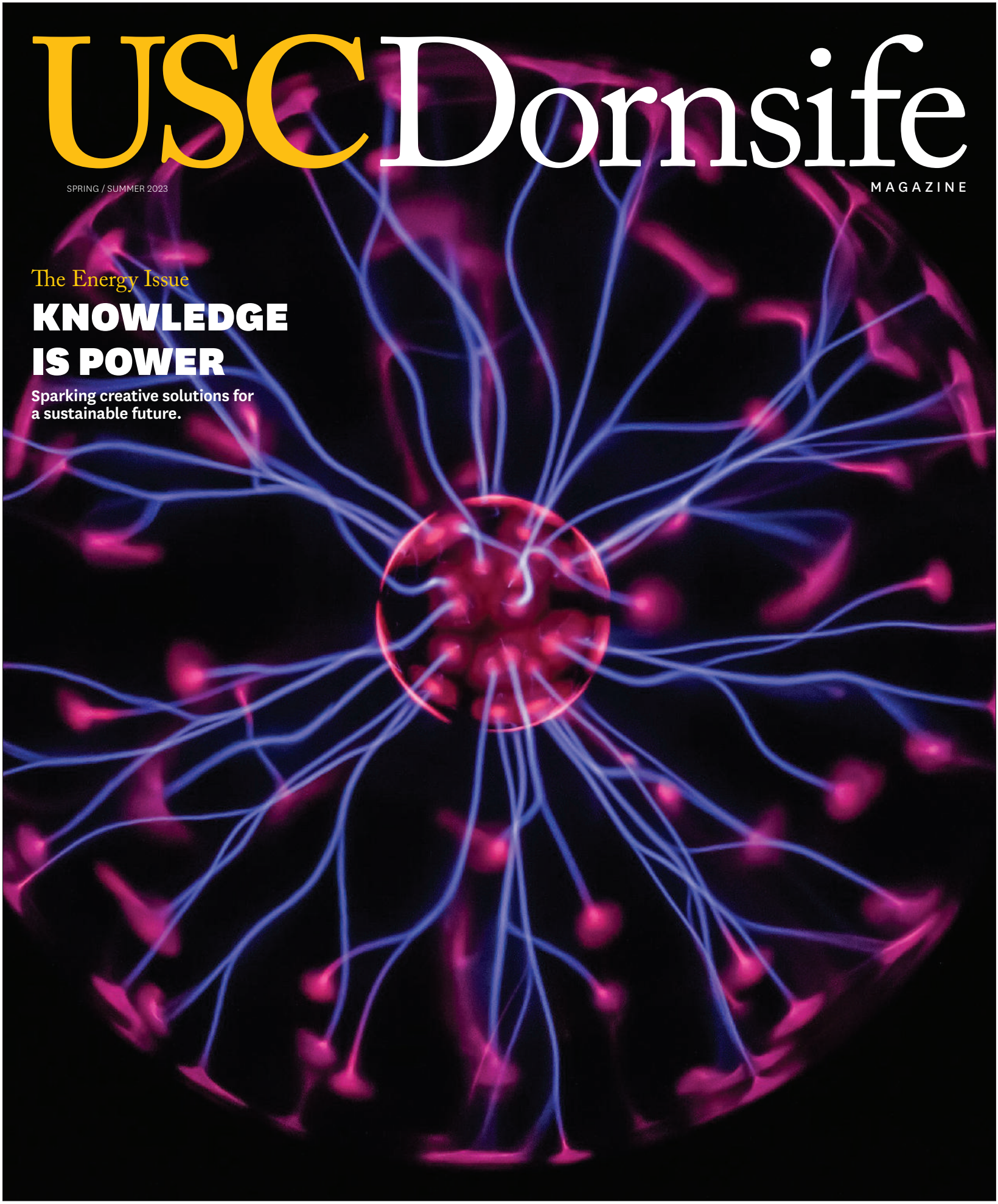
FOR ALUMNI AND FRIENDS OF USC DANA AND DAVID DORNSIFE COLLEGE OF LETTERS, ARTS AND SCIENCES

USC Dornsife MAGAZINE

SPRING / SUMMER 2023



The Energy Issue

KNOWLEDGE IS POWER

Sparking creative solutions for a sustainable future.



MESSAGE FROM
THE DEAN

Powering Discovery

Transitioning society to clean, renewable energy is arguably the most important challenge of the 21st century — a challenge that we, as a global community, simply must get right.

Scientific and technological solutions will drive the coming energy revolution, and the majority of these innovations are underpinned by discoveries traceable to university research. USC has played and will continue to play an important role in both the foundational research and the resulting technological solutions that are changing the game today. And our researchers are hard at work doing more. But we as a society cannot afford to wait for scientists and engineers to do all the work.

Technology exists already to make enormous progress toward the transition to renewable energy. The challenge of implementing these solutions at scale is not a question of science, but of economics, politics and human motivation. So, at USC Dornsife we are not only supporting our natural scientists, we are also investing in research that will help us to close the gap between technological innovation and widespread adoption of sustainable energy. Environmental economists, behavioral and political scientists and others will be key players in this transition, and we at USC Dornsife are very actively working toward helping them have more impact.

This 2023 issue of *USC Dornsife Magazine* will introduce you to a wide range of creative scholarship related to energy — not only as a source of power, but in all the various ways that our scholars think about this theme. You will read how our experts explore the sun's role as a source of renewable energy. You'll read about a microorganism's unique "electrical dance," which might one day be leveraged as biofuel. And our scholars in the humanities guide us through some of the ways that different cultures perceive energy in contributing to well-being. The tremendous creativity and innovation illustrated in these pages give me hope for our future. I hope that they will inspire you and brighten your day as well.

AMBER D. MILLER
Dean, USC Dornsife College of Letters, Arts and Sciences
Anna H. Bing Dean's Chair

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EDITOR-IN-CHIEF
Susan Bell

ART DIRECTOR / PRODUCTION MANAGER
Letty Avila

SENIOR ASSOCIATE DEAN FOR COMMUNICATION AND MARKETING
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Margaret Crable
Darrin S. Joy
Ileana Wachtel

MULTIMEDIA NEWS DIRECTOR
Katie Kim Scott

VIDEOGRAPHER AND PHOTOGRAPHER
Mike Glier

SENIOR WEB SPECIALIST
Michael Liu

AUDIENCE ENGAGEMENT EDITOR
Christelle Snow

ADMINISTRATIVE ASSISTANT
Crisann Smith

CONTRIBUTORS
Emma Ashley, Annie Bang, Jill Darling, Maddy Davis, Jeffrey Fields, Annie Ho, Stephen Koenig, Rachel B. Levin, Meredith McGroarty, Vanessa Roveto, Isobel Smith

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COVER STORY

Sparking Creative Solutions

Energy. It's the fork of silver lightning slicing through a stormy sky. It's a thundering waterfall, the warming rays of the sun, a crackling log fire. It's a tiny seedling pushing through damp earth toward the sunlight. It's the rippling muscles of a tiger chasing its prey, a dolphin arching out of the waves, an eagle wheeling high in the sky.

It's what we humans expend, mentally and physically, as we learn, work, exercise and play — juggling life's myriad demands. We are made of energy; it flows through us and around us. We need it to stay alive and to fuel the demands of our complex world — to keep us warm, to keep us cool, to transport us, to power our lives.

As we face the challenges of climate change, the energy choices we make now have never been more crucial. In this issue of *USC Dornsife Magazine*, we look at energy through the diverse lenses of our scholars' research — from finding nature-inspired solutions to meet our future energy needs to weighing the pros and cons of nuclear power. We report how ancient technology is shaping advances in cooling technology, we explore natural and esoteric energy, and we delve into the unique demands of our own "body electric."

In this issue, we aim to help you discover how USC Dornsife sparks the intellectual and creative energy to forge new connections and find innovative solutions to create a brighter future. As Aristotle astutely observed more than 2,300 years ago, "The energy of the mind is the essence of life." We hope that reading this issue leaves you feeling energized to make truly thoughtful choices when it comes to powering your own life. —*S.B.*

HELP SHAPE THE FUTURE OF *USC DORNSIFE MAGAZINE*
We are excited to announce that your alumni magazine is about to experience a redesign. We would love to get your input. Tell us what you think by participating in our readership survey by Aug. 31. You may then choose to enter a random drawing for a $250 USC Bookstores gift card or two tickets to the Nov. 4 USC Dornsife Homecoming Picnic, plus two tickets to the game. See page 46 for details.



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Contents

SPRING / SUMMER 2023

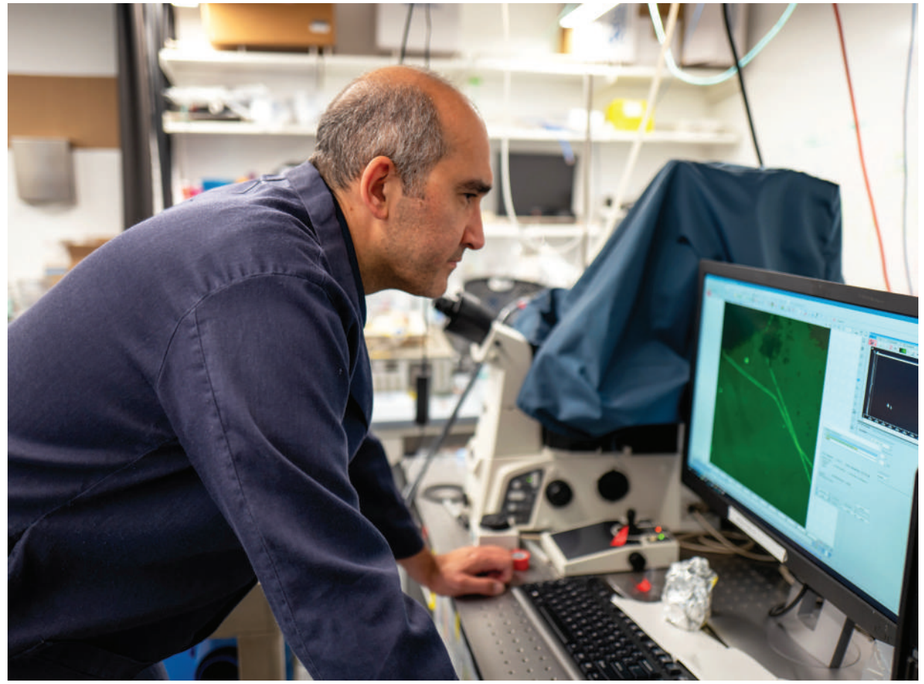


PHOTO BY KOLE GREENE

Divisional Dean of Physical Sciences and Mathematics Moh El-Naggar studies "electric bacteria" in order to harness their power to build new, renewable energy technologies. Read about his groundbreaking research on page 15.

THE ENERGY ISSUE

14 The Power of Nature
Relying on fossil fuels to power our industrialized world has had devastating consequences. To release us from this Faustian bargain, USC Dornsife scientists are letting nature be their guide. *By Margaret Crable*

20 The Body Electric
Choosing what provides us with optimal energy — from the food we eat to the company we keep — can infuse our lives with vitality. *By Rachel B. Levin*

24 Here Comes the Sun
Lessons from the stars: studying solar activity to create a safer future on Earth. *By Susan Bell*

28 Staying Cool
As the planet warms, the most promising solutions to sustainably cooling the air involve harnessing cutting-edge technology — and learning from ancient cultures. *By Rachel B. Levin*

32 The Nuclear Debate
Proponents argue that nuclear power is a solution for a cleaner future. Critics consider it to be dangerous, unsustainable and a distraction from speeding up the switch to renewables. Who is right? *By Ileana Wachtel*

38 The Human Factor
Individual attitudes toward renewable energy and climate change are based on myriad psychological factors that range from the straightforward to the obscure. So, what motivates us to make positive changes? *By Meredith McGroarty*

1 MESSAGE FROM THE DEAN

4 FROM THE HEART OF USC
$50M Sherwin Gift supports USC's environmental initiatives; Trojans mentoring Trojans; Low COVID-19 vaccination rates among kids; New convergent science virtual cancer center; Scholars advise on the healthiest diet.

7 Curriculum

8 Profile

10 Academy in the Public Square

12 Our World

40 Legacy

41 DORNSIFE FAMILY
James Van Cleve and Remo Rohs honored for exceptional scholarship; Dornsife's literary family gather to award Chowdhury Prize.

