh thinking and creative solutions."

Professor van der Leeuw, a citizen of the Netherlands, first directed a series of regional archaeological research projects in Syria, Holland and France aimed at understanding the long-term evolution of the relationship between societies and their environments.

Later, his work focused on bringing a long-term perspective to the problems of present-day desertification and land degradation, observing how changes in the natural environment are linked to technological, sociological and economic changes. This involved as many as 60 researchers from 11 European countries and focused on research areas in all the Northern Mediterranean rim states. His team was the first to bring the complex adaptive systems approach to bear on the problems of the environment.

"Sander is amongst the absolutely extraordinary few who possess the unique combination of a rare intelligence, superb people skills, determination and focus, and above all a sense of responsibility to advancing knowledge through research and teaching the next generation of leaders," said Jim Buizer, who led the establishment of Global Institute of Sustainability at ASU and is now director of the Center for Climate Adaptation and International Development at the University of Arizona.

"Sander has the wonderful ability to make simple the very complex, bring his knowledge of how societies worked in the distant past to inform our present, and bring diverse communities together to solve today's biggest challenges … all toward the betterment of societies worldwide," said Buizer.

The Champions of the Earth Awards were presented at a ceremony on June 4 in Rio de Janeiro as one of the official events leading up to the United Nations Conference of Sustainable Development, known as Rio+20. Thousands of world leaders and representatives from governments, the private sector and NGOs attended Rio+20, held June 20-22, to focus their discussions on two themes: a green economy in the context of sustainable development and poverty eradication, and an institutional framework for sustainable development.

"I think the most important thing such recognition by the United Nations Environment Programme does is acknowledge the urgency of this type of work, encouraging others, and notably our students, to keep moving ahead," said van der Leeuw. "In particular, there is still a great shortage of research by social scientists on global environmental change, both research to improve our understanding of the role of societies in such change, and research aimed at removing the barriers to collective action towards sustainability. I dedicate this prize to the next generation, the one that is beginning to so profoundly transform our world that I already have difficulty recognizing it. A generation that truly sees sustainability as the societal challenge it is, rather than solely as an environmental one – a challenge of equity, education, development and, above all, commitment to doing things differently, collectively, to design a more sustainable world. ▼

Photo: Anick Coudart

Cultivating the Food Desert

By Allie Nicodemo

Arizona State University students study low-income communities, food deserts, and potential impact of community gardens, such as this plot next to Harmon Library in Phoenix, Arizona. Photos: Jacob Sahertian

While candy bars for breakfast and potato chips for lunch may sound great to a five-year-old, parents know that kind of diet won't meet a person's nutritional needs. However, for families living in parts of South Central Phoenix, Ariz., and other neighborhoods, these foods may be more readily available than fresh vegetables and whole grains. That's because certain low-income communities are "food deserts," meaning most residents do not have access to a grocery store or supermarket.

Living in a food desert makes it tough to prepare nutritious meals. The local corner store might stock some fresh produce, but it is often more expensive than it would be at the supermarket. And instead of lean meats like chicken breast, convenience stores sell Spam and beef jerky. Because people with low incomes are less likely to own cars, shopping in neighborhoods with a better food selection may not be a viable option.

"As far as food deserts in South Phoenix, what they do have access to is a lot of convenience markets, essentially. They predominately sell junk food and alcohol," says Tommy Bleasdale, a doctoral student in the Environmental Social Sciences Program in the School of Human Evolution and Social Change in the College of Liberal Arts and Sciences at Arizona State University.

"If you don't have an easy way to get to a supermarket, and these neighborhoods don't because the supermarkets around them have either moved or gone out of business, then you don't have equal access to the quality of food that somebody living in another neighborhood might," Bleasdale says.

Bleasdale worked with Carolyn Crouch, who graduated with a Master of Arts degree from ASU's School of Sustainability, and Sharon Harlan, a sociologist in the College of Liberal Arts and Sciences, to understand the complex issues that disadvantaged neighborhoods face

in trying to access healthy food. Specifically, the team studied the community of Central City South, located in the urban core of Phoenix.