41 Faculty News

42 Creative Writing Contest

44 IN THE PUBLIC SQUARE
USC Dornsife scholars in the news.

45 Remembering

46 Magazine Redesign

47 SURVEY
Help shape the future of *USC Dornsife Magazine*: Tell us what you think.

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$50M Sherwin Gift Unites Disciplines for Ecosystem Conservation

Landmark commitment from USC Dornsife alumnus Ron Sherwin and Leslie Sherwin is the largest to date to support USC's environmental initiatives. *By Jim Key*

At the end of the spring semester, USC Dornsife announced a landmark $50 million gift commitment by Ronald and Leslie Sherwin. When funded, the gift will establish the Ronald and Leslie Sherwin Initiative, which will focus on protecting the environment through research, education and practice. It's the largest single commitment to date to support USC's environmental initiatives, a top priority for President Carol L. Folt.

"We're grateful to Ron and Leslie Sherwin for their commitment to environmental sustainability efforts at USC," Folt said. "Our Assignment: Earth initiatives are having tangible results, including eliminating single-use plastic bottles and moving 25% of our electricity to renewable energy sources. This transformative gift ensures USC Dornsife will attract innovative leaders dedicated to creating a sustainable future."

Ron and Leslie Sherwin, native Angelenos, are nature lovers who believe in the promise of research across academic disciplines to help protect the planet. Their previous gifts to USC Dornsife include a $1 million student research support fund.

"What's important to me is that this gift will promote interdisciplinary research tied to environmental issues," said Ron Sherwin, president of Sherwin Inc. "It's going to take many academic disciplines working together to help protect our environment, including psychology, spatial sciences, political science … even philosophy. So, giving to USC Dornsife, which includes all of those as well as the Wrigley Institute for Environment and Sustainability, just makes sense."

When fully funded, the Sherwin Initiative will be the second largest gift to USC Dornsife after the naming gift from Dana and David Dornsife in 2011. It will fund 10 USC Dornsife faculty chairs focused on ecosystem conservation, half of whom will have research expertise related to ecosystem diversity and species preservation, including everything from coral reef restoration to the development of alternative fuels. The other half will have expertise in the many human factors associated with environmental protection, including environmental economics, behavorial science and political science.

This initiative will also fund research, educational programs, graduate fellowships, conferences and related activities.

"This generous gift will have a profound and lasting impact on USC Dornsife's ability to address the critical challenges of climate change and biodiversity loss," said USC Dornsife Dean Amber D. Miller. "By supporting endowed faculty chairs, research, and educational programming, the Sherwin Initiative will not only establish Dornsife as a leader in ecosystem conservation, but also inspire the next generation of environmental champions who will shape a sustainable future for our planet."



PHOTO BY MICHAEL BLUM

USC Dornsife, home to USC's renowned Environmental Studies Program, has long-standing strengths in materials chemistry, biophysics and microbiology with researchers who are at the cutting edge of developing renewable sources of energy. It's also home to the Wrigley Institute for Environment and Sustainability and its marine science center on Catalina Island. Nestled in a pristine natural environment yet connected to one of the world's largest and busiest urban areas, it's a coastal campus that is ideal for testing sustainable solutions and renowned for its environmental research. Wrigley Institute scholars are working on research ranging from solutions for plastic waste to saving pollinators.

Additionally, because the future of the planet depends not just on innovation but on the choices that humans make, Dean Miller launched USC Dornsife's Human Factors Initiative five years ago. Experts in economics, politics and human behavior collaborate with scholars of history, culture, writing and more to learn how society can implement available technology more quickly, equitably and at scale. Together with USC Dornsife's Center for the Political Future and Public Exchange, they're also learning how to overcome mindsets that inhibit environmental progress.

The Sherwin Initiative will not only add significant faculty expertise to USC Dornsife's environmental conservation efforts, it will also provide meaningful support for research and student programming — all of which are particularly important to Leslie Sherwin, who serves on the board of directors of the Shelter Art Foundation.

"I want to see some positive science and research come out of this donation," she said. "I want to see people get excited about the changes we can make to improve the environment and avoid climate catastrophes."

Ron Sherwin, a third-generation USC Trojan, earned a master's and PhD from USC Dornsife in international relations. "It will take more than money for these initiatives to be successful and self-perpetuating," he said. "But we're confident the USC Dornsife faculty, staff and students have what it takes."

The Sherwins' personal connection to the environment and to USC also plays a role in their decision to give. "While in high school, I spent a lot of time surfing, sailing and playing beach volleyball," Ron Sherwin said. "So, preserving and restoring nature is very personal for me. I'm glad society has largely awakened to the fact that we need to take big action to protect our environment. We hope our gift will inspire others to say, 'Hey, I want to make a difference, too!'"

The gift is personally meaningful in other ways. "When I wanted to go to grad school, USC helped me with financial aid," Ron Sherwin said. "I'm happy to be able to give back now."

IMAGE SOURCE: ISTOCK

Trojans Mentoring Trojans

A network of alumni is helping prepare USC Dornsife students for stellar careers.



If you're a cognitive science major but want to go into the entertainment industry, how do you get your foot in the door?

For junior Lauren Liang, the answer to this question came through the new Alumni Mentoring Program offered by USC Dornsife's Career Pathways in partnership with USC Dornsife Alumni Relations. The mentoring program matches each participating student with an alumna or alumnus working in an industry the student shows interest in.

Liang was paired with alumna Donegal "Donee" Chin, a 2019 psychology graduate, who is an agent trainee in the brand endorsements department of WME, a leading talent agency. Chin provided Liang with career advice and suggested entry points to the industry, and coached her on interview skills.

As Asian American women who both grew up in Southern California and chose majors in similar fields, Liang and Chin also found a lot of common ground beyond their career aspirations.

It's exactly the sort of match the founders of the program were hoping for when they launched a small pilot group of pairings for economics students in 2020. The program expanded to the entire College at the start of the fall 2022 semester. Currently about 100 pairs of students and alumni participate.

Laury DeSanctis manages the mentorship program and processes student applications, hunting for just the right mentor. "Sometimes I'm able to find someone working at the exact company a student wants to work at. I call those my 'golden matches,'" says DeSanctis.

Each mentee and mentor pair work together for 10 weeks, choosing from a list of suggested activities such as reviewing the student's LinkedIn profile, discussing business etiquette or listening to a podcast together. Mentoring can be in-person or virtual. For example, Chin dials in from New York City.

The program is already producing the results it aims to generate. "One student was interested in advertising. With her mentor's help, she was able to get a coveted internship at BBDO Worldwide, which, if you want to work in advertising, is where you want to go," says DeSanctis. "Her mentor had a connection there, helped her get the resume to the right person and helped get that student ready to present well for the interview."

Victor Wright '88, a judge with the Superior Court of Los Angeles County, mentors philosophy, politics and law major Will Chambers. Wright recently hosted a day in court for Chambers and a number of other students in the program who are interested in law careers.

"I loved seeing the smiles of the students who were able to put on a robe, sit in the judge's chair, hold a gavel and take a picture that might inspire a future career," says Wright. *—M.C.*

Vaccine Fears Leave Kids Exposed

Parents shy away from vaccinating kids against COVID-19, fearing potential long-term risks of the vaccine and personal responsibility.



Despite efforts by the U.S. Centers for Disease Control and Prevention (CDC) and pediatric clinicians to increase the COVID-19 vaccination rate among children, many remain unvaccinated due to parental concerns about the vaccine's long-term effects and anticipated responsibility. Those are findings from a recent study published in *Pediatrics* and conducted by the Center for Economic and Social Research (CESR) at USC Dornsife.

The USC researchers sought to determine the causes of low child vaccination rates. Currently, in the United States, only 39% of children ages 5 to 11 and 68% of those ages 12 to 17 have received vaccinations. Meanwhile, 92% of all adults in the U.S. have been vaccinated.

In late 2021, as the Omicron variant surged, the CDC approved a COVID-19 vaccine for children ages 5 to 11. Nevertheless, in the months that followed, millions of children in the U.S. became infected with COVID-19. Pediatric cases and hospitalizations reached record levels, according to the CDC.

In February and March of 2022, USC Dornsife surveyed parents as part of its nationally representative Understanding America Study. Results revealed that 15% of parents believed the vaccine's long-term risks to their child outweighed the risks of not being vaccinated.

Ying Liu, a research scientist at CESR and the study lead, explains that "parents' hesitancy may be partly driven by apprehension about the vaccine, stemming from its rapid development and the use of newer techniques."

Additionally, 18% of parents said they would feel a heightened sense of responsibility if their child became sick following vaccination.

"People often exhibit a more cautious approach when making medical decisions for others, including their own children, than for themselves," Liu says. "Some tend to do nothing rather than vaccinate their child, even though such inaction could result in negative consequences."

Arie Kapteyn, director of CESR and professor (research) of economics at USC Dornsife, notes that this research underscores the pressing need to address perceptions of the COVID-19 vaccine among parents.

"By doing so, we believe the vaccination rate among 5- to 17-year-olds could be increased to over 50%," he says.

The researchers provided recommendations to pediatricians to increase child vaccination rates, including reassuring parents that side effects from the vaccine are rare and mild, whereas the complications from COVID-19 infection are more common and severe. Further, they emphasized that there is no evidence that or plausible way in which the vaccine could alter a child's genetic makeup. Finally, they stressed the potential and avoidable negative outcomes from lack of action when delaying or forgoing the vaccination. *—I.W.*

A Virtual Center

Scholars from around the country and in diverse fields seek better ways to beat cancer.

Could a virtual cancer center that unites national experts from diverse fields such as physics, molecular biology and the humanities be the key to advancing cancer treatments and cures?

The USC Dornsife scientist who co-leads the new Convergent Science Virtual Cancer Center (CSVCC) is enthusiastic about its potential.

Dean's Professor of Biological Sciences Peter Kuhn, who co-founded the center with Cedars-Sinai Cancer Director Dan Theodorescu and funding from the U.S. Department of Defense, says the CSVCC is enabling the future of science.

The center's first conference last fall allowed CSVCC scholars, members of the convergent science council and program officials to meet at USC to share and develop ideas for tackling cancer.

Participants discussed new collaborative projects, opportunities and challenges in convergent science career development, and adding more scholars to the center.

Other topics discussed included the use of artificial intelligence to study, diagnose and treat cancer, how best to move discoveries from the lab to the clinic, and professional development for researchers.

Why is Kuhn, professor of biological sciences, medicine, biomedical engineering, aerospace and mechanical engineering, and urology, so confident in the power of convergent science? He says many breakthroughs in science stem from chance encounters between scholars with deep and disparate expertise who realize they can work together on a common puzzle. The center, however, doesn't rely on chance; it brings experts together with intention.

"Seeing how after just one year the scholars are already collaborating with one another and confidently talking about each other's science in the larger context, it's clear to me that we're on the right track," he says.

Kuhn and Theodorescu hope to expand the center, adding scholars from around the nation to spark even more collaborative projects. *—D.S.J.*



IMAGE SOURCE: ISTOCK

CORONA: TWO CHILDREN FIGHTING CORONA COURTESY OF SWEDISH ARCHIVE OF CHILDREN'S ART; CANCER CENTER IMAGE SOURCE: WIKIMEDIA COMMONS

Down to Earth

"Geological Sciences 105Lg: Planet Earth" digs into the energetic forces that shape our home.



Jutting at a dramatic angle some 150 feet out of the Earth, Vasquez Rocks in northern Los Angeles County is recognizable for its cameo roles in "Star Trek" films and Westerns. It's also where USC Dornsife's Sylvain Barbot, associate professor of Earth sciences, takes undergraduates to gaze at evidence of the spectacular show our planet put on when landscapes were first formed.

Millions of years ago, an abrupt collision between the North American and Pacific tectonic plates forced massive slabs of rock upwards. Subsequent weathering and erosion cut the rock into the picturesque layers we see today.

The field trip is part of Barbot's course "Planet Earth" (GEOL 105Lg), which explores how our world came to be.

Students start with the Big Bang, an explosion so powerful it dispersed all the energy and matter that forms our universe. Next, they learn about the creation of our solar system and Earth. After that, Barbot walks his students through the geological changes that eventually gave us our familiar topography.