For her part of the project, Crouch collected data from each of the community's 14 food outlets to determine the nutrition environment in the area. There is no grocery store within one mile of Central City South, so these food outlets included convenience stores, ethnic food marts and dollar stores. Crouch gave each neighborhood a rating based on availability, affordability and quality of food.

Crouch found that Central City South, like many other low-income areas of the U.S., had low food access, especially in regard to healthy options. A week after these findings were published, the USDA released its own survey confirming that the area of Central City South is a food desert.

Bleasdale is interested in how these communities respond to having low access to healthy food. In the past, community gardens have been one way for residents to get more fruits and vegetables. "That's something that people can do – they can afford the produce because they're growing it themselves. It's kind of a ground-up strategy," he says.

The nonprofit organization Phoenix Revitalization Corporation (PRC) runs a community gardening program and wants to expand into more neighborhoods. In order to help PRC revise its program and better meet the needs of the community, Bleasdale surveyed 149 residents on the perceived benefits and burdens of gardening. The study was published in the May 2011 Journal of Agriculture, Food Systems and Community Development.

While the majority of respondents said they were interested in community gardening, 82 percent were unaware of existing gardens in Central City South, including one located in the HOPE IV public housing project and another next to the Harmon Library. However, they saw potential benefits in community gardening, mainly that it would provide them with more nutritious food. Other benefits included exercise, helping the environment and relaxation.

Respondents also acknowledged the burdens that might come along with gardening. Most people identified lack of space and excessive heat as two major obstacles. Lack of time was also a concern.

"A lot of these people have multiple jobs and the only way they can pull through is working 60, 70 hours a week, so time was a huge issue," Bleasdale says.

Now that the PRC has a better understanding of the community's perceptions of gardening, they can tailor the program and make it more feasible for residents to participate. For example, most people surveyed had no knowledge of the existing local food movement in their neighborhood.

To increase participation, Bleasdale suggests the use of colorful signs to advertise gardens and a community bulletin board to promote communication and social interaction. Additionally, providing education on gardening will allow residents with little or no experience to join in.

Working with a local organization called the Valley Christian Center, the PRC has received funding to build a new half-acre garden, which will be constructed next to the PRC building in the Matthew Henson neighborhood of Central City South. Bleasdale says that's one reason why it's important to do this kind of research.

"By publishing work like this, it gives the non-profit leverage in writing grants. Also, by showing what this particular community wanted, we can then start to discuss other food desert communities surrounding it." ▼

Want to find out if your neighborhood is a food desert? Use the USDA food desert locator: ers.usda.gov/Data/FoodDesert

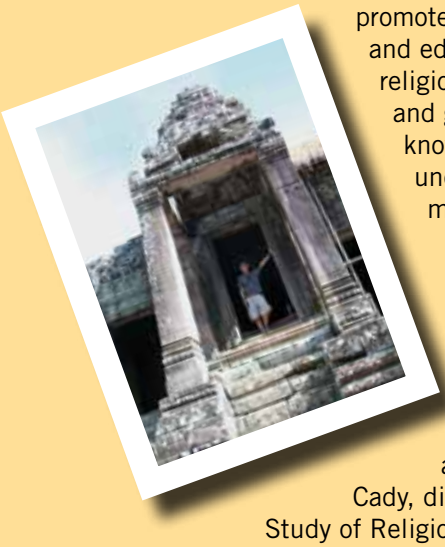
Bryan Tom studied the role of music in anti-extremist movements as part of the Center for the Study of Religion and Conflict's Undergraduate Research Fellows Program.

Music as an instrument of peace

By Samantha Womer

When Bryan Tom first came to Tempe from Tucson, he had no idea that he would end up spending a year studying the music of Southeast Asia and the Middle East. Tom, an ASU undergraduate student in Barrett, The Honors College, was primarily interested in China and had set his sights on ASU because of its Chinese Language Flagship Program.