But, he points out, those recognizable landscapes are not set in stone. Barbot also teaches how our planet is now being altered by human activity. Mining is hollowing out ancient mountains, logging is reshaping forests and climate change is hastening sea-level rise.

Earthquakes are also on the syllabus. These exciting geological phenomena are what first drew Barbot to the field. "I developed a keen interest in geology while I completed my undergraduate education in computer science. I was a visiting student at Caltech and I worked in a lab studying earthquakes. I haven't stopped studying them since," he says.

Earthquakes are also a regular reminder that our planet is still evolving. The recent, devastating earthquakes in Syria and Turkey shifted land in some regions a good 10 feet to the east.

Changes can happen close to home, too. Part of the trip to Vasquez Rocks includes a sobering visit to the San Andreas Fault, itself overdue for a major quake. —M.C.

Energy Enthusiast

Nick Burger '02, Washington, D.C.'s, new deputy director of the Energy Administration, spent his childhood in sub-zero temperatures, 140 miles shy of the Arctic Circle. His interest in energy systems was sparked by a USC Dornsife study abroad program in tropical sub-Saharan Africa. Now, he's leading the charge to encourage residents of the nation's captial to adopt sustainable energy to heat and cool their homes and businesses.

By Susan Bell



PHOTO COURTESY OF RAND CORPORATION / DIANE BALDWIN

Nick Burger, Washington, D.C.'s, new deputy director of the Energy Administration at the Department of Energy and Environment, grew up at the end of a dirt road in rural Alaska. Inspired by a youthful sense of adventure, his parents — newly graduated physicians — had moved to The Last Frontier while awaiting a promised posting to the decidedly warmer climes of Nigeria. By the time the posting finally materialized three years later, his parents opted to stay in Alaska with their newborn son.

Burger spent his formative years fishing, skiing and honing his skills as a competitive ice skater. He has only fond memories of his childhood in Fairbanks, the coldest city in the United States, painting a portrait of a town where the icy temperatures were in stark contrast to the warmth of its community.

"It was a terrific place to grow up and a very supportive environment in many ways, even as remote and wild a place as it is," Burger says.

But when it came time to go to college, Burger felt the irresistible lure of the big city. Recalling his youthful motivation to come to USC, he says, "Los Angeles was about as big and different from Fairbanks as you could imagine."

The offer of a coveted Trustee Scholarship sealed the deal. "To be able to go to a very good school and to have it essentially be free was kind of a no-brainer," he says.

It turned out there was more excitement awaiting him on campus: Burger met his wife-to-be, Dawn Alley, during their scholarship interview weekend. Alley graduated from the USC Leonard Davis School of Gerontology in 2002. She earned her PhD in 2007. The couple married the same year and have two children.

At USC, Burger started out as a business major. But after taking the university's celebrated leadership course, taught by USC Leadership Institute founder Warren Bennis and then-USC President Steven Sample, Burger switched to interdisciplinary studies, enabling him to essentially create his own major.

He chose to combine classes in behavioral economics with a graduate course in the occupational therapy program and classes in value analysis in the philosophy department. His thesis, he decided, would explore the value of work.

A DIFFERENT RELATIONSHIP WITH ENERGY

In his junior year, Burger spent six months on a USC Dornsife study abroad program in Ghana, where he became fascinated by two things: systems and energy.

"Shortly after I arrived, I remember looking out over a field. There was a beautiful sunset and all these little, glowing fires. Then I realized that the fires were burning piles of trash."

Rather than finding this off-putting, Burger realized that what he was observing was simply a different system from those he was familiar with.

"Where I grew up, we didn't have trash collection," he recalls. "We put all our trash in a big trailer, and then once a month my dad would drive it down to the dump. Here, in the city, they collect our trash every day. But there was no trash collection for most people in Ghana at that time."

Burger says living in Ghana taught him many valuable lessons about energy, some of them deeply personal. One of the most important: learning to conserve and focus his own energy — first because of the heat and humidity and second because trying to do too many things inevitably meant accomplishing less.

"One of the things I observed in Ghana was how people interacted with energy, what it meant to them and the access they had to it, which was obviously wildly different than what we experience in the United States.

"We visited towns in rural areas that were dark at night because they weren't connected to an electrical grid. Sometimes households had a battery system. Occasionally a small generator would be powering a few shops. Many people used kerosene lanterns to generate light. Such limited access to electricity created a very different way of life."

On his return to USC, Burger set up an independent study course with Krishna Kumar, then a macroeconomist at USC Marshall School of Business, to explore the economics of rural electrification in West Africa.

"That was one of my first true forays into the energy and environment space," Burger says. "That experience in Ghana and that class set me on the path I ended up taking after USC."

After earning a PhD in economics from the University of California, Santa Barbara, Burger wanted to pursue a career that combined environmental economics with international development. He found the perfect fit at RAND Corporation in Washington, D.C., where he spent 14 years focusing on environmental, energy and international research before becoming director of RAND's Washington office for four years.

BUILDING HANDS-ON EXPERIENCE

While at RAND, Burger started volunteering with Habitat for Humanity, a nationwide nonprofit that partners with people on low incomes to build or repair affordable housing they can call home. Burger's first project was the Empowerhouse — Washington's first dwelling built to Passive House standards on energy-efficient design and construction. The house was exhibited on the National Mall as part of the Department of Energy's 2011 Solar Decathlon Project.

Since then, Burger has built six more energy-efficient Passive Houses with Habitat for Humanity. That hands-on experience sparked a passion for energy efficiency and building science and has been seminal in both Burger's personal project to design and build an energy-efficient cabin near his childhood home in Alaska and in his next career move.

> "It's crucial to understand that self-interest is pretty powerful. We can and should rely on it in some cases because we can use it to do good things."

A NEW START

In September 2022, Burger left RAND to move to the Department of Energy and Environment, where he heads up a team of 45 people as deputy director of the Energy Administration.

Burger's team manages the District's Building Energy Performance Standards program, working through regulation and financial assistance to improve the energy consumption, efficiency and performance of larger buildings, including hospitals, schools, office buildings and affordable housing.

Burger's main challenge is ensuring the nation's capital meets its goal of becoming carbon neutral by 2045.

In 2022, Congress allocated $8 billion to support domestic energy efficiency, of which some $60 million will go to Washington. Burger's agency will work with households to provide financial support to swap out gas appliances for new, more efficient electric appliances, while also improving the energy efficiency of homes through better insulation.

The major challenge he faces is how to convince people to switch.

"We do have to educate people," Burger says. "And the most important group for us to educate — not just about technology but also about mindset and acceptance — is our contracting community. Because what contractors recommend to homeowners is going to be critical."

Burger also needs to convince homeowners to be more accepting of these technologies — something he hopes to do by partnering with community influencers.

ENLIGHTENED SELF-INTEREST?

Burger is realistic about what it takes to convince people to switch to greener energy.

"We have to recognize that the effects of climate change may not be what most households are thinking about on a day-to-day basis. So, partly it's about using the right words when we talk about climate change. But I think partly, honestly, it's *not* talking about climate change."

In communicating with households, Burger says his department avoids leading with, "You want these systems because it's going to help the climate." Instead, they tell homeowners, "You want these systems because we've made them free. They perform better than what you have. They make your house healthier and more comfortable."

Burger traces the understanding that self-interest can be a greater motivator than altruistic concerns about climate change back to the behavioral economics course he took at USC Dornsife, more than two decades ago.

"It's crucial to understand that self-interest is pretty powerful. We can and should rely on it in some cases because we can use it to do good things," he says. "We should also be cautious about assuming what other people view as in their self-interest because it might not be true.

"And it might not be the best way to start that conversation."

How Scholars Conduct Time-Sensitive Research at Warp Speed

USC Dornsife's Understanding America Study enables scholars to rapidly take the pulse of the nation.

From the earliest days of the COVID-19 pandemic, one tool proved particularly useful for researchers to quickly gather and synthesize nationally representative data: the Understanding America Study (UAS).

Created and managed by the USC Dornsife Center for Economic and Social Research (CESR), the UAS enabled scholars to examine how the crisis was affecting nearly every facet of life, including youth mental health, children's education and small businesses.

"By the end of March 2020, we were already surveying parents about their children's educational experience," says Anna Saavedra, a behavioral scientist at CESR. Findings from this and subsequent surveys were reported under the banner of the Understanding Coronavirus in America study and were cited frequently by national news media and policymakers.

A REPRESENTATIVE SAMPLE

A highly prized tool for scholars, "The UAS is available to any researcher interested in studying English- or Spanish-speaking adults in the United States," says USC Dornsife's Arie Kapteyn, professor (research) of economics and founder and director of CESR, which celebrated its 10th anniversary on March 15.

The panel of participants currently totals more than 10,000 adults who live in randomly selected households across the U.S., offering researchers a representative sample. "We provide statistical adjustments as needed to align the sample with the country's population in terms of gender, race and ethnicity, education, age and geographic region," says Kapteyn.

A FLEXIBLE RESOURCE

The UAS panel was also designed to be flexible to allow for the rapid development and dissemination of new survey questions and topics, says Marco Angrisani, assistant professor (research) of economics and one of the original developers of the UAS. Over the years, the developers have made the study compatible with new technologies such as apps, Fitbits and air quality monitors, which allow data to be gathered quickly and in new ways.

"We aim to make the surveys kind of fun and easy to complete, enabling people to respond at their own pace — things that are really different from what national studies have historically done," Angrisani says.

Kapteyn says the strategy has worked. "Response rates are usually between 70% and 75%," he says, depending primarily on the topic, time of year and survey length.

PROVIDING "WARP-SPEED" STUDIES

During the COVID-19 pandemic, the UAS was in particularly high demand among scholars who wanted to gather their own data or use its near real-time tracking survey data.



Felix Kabo, formerly a researcher at the University of Michigan, Ann Arbor, and now the research director at CannonDesign, helped design a UAS survey on how pandemic-related government aid was distributed to Black-owned versus non-Black-owned businesses.

The ease of use of the UAS enabled his team to design, code and distribute the survey in about 10 weeks.

"This may not sound so quick," Kabo says, "but it's like warp speed in study years."

MAKING A DIFFERENCE

Because UAS data is publicly available, it's often used, studied and cited by researchers, government officials, private businesses and others.

The UAS continues tracking the pandemic's potentially lasting effects on mental health and learning as well as the impact of interventions to address related issues, by taking measurements quarterly.

Angrisani notes that one of the core strengths of the UAS is how accessible it is to diverse users. "Being able to connect with different spheres ... enables the survey to make a difference in the larger world beyond academia." —*M.M.*

Learn more at:
cesr.usc.edu

10 YEARS USC Dornsife *Center for Economic and Social Research*

ACADEMY IN THE PUBLIC SQUARE AND HEALTHIEST DIET IMAGE SOURCE: ISTOCK

What Is the Healthiest Diet?

Scholars explain which foods we should be eating to live a longer and healthier life.



Sifting through nutritional recommendations has become increasingly complicated and can often be confusing. At a Dornsife Dialogues event hosted by USC Dornsife, USC experts on healthy behavior, diet and aging discussed the best way to eat for optimal health. They also set the record straight about diet myths and misinformation.

Why is diet so important? A healthy diet reduces inflammation in the body, says Maryann Pentz, a behavioral health specialist. Poor diets contribute to inflammatory processes that can lead to conditions such as diabetes, heart disease, Crohn's disease and other autoimmune disorders, and certain cancers.

Diet also affects mental health. "We get a better sense of well-being overall if we're eating right, and that's true for adults, adolescents and children," says Pentz, professor of population and public health sciences at Keck School of Medicine of USC.

So, what is the healthiest diet? A recent analysis of diets around the world found that people who live the longest generally follow a mostly vegetarian or pescatarian (seafood) diet that is high in legumes, whole grains and healthy fats like nuts and olive oil and low on consumption of red meat.

While low-carb, high-protein diets have seen rising popularity, if you want to live a long life, they're best avoided, says biogerontologist Valter Longo. "I've gone everywhere in the world and met centenarians," he says. "I've never met one that said, 'I have a low-carb diet.'"

The good news is that it's never too late to adopt a healthier diet. No matter what age you begin, you can add years to your lifespan by switching from the standard Western diet to this "longevity diet," notes Longo, professor of gerontology and biological sciences at the USC Leonard Davis School of Gerontology.

"Even if you start at 80, [you can add] three to four years of life expectancy," he says.

The USC experts also discussed the benefits of fasting. Research indicates that following a low-calorie regimen called the "fasting-mimicking diet" can reduce risks of major diseases and even potentially reverse diabetes.

And you don't have to punish yourself to achieve benefits. Longo says that just two, five-day, low-calorie fasts a year can improve your health.

So how can we change behavior? Starting young is obviously ideal, but while instilling healthy eating habits in children is important, it can be challenging. Pentz has some suggestions. Instead of offering snacks such as chips or candy, reach for fruits with high water content, like oranges. Try to adjust favorite foods rather than ditching them. If a child enjoys hamburgers, for instance, swap out the beef patty for a fish patty instead. Introduce vegetables in small amounts, for example by adding a little spinach to scrambled eggs.

A last piece of advice: Watch your water. Hydration is important, but too many carbonated beverages (even sugar-free ones) can erode teeth enamel. Pentz says stick to a can or two of sparkling water a day and drink mostly flat water. —*M.C.*

Scan the QR code to watch this Dornsife Dialogues event. To watch past events, visit dornsifedialogues.usc.edu.

Listen to the podcast version and subscribe using your app of choice.

Our World

USC's Capital Campus

Serving as a coast-to-coast bridge for interdisciplinary study, the Washington, D.C., campus will enable students and faculty to collaborate with global opinion leaders.







CAPITAL CAMPUS
1771 N St NW
Washington,
DC 20036





USC's new Capital Campus in Washington, D.C., which opened in March, will significantly increase the university's reach by expanding its deep academic and research expertise, innovation and talent on the East Coast.

Announcing the opening of the new campus, USC President Carol L. Folt said, "Washington, D.C., is the natural place for us to establish a thriving hub. It is a nexus for the arts, public policy organizations, research agencies and foundations. Washington, D.C., offers unparalleled opportunities for our experts, researchers and students to learn and listen, connect, and share views on the national stage."

Located in the heart of the Dupont Circle neighborhood, the USC Capital Campus places the university at the center of political and academic policy discussions and creates a bridge to embassies and diplomatic missions. The prime location strengthens the opportunity for interdisciplinary researchers, policy experts, faculty and students to work in even closer collaboration with leading government and research institutions.

The campus will give USC a strong bicoastal presence and provide students with a space to pursue new undergraduate and graduate programs in the sciences, arts, political science, education, communication, and journalism, among other disciplines.

Occupying a 60,000-square-foot building, the campus will also be a vibrant center for the many active Trojan alumni who live and work in the region, offering them a tangible connection with their alma mater on the other side of the continent. As USC's East Coast anchor, the campus provides state-of-the-art office space, multiple event venues and an outdoor terrace offering panoramic views of the city skyline.

USC has maintained a thriving presence in Washington for decades — and not just through the countless Trojan alumni who work at all levels of government, science, the military and the media in the capital.

The university will build upon the strong foundation created by programs such as the USC Dornsife Washington D.C. Program that sends students to study and work in the nation's capital for a semester, enabling them to complete internships with government agencies, NGOs, advocacy groups, think tanks, consulting firms and congressional offices. *—USC News Staff*

CAPITAL CAMPUS PHOTO COURTESY OF NEW MEDIA SYSTEMS; TROJAN MARCHING BAND PHOTO BY BRETT PADDLEFORD; STUDENT PHOTOS COURTESY OF ELIZABETH CHEN AND JEFFREY FIELDS; CAPITOL PHOTO IMAGE SOURCE: ISTOCK; ILLUSTRATION BY SARVANI KOLACHANA





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Dornsife D.C. Program

Jeffrey Fields, director of the Dornsife Washington D.C. Program, outlines this semester's activities.



Jeffrey Fields, associate professor of the practice of international relations

The USC Dornsife Washington D.C. Program provides students with a semester-long experience to work and study in the nation's capital. Students come to Washington for the spring semester, take a full slate of courses and complete an internship at one of the capital's many agencies, companies, and government or non-government institutions. In addition, the program offers a plethora of co-curricular and social activities. This year — to name just a few of our adventures in Washington — we bowled at the White House, visited CIA headquarters and took a boat cruise on the Potomac River to Mount Vernon. Dean Amber D. Miller attended and spoke at our annual spring reception in March.

The semester brought additional excitement with the opening of USC's new Capital Campus.

On the morning of the grand opening, students had an hour-long meeting with USC President Carol L. Folt during which she outlined her vision for the campus. The students then served as roving ambassadors for the USC Dornsife Washington D.C. Program during the ribbon cutting ceremony. The Capital Campus will be a USC-owned hub for almost all the program's activities. It will provide our own space for holding classes and hosting guest speakers and panel presentations, and serve as a space for networking and public affairs events. Students now also have a beautiful place to study and socialize beyond their apartments. With the new home, our first initiative will be to expand the program to include a robust series of summer activities for USC students interning in the nation's capital. *—J.F.*

A Student Perspective

I am a junior majoring in international relations at USC Dornsife. Here is what made my experience in Washington, D.C, this spring so unique. *By Isobel Smith*





International student Isobel Smith hails from New Zealand.

The USC Dornsife Washington D.C. Program is unlike any other semester-away opportunity. If a semester in the nation's capital participating in an internship of your choice isn't enticing enough, the program offers world-class professors and the opportunity to meet members of Congress, CEOs and thought leaders. As a junior studying international relations at USC Dornsife, with a news media and society minor at USC Annenberg School for Communication and Journalism, I affirmed and enhanced my academic focus during my time in Washington.

Gaining access to usually inaccessible people and organizations is a staple of the program. Guest speakers, events and visits to the State Department, the Pentagon and the CIA bring learning and networking opportunities. This program teaches you how to capitalize on the renowned Trojan network — which often leads to mentors and job opportunities.

A tight-knit cohort in small discussion-based classes makes for an optimized learning environment and long-lasting friendships. The program differs from a typical semester at USC as it's more focused, both academically and professionally.

As an example, our final day this term was action-packed, beginning with a tour of the Pentagon, then meeting the under secretary of defense for research and engineering and deputy press secretary Sabrina Singh '09, who graduated with a degree in international relations. Next we made our way to Capitol Hill for meetings with Senators Michael Bennet and Ted Cruz and numerous members of the House of Representatives as a part of our "How Washington Really Works" class. This program embodies bipartisanship and civil discourse, which can seem rare these days. Other highlights include debating West Point students on the House floor, the annual spring reception and the opening of the USC Capital Campus.

The new campus will make the "USC in D.C." opportunity available to more students across USC's many schools. With this investment, the capital feels closer to our Los Angeles campus than ever before.

Everyone I know who has come through this program will tell you it changed their lives. Whether it affected their career aspirations, landed them a job or taught them how to balance work and school, the program leaves a lasting impression.

I can attest to the transformative power of the USC Dornsife D.C. program, and I highly recommend it to any student looking for a unique and meaningful experience.



The Power of Nature

Relying on fossil fuels to power our industrialized world has had devastating consequences. To release us from this Faustian bargain, USC Dornsife scientists are letting nature be their guide.

By Margaret Crable

Formed from the ancient remains of plants that lived and died millions of years ago, fossil fuels once seemed like supremely promising, benign gifts bestowed upon us by nature for our progress and prosperity.

Scientific ingenuity developed raw oil and coal into fuels for powerful engines that helped spur the greatest improvements in human living standards. More than that, they supercharged economies, transformed cities into bristling forests of skyscrapers, extended lifespans and landed men on the moon. They also came with a heavy cost.

These same fuels have polluted the atmosphere, contaminated ecosystems and poisoned our lungs. The emissions we create by burning them are on track to warm our planet to a perilous degree — unless we quickly change course.

Fortunately, nature offers potentially limitless alternatives to fossil fuels. Our sun beams down more energy in an hour than humanity uses in an entire year. And the soil beneath our feet is rich with tiny bacteria, silently conducting an electrical dance that dates back more than 3 billion years.

As scientists turn once again to the natural world for solutions to our energy needs, they are also taking precautions to avoid recreating a relationship as fraught as our centuries-old dependence on fossil fuels.

"We want to create a new paradigm, but not one that's just as bad as the old one," says Stephen Bradforth, senior advisor to the dean for research strategy and development and professor of chemistry. He is one of many researchers at USC Dornsife who are looking to nature to inspire scientific solutions and to provide green, reliable energy to meet our global needs.

BACTERIA'S ELECTRIC SLIDE

In Moh El-Naggar's lab, looking to nature requires a powerful microscope.

El-Naggar, divisional dean of physical sciences and mathematics, is exploring the curious qualities of a power-generating bacteria. As part of their metabolism, *Shewanella oneidensis* move electrons from the inside of their cells to surfaces outside their cells.

Building on the research of Professor Emeritus of Earth Sciences Kenneth Nealson, who first discovered these "electric bacteria" in the 1980s, El-Naggar says it's possible to "wire-up" these bacteria to metal or semiconductor technologies to extract renewable energy, make biofuels or build new bioelectronics.

For instance, the bacteria could potentially be deployed in wastewater treatment plants where they would dine on what's been flushed down the drain while providing the energy necessary to power the plant.

"In the United States, more than 5% of the energy from our electrical grid is used just to treat our waste," says El-Naggar, Dean's Professor of Physics and Astronomy and professor of physics and chemistry. "Technology that can treat waste while also generating its own electricity would obviously be a very welcome development."

El-Naggar is hopeful his research will one day lead to "living electronics": small devices, such as phones or lamps, powered exclusively by bacteria.

HOW DO YOU HOLD A SUNBEAM IN YOUR HAND?

Of course, bacteria are not nature's only energy offering. The sun pumps out an astonishing 173,000 terawatts of power continuously — more than 10,000 times the world's energy needs.

Solar panels enable us to capture some of this energy bonanza, but the silicon used to fabricate them is not a very efficient material, says Richard Brutchey, professor of chemistry. Its popularity, he notes, was driven largely by advances in low-cost production by China, which now dominates the solar panel market.

"We want to create a new paradigm, but not one that's just as bad as the old one."

Game-changing new solar cell materials absorb light much more effectively than silicon, but these innovations use rare elements like indium and tellurium.

After digging through the rock catalog at the Natural History Museum of Los Angeles, near USC's University Park campus, in search of a better alternative to conduct solar energy, Brutchey discovered a potential candidate: bournonite. Named after the French mineralogist Jacques-Louis, Comte de Bournon, this stable, black mineral is made of abundant elements, absorbs light well and can be printed into a thin film for solar panels.

THERE'S JUST ONE DRAWBACK

"It's really promising, but it contains lead," says Brutchey. "We're investigating the possibility of substituting a non-toxic element for bournonite's lead content."

Brutchey isn't the only USC Dornsife faculty member working on better, thinner solar energy technology. Visit Barry Thompson, professor of chemistry, in his office and he will unfurl a roll of thin plastic coated with a dark pattern of thin stripes. Each stripe is composed of organic molecules that can generate electricity from sunlight.

Because solar cells made of silicon require a lot of the material, they are bulky and rigid. The molecules in Thompson's organic solar cells could be inserted into materials flexible enough to bend, fold and even stretch. Plus, they are cheap to produce. With this sort of technology, Thompson thinks we could someday "print" solar panels. Long sheets of the molecules could be plastered over the exteriors of skyscrapers to generate energy for air conditioning, computers and water coolers.

And while we're at it, why not do the windows as well?

Mark Thompson, Ray R. Irani, Chairman of Occidental Petroleum Corporation, Chair in Chemistry, is currently working on an exceptionally thin solar film that could cover windows and capture some 8% to 10% of the energy provided by sunlight falling on the building.

Thankfully, there is no need to worry that his idea would transform offices into inhospitable caves. The solar film does not affect the transparency of the glass. It also won't dramatically boost costs, says Mark Thompson, professor of chemistry and chemical engineering and materials science. Coating glass with solar film would only slightly raise the cost of window production, and the increase would be offset by savings on energy bills.

This innovation could be a boon for cities like Los Angeles, which is aiming for all newly constructed buildings to be carbon-neutral by 2030. Rooftop solar panels won't be enough to achieve that.