As part of a Department of State grant, Tom learned to speak Mandarin and studied abroad in Shanghai for a year. Upon his return, however, Tom's interest in learning about other cultures led him to ASU's Center for the Study of Religion and Conflict.



The center serves as a hub to promote interdisciplinary research and education on the dynamics of religion and conflict, both nationally and globally. It aims to advance knowledge, deepen cross-cultural understanding, and promote a more peaceful world.

Both units are part of ASU's College of Liberal Arts and Sciences.

"Lasting peace requires more than negotiations among leaders," says Linell Cady, director of the Center for the Study of Religion and Conflict. "Researchers working with the center study a wide variety of approaches to promoting peace."

Tom participated in a project called "Finding Allies in the War of Words: Mapping the Diffusion and Influence of Counter-Radical Muslim Discourse." Directed by Mark Woodward, a religious studies professor, the project focuses on Southeast Asia, West Africa and Western Europe to map the role that Muslim social, cultural, religious and political movements play in defeating Islamic extremism. Tom contributed by studying the role that music plays in promoting anti-extremist messages.

He found two basic types of music. Music with a "top-down" approach that has been commissioned by a government or non-government organization is very popular and easy to find. These organizations pay artists to write lyrics with themes that fit their goals.

"A top-down approach is when an organization attempts to spur social change using top-down measures," Tom says. "Essentially trying to change people's attitudes through national policy, large-scale talks or through international organizations and institutions."

The other type of music, known as the grassroots movement, is initiated by individual artists and was more difficult for Tom to find.

"Small organizations and neighborhood communities banding together in an attempt to spur social change" is how Tom describes grassroots movements. Tom says that both types of music express counter-extremist themes, but the top-down lyrics tend to be more direct, whereas grassroots music provides more of a way of thinking than a straightforward message.

One leader of the grassroots approach is Ahmad Dhani, an Indonesian musician and songwriter.

"He was an individual that started independently in efforts to spread the word of peace through his music and gathered followers along the way," Tom says. For example, his song "Laskar Cinta" means "Warriors of Love," and is described as a "musical fatwa against religious hatred and terrorism."

Diana Coleman, a graduate research assistant at the center and Tom's mentor, said that his research was important to developing more knowledge on music in Islam.

"Ethnographic research overseas revealed a number of popular musical movements that were explicitly counter-extremist," Coleman says. "More research was needed on this topic so Bryan provided background research on current debates about the permissibility of music in Islam."

She explains that through his research, he tracked current

trends of expression in Southeast Asia, West Africa and Europe, which included both traditional music and emerging genres like Muslim punk and rap.

"Grassroots music operates as a counter-extremist force in the Southeast Asian setting, and fits into the popular culture dimension of the overall project," says Coleman.

Once Tom's data was collected, the research team created surveys. These were distributed during Woodward's recent travels to Southeast Asia, where he was conducting research for the overall project. The study involves site-based teams living in Europe, Africa and Asia, and includes researchers from a wide variety of disciplines, including anthropologists, religious and Islamic studies scholars, sociologists and political scientists.

"Since 9/11, the question [has been] 'where are the moderate Muslims?' This project is one of the first systematic efforts to answer that question in key regions across the globe," Coleman says.

In addition to focusing on Muslim movements that challenge violent extremism, researchers at the Center for the Study of Religion and Conflict study a variety of topics including international affairs; politics and gender; religion and generosity; and religion, science and the challenges of transhumanism. Both graduate and undergraduate students conduct research with faculty.

The center also sponsors an Undergraduate Research Fellows Program in which students have the opportunity to take a special seminar with the center's director. The seminar includes students whose interests range from Arabic studies to economics to political science to humanities. The program also provides internship opportunities for students to work with faculty on their research projects.