"When you get to buildings over two stories, there isn't enough roof space for the panels necessary to generate the building's energy needs. You have to add solar panels somewhere else," says Mark Thompson. Adding his thin solar film to windows, and perhaps Barry Thompson's printed solar sheets to building exteriors, could be just the trick to meet the city's ambitious goals.

SUNSHINE ON A CLOUDY DAY

Though the sun is a powerful generator, its energy can be partially — or even totally — inaccessible, depending on location, season and time of day. To entirely replace fossil fuels with sunshine, we need to solve our storage problem.

Lithium-ion batteries provide decent solar storage at small levels, but scaling up has been a major challenge. Once these batteries become large enough to contain the amount of solar energy necessary to power our industrial world, they will require complex, costly systems to avoid bursting into flames.

Plus, lithium-ion batteries use pricey metals such as nickel that (you guessed it) come from destructive mining in only a few locations on the planet. Our growing dependency on them could trigger similar geopolitical conflicts to those sparked by oil.

Scientists at USC Dornsife are devising better options. G. K. Surya Prakash, George A. and Judith A. Olah Nobel Laureate Chair in Hydrocarbon Chemistry, worked with the late Sri Narayan, professor of chemistry and co-director of the USC Loker Hydrocarbon Research Institute based at USC Dornsife, to develop redox flow batteries, which use chemical baths to store energy.

Charged electrons captured from solar panels are stored in one tank of chemicals. Once they have been used — to power a lamp for example — the electrons are returned to a different vat where they are recharged using solar power or other renewables, such as wind. It's possible to scale up this process simply by adding more chemical tanks. Just as important, the systems have a low risk of catching fire.

Narayan and Prakash, professor of chemistry and chemical engineering and materials science, were figuring out how to make this technology rely on low-cost, readily available materials. In 2020, they demonstrated the success of a redox flow battery that uses iron sulfate and anthraquinone disulfonic acid for the chemical baths. Both materials are inexpensive and abundant.

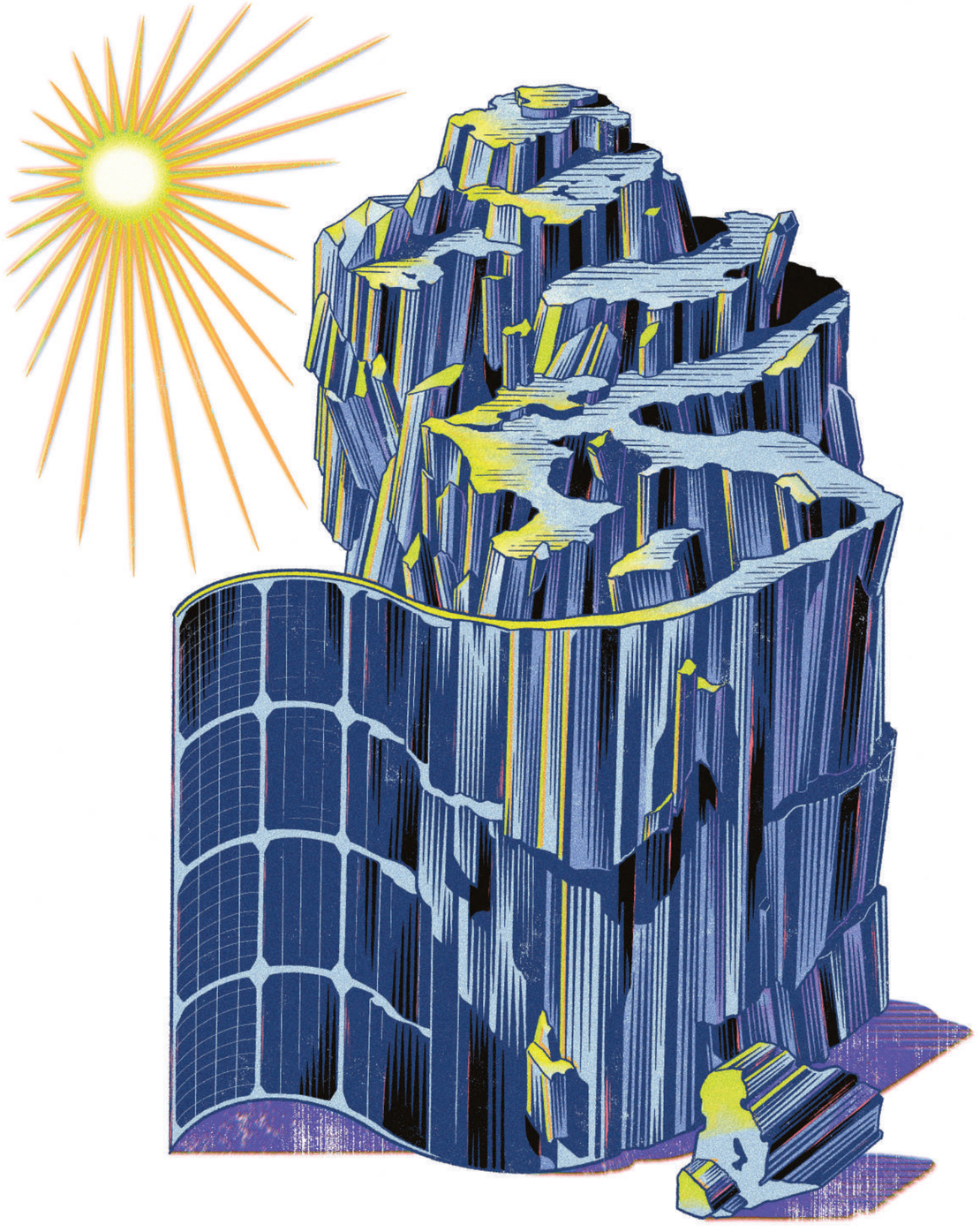
IRON MAN

Redox flow batteries are a good solution to storing solar energy to use as electricity. But what about non-electric energy needs? According to the Environmental Protection Agency, transportation accounts for almost 30% of greenhouse gas emissions in the U.S. Electric cars are gaining in popularity, but the batteries are heavy and require rare minerals. Plus, replacing every car and truck with an electric vehicle would generate an enormous amount of carbon during production and assembly.

Scientists think there's a better way: hydrogen fuel. Hydrogen can store considerably more energy in less space than batteries, and refueling is quick. It's also powerful. NASA already uses hydrogen to launch its rockets into space. Plus, existing combustion engines can be easily converted to use hydrogen instead of gas.

Currently, the cheapest way to make hydrogen is by burning coal. A greener way to manufacture it is through electrolysis, a process that sends electricity through water and splits hydrogen away from the oxygen molecule. The machines used for this, called electrolyzers, need expensive and rare materials such as nickel. This bumps up the price of production, making green hydrogen too costly to compete with gasoline — so far.

Narayan was developing a much less expensive way to build these machines to lower the price of hydrogen fuel by replacing all the nickel in the electrolyzer with inexpensive, iron-based materials. His all-iron prototype has already successfully racked up more than 1,500 hours of durability testing.



ILLUSTRATIONS BY YIRAN JIA FOR USC DORNSIFE MAGAZINE



LIQUID SUNSHINE

There is another way to make green hydrogen: by copying nature. In photosynthesis, the sun's rays spark a chemical reaction in plants that turns water and carbon dioxide into the sugars needed for growth.

Researchers want to mimic this process to generate hydrogen and other fuels. They aim to use the sun and precise chemical reactions to form hydrogen from water — with no electricity required. This approach, called photocatalysis, will need a little human assistance to meet our power needs.

Photocatalysis requires the use of a photosensitizer — a molecule that will absorb the sunlight — and the energy generated is used to kick-start the chemical reaction. Materials currently in use as artificial photosensitizers don't take in much of the solar spectrum, which means they don't convert as much of the energy available to us in sunrays. They also rely on rare, expensive materials like ruthenium and iridium.

Thabassum Ahammad, a doctoral student in chemistry under the supervision of Bradforth, is experimenting to see if Earth-abundant options for photosensitizers convert light as efficiently. He tests molecules that are designed and synthesized in Mark Thompson's laboratory.

A visit to the lab reveals large tables on which a maze of spectrometers for measuring light is carefully arranged. When Ahammad flips a switch, a bright laser beam shoots out, bouncing swiftly across the surface of these instruments before hitting the sample of the test photosensitizers. Starting with the brief event of light absorption (faster than a nanosecond), the experiment captures, moment by moment, how well the photosensitizer is able to transform the energy from the captured light.

In addition to a photosensitizer, artificial photosynthesis requires special catalysts to help boost the production of energy. "Photosynthesis is actually not that efficient," says Smaranda Marinescu, associate professor of chemistry. "We're interested in making this process faster and more productive."

A chemical catalyst can be used to help speed up the process of generating hydrogen from water. Platinum is an excellent catalyst but — as anyone who has bought a wedding ring may know — it's an expensive and rare metal.

Marinescu is looking for more abundant materials to create catalysts that are also more powerful than those available in the natural world. She's currently investigating cobalt and sulfur-containing materials — both elements are much more commonly found than platinum — as promising and affordable options.

If all this innovation can produce cheap, cleanly produced hydrogen, fossil fuels could be replaced with relative ease. Plus, converting solar to fuel can help emerging nations and rural communities that may not have access to electricity. "If you can only convert solar to electricity, that doesn't help people who are off the grid," Ahammad notes.

THE METHANOL CURE-ALL

Using existing infrastructure to create a greener future is consistent with Prakash's decades-long "methanol economy" work to replace fossil fuels with methanol.

An inexpensive wood alcohol, methanol can be mixed with water then dropped into a fuel cell to produce electricity. It's a clean-burning internal combustion fuel and avoids some of the complications of hydrogen, which must be stored as a pressurized gas and can diffuse into the atmosphere over time. Methanol, which can also be converted to all petrochemical products, could also use existing pipe infrastructure originally built for petroleum or natural gas transportation.

Most of the methanol in use today is created by using coal or natural gas, but "green" methanol can be made by capturing carbon from the air. In direct air-capture systems, air is drawn in by fans then cleaned of dust using filters. Next, it's passed through a chemical solution that attracts the carbon dioxide, separating it from other molecules. Add some "green" hydrogen and catalysts to this collected carbon and presto — "green" methanol.

It's a welcome way to clean the atmosphere of excess carbon dioxide caused by burning fossil fuels, while producing a green and renewable energy source.

"CO_2 is not a bad molecule, we just need to manage it," says Prakash. "Nature manages it through photosynthesis: we can manage it through chemistry."

PLANT POWER

Methanol and hydrogen represent just some of the cleaner-burning fuels out there. Off the coast of Santa Catalina Island, in the waters near the USC Wrigley Marine Science Center, lies a thick forest of kelp that USC Dornsife scientists hope could one day power airplanes and cars.

Unlike terrestrial crops, such as corn, which are grown for biofuels, kelp doesn't need massive amounts of land, fresh water or fertilizer. It is one of nature's fastest growing plants, and the fuel derived from it doesn't give off atmosphere-warming carbon dioxide. A Utah-sized patch of ocean kelp could potentially supply 10% of America's energy needs.

Diane Kim, adjunct assistant professor of environmental studies, has been working on an ingenious mechanical contraption, dubbed the "kelp elevator," which raises and lowers stocks of kelp to give them optimal access to sunlight and nutrients. A recent study found that this technique quadrupled production.

THE FUTURE IS (ALMOST) NOW

Kelp fuel, skyscrapers clad with solar panels, electronics powered by tiny microorganisms — this might all seem a little farfetched. Don't be too skeptical: USC Dornsife faculty already have an impressive track record of success.

A renewable methanol plant in Iceland, named for the late USC Dornsife chemist and Nobel Prize winner George Olah, an early collaborator with Prakash, already uses their innovation. It captures as much carbon as the local power plant emits and produces almost 530,000 gallons of methanol annually. And you might already be using technology invented by Mark Thompson to read this article. He came up with the molecules that display red and green colors on phone screens.

Could we soon power our world on sunshine falling through Mark Thompson's solar windows, or fill our gas tanks with clean fuel brought to life by Marinescu's catalysts? It wouldn't be the first time scientists have been inspired by the wonders of nature to create revolutionary new wellsprings of energy.

> "CO_2 is not a bad molecule, we just need to manage it. Nature manages it through photosynthesis: we can manage it through chemistry."



THE BODY ELECTRIC

Coursing with electrical pulses and in need of continual fuel, our bodies consume, create, expend and transfer energy in a multitude of ways. Choosing what provides us with optimal energy — from the food we eat to the company we keep — can infuse our lives with vitality.

By Rachel B. Levin

An Olympic long jumper stands poised at the edge of the runway, preparing to sprint toward the take-off board. Years of training have prepared her for the moment her feet will push off the ground, sending her airborne and delivering her into the sand with a force up to 12 times her body weight. The athlete's performance rides on how effectively she will convert the horizontal energy of her sprint into the vertical energy she needs to ascend.

"You have to be able to control these forces strategically," says Jill McNitt-Gray, a USC Dornsife professor of biological sciences and biomedical engineering who studies biomechanics in Olympic and Paralympic track and field athletes. "What happens in those last couple of steps is really important."

But McNitt-Gray explains that the long jumper's momentum isn't the only kind of energy that's crucial during those fateful footfalls. There's also the caloric energy received through nutrition. The metabolic energy invested in building up the athlete's bones and muscles to bear the load of the forces. The mental energy cultivated through a positive mindset. And the motivating energy from the roaring cheers of the crowd.

What the Olympic long jumper illustrates in bold strokes is that our bodies are energy made manifest. Though most of us will never tackle such challenging physical feats, we all utilize energy in this multitude of forms to survive and thrive.

Perhaps it's no coincidence that when we make choices to optimize our energy — from eating healthy foods and staying active to thinking positively and nurturing meaningful connections — our well-being soars.

FILL 'ER UP

The notion of the body as an energy-generating "machine" dates back to the 17th century, when writers began to describe the body in mechanical terms. Today, we invoke the metaphor of an engine when we say that our "tank" is running empty or that we need to "refuel."

Food is the body's primary source of fuel. Our digestive system breaks down the three main macronutrients — proteins, carbohydrates and fats — from food into simpler molecules. In our cells, the energy stored in these molecules is transferred to adenosine triphosphate (ATP), which powers most cellular processes.

ATP "has to be churned out on a minute-by-minute basis," says Lorraine Turcotte, professor of biological sciences at USC Dornsife. "The job of eating is ultimately to provide nutrients to produce the ATP that we need to just live," says Turcotte, who studies metabolic function.

But making the right food choices for optimal energy can be tricky. Our evolutionary history has primed us to prefer foods high in fat, as well as sweet-tasting foods.

For our prehistoric ancestors, fats provided a calorie-dense source of energy to sustain them until their next hunt. Their sweet tooth led them to trees or bushes to gather fruit for a more rapid source of energy.

Ours may direct us to the doughnut shop.

"In the modern food industry, foods that we inherently prefer are being prepared in such a way that they're highly processed, and the sugars are not coming from a natural source," says USC Dornsife's Scott Kanoski, associate professor of biological sciences. Kanoski, who studies the neurobiological mechanisms underlying obesity, notes that these foods affect the same brain pathways as addictive drugs, making them difficult for us to resist.

High sugar consumption spikes blood sugar, setting us up for an energy crash. And if our blood sugar climbs too high, too often, diseases like type 2 diabetes can set in. Kanoski's research has shown that sugar-laden diets lead to damage in the hippocampus, a brain region implicated in memory.

Diets lacking in vitamins and minerals can also imperil our energy. "We need to have all of our vitamins and minerals to maximize utilization of our fuels," says USC Dornsife's Grayson Jaggers, associate professor (teaching) of biological sciences.

"The most important dietary advice is also going to be the most boring because it's what our parents tell us," says Jaggers, who teaches nutritional biochemistry. "Eat your vegetables and don't have too many sweets. You can spend billions on nutrition research. And this is always what it comes down to."



USE IT OR LOSE IT

In certain affluent corners of the industrialized world, it's now possible to order groceries with the tap of an app. This stands in stark contrast to the considerable amounts of energy required to obtain food in our prehistoric past.

"The last 2 million years of our physiological evolution occurred in a high-activity lifestyle," says USC Dornsife's David Raichlen, professor of biological sciences and anthropology. He notes that vigorous physical activity cues the body to invest energy in metabolic processes that support the body's ability to be active.

"If we are sedentary, we are essentially telling our bodies that we don't need to invest energy in thick bones and strong muscles to manage loads, vessel elasticity to support cardiovascular function, etc.," says Raichlen. Atrophy and disease may follow.

At the cellular level, physical activity helps support the production of ATP in the mitochondria (aka the "powerhouses" of the cell). "The mitochondria of a person who exercises regularly are better adapted to give us ATP at the perfect grade that we need to power our metabolism," says Turcotte.

Exercise is not only a sound investment of metabolic energy, it can also make us *feel* more energetic. When you exercise, "you're providing your body with endorphins, endocannabinoids and all sorts of molecules that improve your mood and your feelings of well-being," notes Raichlen.

MIND OVER MATTER

Food and exercise (and, let's face it, coffee) fuel our get-up-and-go, but we can also say that the body is itself "electric." Electrical currents course through our 40 trillion cells (aka the "electrome"), transmitting signals head to toe. At rest, we generate enough energy to power a 100-watt lightbulb.

When we expend too much mental and physical energy, we find electrical metaphors handy to describe our state: "fried," "burnt out," "low batteries."

Stephanie Eggert, a senior lecturer in USC Dornsife's Department of Physical Education & Mind Body Health, says that many students show up to her Kundalini yoga classes needing to "recharge." She explains that from a yogic perspective, much of what drains our energy happens at the level of mindset: perfectionism, overcommitting, negative self-dialogue.

"Kundalini is a system that allows us to allocate our energy toward more efficient pathways," says Eggert.

In addition to physical yoga poses and breathwork, Eggert's classes incorporate meditation and mantras intended to redirect the mind away from self-defeating thoughts. Studies have shown that these facets of yoga can indeed disrupt habitual thinking patterns and increase energy. Anecdotally, many of Eggert's students report that their energy levels transform through the practice — they feel more "radiant."

USC Dornsife's Iony Ezawa, assistant professor of psychology, notes that a shift in mindset can also be therapeutic for those suffering from clinical depression.

Fatigue and lack of energy are common symptoms that can become self-perpetuating in depressed individuals. "They're having that thought, 'I don't have the energy to get up today,'" says Ezawa. "And that thought is then impacting their ability to actually get up."

Cognitive-behavioral therapy (CBT), which challenges negative thought patterns, can be an effective treatment. A therapist might suggest reframing a thought such as "I don't have the energy to do this" to "Despite my low energy, it's still possible."

Often, says Ezawa, "that's just enough to get the ball rolling. You start to do a little bit, then the energy and the motivation tend to follow."

> "The most important dietary advice is also going to be the most boring because it's what our parents tell us."

SPREADING GOOD VIBES

The effectiveness of CBT demonstrates that sometimes we need a helping hand to adjust our outlook. Indeed, positive social relationships can buoy and even rekindle our energy.

The USC Dornsife Alumni Mentoring Program offers an excellent example. The program pairs USC Dornsife students with alumni mentors who work in each student's field of interest. Over a 10-week period, mentors engage their mentees in remote and/or in-person, career-oriented activities such as discussing potential career paths, practicing interview skills and creating vision boards to map the future.

Program Coordinator Laury DeSanctis notes that the program is particularly energizing for students who are unsure how their major will translate into a career. "Being able to talk to their mentor about career paths they may never have considered opens up all kinds of possibilities for them," she says.

DeSanctis has seen this exchange transform students' career anxiety into excitement about the future. They become more motivated to excel in their classes and activities and seek out novel opportunities.

"That energy actually goes both ways," says DeSanctis. Mentors report feeling invigorated by the impact they are making on students, the new directions they begin to envision for their own careers, and the lively buzz of the university environment.

"Honestly, stepping back on campus 20 years later and simply hearing the band can recharge you," she says.

SPEAKING OF THE BAND ...

If you've ever gotten amped up while listening to the Trojan Marching Band play "Fight On," you know that music is a powerful pathway for boosting energy.

"We're very good at synchronizing our internal rhythm to the rhythm of music," says USC Dornsife's Assal Habibi, head of the Brain & Music Lab at USC Dornsife's Brain and Creativity Institute and associate professor (research) of psychology. "Music that we perceive as exciting and happy increases our heart rate and lifts our mood."

Music is a balm for social bonds, as well. In her lab, Habibi observes people's behavior before and after they play drums together. She finds that the more synchronized participants are in their drumming rhythm, the more empathetic and sociable they become toward one another.

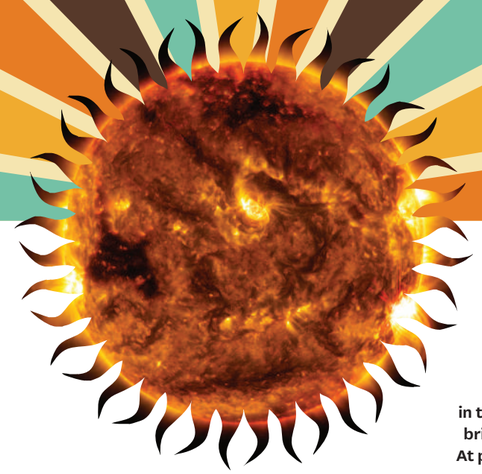
From the mentorship dyads to the drum circles, and even to the crowd cheering on the Olympic long jumper, the energy we offer to one another can be infectious — and life-affirming.

ILLUSTRATIONS BY LUCIANO CIAN FOR USC DORNSIFE MAGAZINE

Here Comes the Sun

The most important source of energy for life on Earth, the sun is the largest object in our Solar System. A nearly perfect ball of hot plasma, it is heated to incandescence by nuclear fusion reactions in its core, radiating this energy mainly as light and ultraviolet and infrared radiation. The energy of sunlight supports almost all life on Earth through photosynthesis and drives Earth's climate and weather.

By Susan Bell



DID YOU KNOW:

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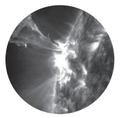
About 73% — roughly three-quarters of the sun's mass — consists of hydrogen. The rest, about 25%, is mostly helium, with much smaller quantities of heavier elements, including oxygen, carbon, neon and iron.

27M F

The sun's surface may be blisteringly hot at 10,340 degrees Fahrenheit, but its outer atmosphere is 300 times hotter. And that's nothing compared to the temperature at the sun's core, which is about 27 million degrees Fahrenheit — hot enough to sustain nuclear fusion.

432,000 miles

The sun's radius is about 432,000 miles — 109 times that of Earth — while its mass is about 330,000 times that of Earth. The sun's mass comprises about 99.86% of the total mass our solar system.



Gases on the sun's surface sometimes erupt, shooting solar flares far out into space. These flares can potentially interfere with satellites, disrupting phone, satellite navigation system and television reception.

1% every 100M years

The sun is by far the brightest object in the Earth's sky and is about 13 billion times brighter than the next brightest star, Sirius. At present, the sun is increasing in brightness by about 1% every 100 million years.

About 1 million Earths could fit into the sun.

Many prehistoric and ancient cultures revered the sun as a solar deity. Pyramids, standing stones and massive earthworks are among the impressive structures erected by ancient peoples to track the sun's movements.



LESSONS FROM THE STARS: studying solar activity to create a safer future on Earth.

In 1859, the Carrington Event, the most intense geomagnetic storm in recorded history, created spectacular auroral displays around the globe, illuminating the night skies so brightly that birds began singing and laborers set off for work, mistakenly believing the sun had risen. Telegraph systems around the world — essential for communication at the time — began to fail as fires sparked and telegraph poles toppled, plunging the "Victorian Internet" into chaos. The cause? A massive solar flare with the energy of 10 billion atomic bombs was spewing electrified gas and subatomic particles toward Earth.

"Thankfully, we haven't had anything that strong from the sun since," says Edward Rhodes, a solar expert and professor of physics and astronomy at USC Dornsife. "But the worry now is: Will the sun generate such a severe event in the future that it will cause problems we just aren't prepared for? Now everything is computerized — that would obviously have major consequences."

Rhodes, who joined USC Dornsife in 1978, is a pioneer in the field of solar physics known as experimental helioseismology, which uses seismic techniques — similar to those employed by geophysicists in studying the Earth — to explore the internal structure and dynamics of the sun.