Undergraduate students receive extensive mentorship and build relationships with both graduate students and professors. Tom says the center is like a small family and everyone continues to remain close even after the fellowship is over.

"I've stayed in touch with quite a few of the people from the research program and have that connection base now," he says. "The center's fellowship program really helped provide the framework for my research methodologies and I am extremely grateful for the opportunities it provided me."

Coleman praised Tom for his personal enthusiasm towards his research and his colleagues.

"Bryan Tom delved into the research for the Allies project with the same enthusiasm he brought to working on micro-loans, feeding the homeless, driving to Tucson for a younger sibling's birthday or sporting event and interning at the Arizona legislature," Coleman says. "Bryan is steeped in life, all around!"

Tom has held internships with the U.S. Department of State and USAID, working in economics. He also has had a Boren National Security Education Program (NSEP) scholarship, participated in ASU's Spirit of Service Scholar Program and was an International Leadership Foundation Fellow in Washington, D.C. This summer he interned with the investment firm Goldman Sachs to learn more about how banks operate, implement and manage microlending programs and finance projects. Tom will graduate in December 2012 with a major in economics and minors in Mandarin and mathematics. Ultimately, he hopes to pursue a career in foreign relations. He says his dream is to work for the United Nations within their economic and social policy division or to become a foreign policy advisor in Asia.

When he came to ASU, Tom didn't think the study of religion would be a big facet of his undergraduate education. He says his work with the Center for the Study of Religion and Conflict opened his eyes to issues he had never thought about before.

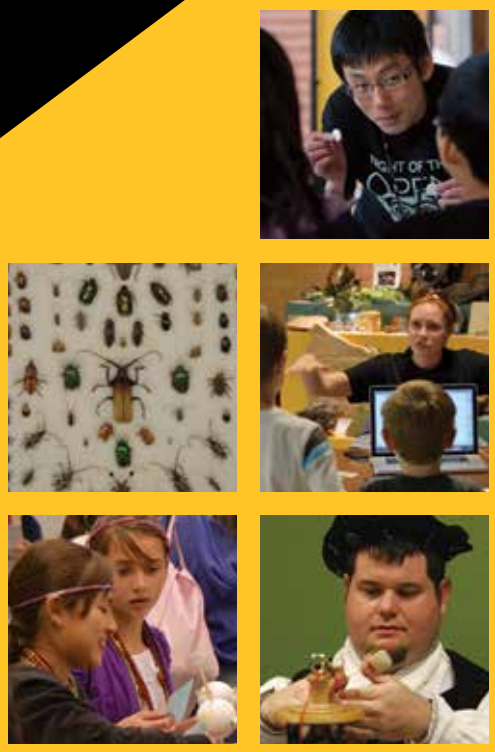
"It's amazing how much you have to take culture into context when shaping economic policy. The terms of agreements change based on people's religious backgrounds. A lot of this comes from the moral values they grew up with," he says. ▼

Nathan Tyson, a history major and aspiring pilot, became the first officer commissioned by the Navy ROTC program at Arizona State University. As part of the ceremony, his brother Corporal Brenton Tyson placed the "cover" (officer's hat) on his head, a symbol of the transition from midshipman to 2nd Lieutenant.

Photo: Tom Story

NIGHT OF THE OPEN DOOR

Saturday, March 2, 2013



The **Night of the Open Door** is a signature event of the **Arizona SciTech Festival** and offers a window into the creative energy that powers a world-class university. Hundreds of ASU student volunteers, faculty and staff come out to host more than 135 interactive and exciting exhibits and events. Teenagers, children, parents, neighbors, alumni and entrepreneurs can visit laboratories, living collections, museums; meet ASU students and experts; and share in artistic performances, culture, languages, lectures, and hands-on activities.

You and your family are invited to join us on **March 2, 2013** for our second annual ASU Night of the Open Door. Step out, explore and celebrate Arizona's and ASU's leadership in science, technology, innovation and creative enterprise!

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