Rhodes is trying to understand whether the structure of the sun is changing in response to changes in the solar activity cycle. To do that, he and his team are studying sunspots — planet-sized regions of strong magnetic fields on the sun's surface that appear darker because they are cooler than their surroundings.

"If we can improve our predictions concerning changes in the number of sunspots and the activity of the solar cycle, then we may be able to improve our knowledge of space weather and determine what is likely to cause major problems on Earth and what isn't," Rhodes says.

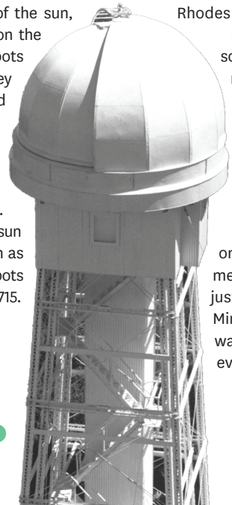
"There's still a lot of variability from cycle to cycle in what the sun happens to be doing at any given time," he says. "By doing fundamental research on the sun as a star to learn more about how it's changing, we can couple what we learn about those changes with research on space weather to determine whether a particular event will be as strong as in the same phase of the previous cycle, for example."

SOLAR CYCLES AND SUNSPOTS

Solar cycles were first observed in 1610 by Galileo, who also observed sunspots by pointing his small refracting telescope at a paper or cardboard surface and watching the bright disc of the sun, freckled with dark sunspots, move across it. After observing several spots on the front hemisphere of the sun, he realized that when some disappeared only to reappear on the other side of the sun two weeks later, they were the same spots — they had simply been invisible from Earth because they were on the other side of the sun. This information then enabled Galileo to calculate the rotation rate of the sun by measuring how rapidly these spots moved.

The celebrated Italian astronomer and his contemporary, English stargazer Thomas Harriot, were fortunate to be conducting their observations at a period of maximum solar activity. Both had chanced upon a 35-year span of time before the sun went into an extended period of minimum activity, now known as the Maunder Minimum, when there were very few or no sunspots visible on the sun's surface for about 70 years between 1645 and 1715.

During that period, the Northern Hemisphere of the Earth cooled slightly. Glaciers extended, rivers froze over and temperatures in major northern European cities dropped.



A NEW MAUNDER MINIMUM?

Rhodes and his students have been investigating whether recent claims that the sun was heading for another Maunder Minimum might be true.

"The study of solar cycles shows that the number of sunspots on the sun peaked a number of years ago," Rhodes says. "As solar cycles became weaker, it began to look a little like a plot that was made of sunspots from Galileo and Harriot leading into that Maunder Minimum."

Rhodes, assisted by his research group, has been operating the Mount Wilson 60-foot Solar Tower since he joined USC Dornsife in 1978. One of two solar telescopes at Mount Wilson, it is the only one still officially in operation.

Shortly after Rhodes arrived at USC Dornsife, NASA headquarters tapped him to join the European Space Agency team planning the Solar and Heliospheric Observatory (SOHO) spacecraft. The completed spacecraft, which could point its cameras at the sun 24 hours a day, went into orbit in 1996. It became the primary spacecraft instrument until it was supplanted by the new 16-million-pixel camera system aboard the Solar Dynamics Observatory, launched in 2010.

Rhodes and his team used data from SOHO to study Cycle 23. Now, they are studying Cycles 24 and 25 with the Helioseismic and Magnetic Imaging experiment on the Solar Dynamics Observatory. Every two or three months, they receive new data that has been partially processed by Stanford University. Rhodes' students are trained to process that data so the team can see what the signature of these changes in the frequencies of the solar oscillations looks like at this solar cycle compared to the two previous ones.

"In the last year or so, we can see that maybe the sun isn't going to be substantially weaker in this, our 25th solar cycle, than in the previous cycle, as was predicted," Rhodes says. "Also, the anticipated long-term absence of sunspots may not begin in the mid-2030s, as some experts had claimed, and might not occur until centuries in the future."

AVOID CONFLATING SOLAR ACTIVITY WITH CLIMATE CHANGE

Rhodes cautions against linking solar activity with climate change or concluding that a new Maunder Minimum could help offset global warming.

"Because the Maunder Minimum occurred when there were changes in the Earth's climate, I've been concerned that if the sun were to enter another extended 70-year minimum of activity, people would say, 'See, we told you the sun is making the Earth now cool down a little, that in the past too much solar activity was warming the Earth,' and that is not the case," Rhodes says.

Even the small changes in the overall brightness of the sun or total solar irradiance — the amount of sunlight that reaches each square meter at the top of the Earth's atmosphere every second — don't appear to be enough to cause any long-term differences in climate.

Surprisingly, at the time when sunspots increase, which one would think would cause the sun to darken slightly, the total solar irradiance increases. Scientists think that, collectively, the non-spot portion of the sun's atmosphere is brightening more than the sunspots are dimming.

"The fact that it gets brightest when there are the most spots on the sun and then gets a little fainter when there are fewer would mean that if we had 70 years of few spots, then the sun would be just a little fainter," Rhodes says. "Even a prolonged Maunder Minimum would only briefly, and minimally, offset human-caused warming, and global temperatures would quickly rebound once the event concluded." D

Earth(quakes), Wind and Fire

Our planet and the surrounding universe display awe-inspiring demonstrations of energetic power.

A dozen or so times a year, Southern California residents are visited by strange gusts so strong they can uproot trees and send roof shingles flying. Known as the Santa Ana winds, they can reach up to 100 miles per hour and are generated when hot, high-pressure desert air from the east meets cooler air from the coast.

These winds are just one expression of the tremendous natural energy that surrounds us. Mount Shasta near the northern tip of the state is an active volcano. The infamous San Andreas Fault that runs through 750 miles of California has the potential to cause a magnitude 8.0 earthquake.

The universe around us isn't any more peaceful. Every year, stars explode in the skies with the force of countless nuclear bombs. Even the tranquil moon is quaking.

SHAKE, RATTLE AND ROLL

Our planet is energetic down to its molten core, which Dean's Professor of Earth Sciences John Vidale, former director of the Southern California Earthquake Center based at USC Dornsife, recently discovered may shift rotational speed every six years or so. As the motion changes, our days lengthen or shorten because of energy passed back and forth between the solid inner core and the rocky mantle above.

Above the core, the tectonic plates of Earth's crust are in constant motion. Their subtle shifting generates friction as the plates scrape against each other. Most of this built-up energy is released through geothermal heat, but sometimes it results in earthquakes that can be devastatingly strong. The recent deadly quakes in Turkey and Syria gave off the equivalent energy of 8 million tons of detonated TNT.

In California, earthquakes aren't the only unpredictable energy. Wildfires rip through the land with fierce intensity each year. They can reach temperatures of 2,000 degrees Fahrenheit — one-fifth the heat of the sun's surface. As periods of drought extend due to climate change, fires are only getting bigger.

"In 2020, fires in California burned more than 4 million acres and spawned a new term: 'the gigafire,' a wildfire that burns more than 1 million acres."

"In 2020, fires in California burned more than 4 million acres and spawned a new term: 'the gigafire,' a wildfire that burns more than 1 million acres," says William Deverell, professor of history, spatial sciences and environmental studies. Smoke from wildfires recently tampered with another form of our natural energy: Solar energy production in California plunged during the raging 2020 fire season due to smoky skies.

STAR POWER

Out in the galaxy, energy puts on an even grander show. "Moonquakes" regularly wobble our moon when meteorites strike and shake it, while Earth's gravitational pull squeezes its interior and buckles the surface. Dying stars, dubbed supernovas, explode with a strength that's an octillion (a billion, billion, billion) times more powerful than our biggest nuclear bombs. And black holes exert a gravitational pull so potent that not even light can escape.

There's another, stranger energy out there as well: dark energy. Not yet totally understood, it's the name we give to the force behind the accelerating expansion of the universe. If this expansion continues unabated, some scientists think it could result in the ultimate energetic showdown.

"It could end up ripping our universe apart," says USC Dornsife's Kris Pardo, assistant professor of physics and astronomy.

We've got some time to prepare, though. Even in one of the worst-case scenarios, scientists don't anticipate the "big rip" (if it even happens) for another 22 billion years. —*M.C.*



ON PREVIOUS PAGE: SUN IMAGE SOURCE: NASA/SDO; SOLAR FLARE IMAGE SOURCE: CARNEGIE INSTITUTION FOR SCIENCE COLLECTION AT THE HUNTINGTON LIBRARY, SAN MARINO, CALIFORNIA; THIS PAGE: MOONQUAKES IMAGE SOURCE: ISTOCK; STONEHENGE IMAGE: ISTOCK; SOLAR TELESCOPE IMAGE IMAGE COURTESY OF THE OBSERVATORIES OF THE

"I'm pickin' up good vibrations"

The concept of esoteric energy, an unseen force that can affect change, is common across cultures around the world. What's behind this mysterious, enduring belief?

Ever walk into a building and think, "Wow, this place has great energy"? You're in good company. For tens of thousands of years, and in cultures around the world, humanity has been picking up on compelling vibrations.

For the ancient Maya of eastern Mexico, Guatemala and Belize, "k'uh" was the sacred, animating force that permeated all things. "This divine energy motivated the sun, moon and stars, but also gives us our own life and energy," says Eric Heller, lecturer in anthropology at USC Dornsife.

Revered people such as members of royal families, and places such as mountains that supply fresh water, might contain a higher concentration of "k'uh." In fact, Maya pyramids that represent mountain peaks and massive slabs of stone that are carved in honor of royalty still draw worshippers.

In Tibetan Buddhism, human life straddles both a physical body and pure energy. The two are connected via wheels or "chakras" dotted along the body. To achieve awakening, chakras must be kept open through practices such as meditation, yoga and chanting, practices that can lead to the transcendent state of enlightenment and absolute energy known as Nirvana.

SHOCK AND AWE

In Abrahamic traditions, belief in purely esoteric energy exists mostly on the margins. Yet the notion of a space imbued with sacred energy is certainly familiar to most people with religious beliefs — and even to some without.

Walk into a cathedral and you might find yourself overcome by awe. This feeling could be due to the accumulated power of history. "People have been visiting the same place for a thousand years, so you are engulfed in antiquity," says USC Dornsife's David Albertson, associate professor of religion.

But such places may also owe their appeal to those whom USC Annenberg School for Communication and Journalism's Diane Winston dubs "spiritual technicians" — people who know how to create a sacred space.

"This could be the architect of a cathedral or clergy preaching a sermon. There are many ways to construct a spiritual experience," says Winston, Knight Center Chair in Media and Religion and associate professor of journalism and religion.

QUANTUM CONNECTIONS

Skeptics of this concept of energy may be intrigued to learn there are some compelling parallels between folk conceptions of energy and emergent scientific theories surrounding the very nature of our reality.

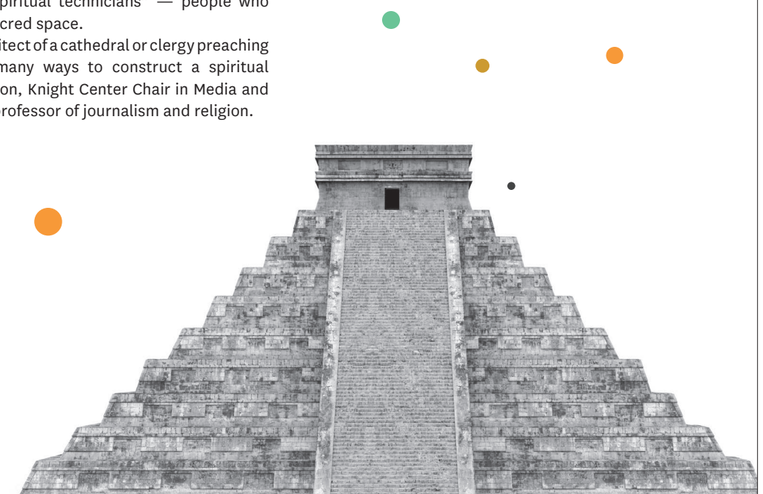
Based on an Eastern belief that vital energy flows through our bodies, the Japanese practice of Reiki is a healing technique believed to reduce stress and encourage relaxation through the transference of universal energy. Practitioners even claim it can be done remotely.

"The modern concept of healing focuses uniquely on the body and mind. In non-Western healing practices, energy that expands out into the community, families and the cosmos can also be healed," says Thomas Ward, associate professor (teaching) of anthropology.

Although medical studies have not confirmed the veracity of Reiki's healing powers, its underlying philosophy may not be completely off base.

Last year, the Nobel Prize in physics was awarded to a trio of scientists for experiments that overturned the reality of the universe as we know it, laying bare a profound mystery at the heart of reality. Their experiments focused on quantum particles, the smallest physical particles in the universe. Their findings show that if these particles once touched, they continue to have an effect on each other after they've been separated.

If this theory proves correct — and given that most elements of our bodies were formed in ancient stars over the course of billions of years — maybe the spiritual idea that life may be connected across distance, or even time, doesn't seem quite so farfetched, Ward notes. Perhaps Reiki's practitioners, and other proponents of an interconnected and cosmic energy, have indeed picked up on a subtle truth humming within the fabric of our universe. —*M.C.*



ANCIENT MAYA TEMPLE OF KUKULCÁN AT CHICHÉN ITZÁ IMAGE SOURCE: ISTOCK

"The modern concept of healing focuses uniquely on the body and mind. In non-Western healing practices, energy that expands out into the community, families and the cosmos can also be healed."



Staying Cool

As the planet warms, our ability to cool the air is a growing necessity, particularly in global hot spots. While the high costs and environmental pitfalls of modern air conditioners spur research into more sustainable and equitable alternatives, ancient cooling approaches beckon us to learn lessons from the past.

By Rachel B. Levin

Last September, an epic heat dome settled over the western United States, causing the region's most severe heat wave on record. In many areas, temperatures soared to triple-digit highs for more than a week. Almost a thousand heat records were broken.

The scorcher is just one example of how heat waves are becoming more intense and longer lasting due to global warming. By 2050, nearly half the world may live in areas where the mercury rises to dangerously high levels for at least a month each year, threatening human health and ways of life.

In warm regions, demand for air conditioning is on the rise. The number of A/C units is estimated to reach 5.6 billion globally by 2050, up from around 2 billion units today. But populations without the means to obtain and maintain these costly systems will be left out in the cold — or, rather, heat.

Traditional vapor-compressor air conditioners also have considerable environmental costs. They are energy guzzlers, and if fossil fuels are burned to obtain that energy, more planet-warming emissions are released into the air. The toxic refrigerants many of these systems rely on are also potent greenhouse gases that can leak into the atmosphere.

In its current form, A/C is no panacea for beating the climate-change heat. But how else can we keep cool?

The most promising solutions on the horizon leverage technology — some of it cutting-edge, some of it downright ancient.

BUILDING A BETTER A/C

One approach is to reimagine the air conditioner itself, to make it less power hungry and less toxic to the environment. With his company Phononic, Tony Atti '00 is doing just that.

Atti earned a PhD in chemistry from USC Dornsife, where he studied at the USC Dornsife Loker Hydrocarbon Research Insitute, led by renowned chemists G. K. Surya Prakash and the late George Olah, winner of the 1994 Nobel Prize in chemistry.

Atti founded Phononic in 2009 to advance thermoelectric technology, in which cold is generated by moving heat from one side of a thermoelectric chip to another. The technology can use significantly less energy than compressor-based cooling systems and contains no toxic refrigerants. Though the principles underlying thermoelectric technology date back to 1834, Atti spearheaded an effort to make it commercially viable for the 21st century.

Phononic's thermoelectric HVAC technology will debut this summer in a first-of-its-kind air-cooling system in Europe. Atti explains that the system works by using a building's established compressor-based system to partially chill the outside air, before Phononic's technology kicks in to cool it to thermostat level.

Test data show that this hybrid operation reduces a building's energy consumption by almost 50% and reduces emissions from the building system's hydrofluorocarbon refrigerant by more than 30%.

Phononic has also developed solutions for localized outdoor cooling. In 2019, the company installed thermoelectric bladeless fans in several popular outdoor locations in Singapore. The fans, which use 50% less energy than industrial bladed fans, create an "air curtain" of cooling over a distinct area that can decrease ambient temperature by up to 50 degrees Fahrenheit and humidity by up to 15%.

Atti plans to bring Phononic-enabled cooling solutions to the United States and elsewhere around the world but notes that moving the needle on compressor-based systems involves time and persistence. "It's not an easy task," he says. "Major industries don't wake up every morning figuring out ways to disrupt themselves."

INCENTIVIZING POWER SAVINGS

Phononic's power-saving technology would have come in handy during the West's September 2022 heat wave, when California's power grid — overtaxed by air conditioning use — careened toward failure. The state's grid operator sent texts to consumers warning of blackouts if they didn't slash their power use. Some voluntarily cut back. The lights stayed on.

But Provost Professor of Economics and Spatial Sciences Matthew Kahn believes that as heat waves intensify, utilities can't rely solely on volunteerism to avert blackouts. That's especially true as states such as California phase out fossil fuels and increase reliance on wind and solar energy, supplies of which dwindle when the wind isn't blowing or the sun has set.

> **“We’ve come up with a way to use market forces and personal freedom so that we never have a blackout again.”**

Kahn has been collaborating with USC Viterbi School of Engineering’s Bhaskar Krishnamachari on a plan to boost power conservation at critical times. “We’ve come up with a way to use market forces and personal freedom so that we never have a blackout again,” says Kahn.

The pair champions dynamic pricing programs, in which households that are large users of power are offered a lump sum enrollment payment in exchange for agreeing to higher electric rates when demand surges. “When you face a higher price for consuming resources, this actually nudges you to get lean and mean,” Kahn says.

About two-thirds of homes across the U.S. now have smart electric meters, which communicate a home’s electricity consumption wirelessly to utility companies every few minutes. With the help of linked mobile apps, those enrolled in dynamic pricing could be notified hours in advance of a price surge and plan their usage accordingly.

The anticipation of higher rates may also spur consumers to make power-saving upgrades to keep their homes cooler, such as replacing windows and installing smart thermostats. These devices can be programmed to precool homes before prices rise.

Kahn notes that the top residential power users tend to be high-income households with large homes, so low-income households would not bear the burden of surge pricing.

Unfortunately, political resistance and slow adoption of technology in some cities could be obstacles. “We need smart meters in people’s homes to be able to launch our experiment,” says Kahn.

RECONCEIVING THE BUILT ENVIRONMENT

While the latest feats of engineering can encourage more sustainable A/C use, there’s also much we can learn by exploring ancient cooling techniques.

“Long before the advent of air conditioning, people living in hot climates dealt with the challenges of heat, so it is worth looking to their cooling strategies for inspiration,” says Ciruce Movahedi-Lankarani, Farhang Foundation Chair in Iranian Studies and assistant professor of Middle East studies. He notes that certain hallmarks of traditional Middle Eastern architecture serve both ornamental and cooling functions.

Latticework on the exterior of windows enhances air circulation and offers shade from the sun. Wind catchers, which are hollow towers that Movahedi-Lankarani describes as “reverse chimneys,” channel breezes into the home. Internal courtyards, shaded by rooms or walls and often containing lush greenery and splashing fountains, offer a refreshing respite from the heat.

The sandy color of the limestone and mud used to erect traditional buildings reflects heat, and the moisture these materials absorb in humid conditions can later evaporate to provide cooling.

These ancient architectural approaches have largely been abandoned in the modern era. As Middle Eastern cities exploded in size in the 20th century, “many of them essentially transplanted glass, steel and concrete-style structures from Europe, the United States and the Soviet Union,” says Movahedi-Lankarani. “These materials and architectural styles don’t work very well with the local climate. They get hot, essentially.”

As the region warms, “There is some exploration of returning to these more traditional forms of architecture,” he says. But Movahedi-Lankarani also notes that tearing down glass and steel structures to build anew is expensive, not to mention resource-intensive.

GREENING THE URBAN DESERT

The most ancient form of cooling “technology” is perhaps the simplest: the tree. Outdoors, trees provide cover from the sun, and the water vapor they release adds to their cooling effect. When they shade windows and walls, our leafy friends can also cool indoor spaces.

But in cities across the U.S., poor neighborhoods experience on average 25% less tree cover than wealthy ones. Disadvantaged communities also contain a higher share of concrete and asphalt surfaces that absorb heat and then release it back into the atmosphere. These factors create urban heat islands: tree-poor neighborhoods that are hotter than their greener counterparts.

“If you stand in the middle of an unshaded street on one of these really hot days over 100 degrees Fahrenheit, the temperature might climb up to 130 degrees Fahrenheit due to both the sun’s rays and heat rising from the asphalt,” says John Wilson, director of USC Dornsife’s Spatial Sciences Institute and professor of sociology, civil and environmental engineering, computer science, architecture and preventive medicine. “If you walk to the nearest street tree that has a large, vibrant canopy, then you suddenly find the temperature is 30 degrees Fahrenheit or 40 degrees Fahrenheit less than the temperature above the blacktop.”

Wilson is the project lead of the USC Urban Trees Initiative, a collaboration between USC Dornsife’s Public Exchange and the City of Los Angeles. To reach the city’s goal of increasing the tree canopy by 50% in low-income neighborhoods by 2028, Wilson and a team of USC Dornsife and USC School of Architecture scholars and students are advising the city on the number and type of trees that should be planted, and where to plant them.

Since the initiative’s launch in 2020, the team has completed an inventory of each designated neighborhood’s existing tree canopy, created designs for new plantings and collaborated with community members to determine priority streets for the new trees.

Now, Wilson is developing a shade model using Geographic Information System technology and data from the Los Angeles Region Imagery Acquisition Consortium. The model will project how much shade the proposed tree plantings will cast on streets, sidewalks and buildings to predict the cooling benefits. This will help the city make final decisions about planting configurations, with an eye toward putting shovels in the ground in 2024.

THE COLD REALITY

The Urban Trees Initiative highlights the complexities of the planet’s quest for sustainable cooling. To provide relief for the largest number of people, the most comprehensive strategies will not only conserve energy and temper the heat but also address social and economic inequalities.

Movahedi-Lankarani notes that without political interventions, the ongoing impacts of extreme heat will not be felt evenly. Those who have the means to access A/C, modify homes and landscaping, and move to cooler or greener areas will experience rising temperatures differently from those who do not.

“Technology is not likely to be a silver bullet” for the majority of the world’s cooling needs, says Movahedi-Lankarani. “It’s likely that our existing social arrangements and ways of life will also have to adapt to a changing world.”



ILLUSTRATIONS BY KATHERINE STREETER FOR USC DORNSIFE MAGAZINE

THE NUCLEAR DEBATE: GREEN ENERGY SOLUTION OR DANGEROUS DISTRACTION?

Proponents argue that nuclear power is a solution for a cleaner future. Critics consider it to be dangerous, unsustainable and a distraction from speeding up the switch to renewables. Who is right?

By Ileana Wachtel

The United States is the world's largest producer of nuclear energy, but for the last three decades, Americans' primary exposure to nuclear power has arguably come not from scientific or political debate, but from its unflattering portrayal on a popular animated TV show. On the long-running satirical comedy series *The Simpsons*, the cooling towers of the fictitious Springfield Nuclear Power Plant are cracked, safety violations are rife, disposal of radioactive nuclear waste is haphazard at best, and the plant's negligent safety director is none other than arch-bumbler Homer Simpson.

Whether this portrayal has influenced Americans' opinions or simply reflected their worst fears is debatable. What we do know is that the Office of Nuclear Energy was sufficiently concerned about potentially negative fallout from *The Simpsons* to release a statement in 2018 to clarify any misconceptions about nuclear safety possibly created by the show. The tone of the statement was humorous, but its message was clear: Stringent safety precautions and protocols in nuclear power plants are strictly enforced at all times.

Whatever impact *The Simpsons* may have had on public opinion in the past, perceptions of nuclear power in the U.S. are rapidly improving. Increasingly touted as a potential clean energy solution in the battle against climate change, nuclear power is undergoing a renaissance in the U.S., with a growing number of leading environmentalists and powerful political figures from both sides of the aisle championing the energy source as a winning alternative to fossil fuels.

The burning question our leaders must answer is this: How can we stop burning fossil fuels to meet our climate goals while ensuring the power grid remains reliable? While serious concerns over its safety remain, could nuclear power be the answer? Our experts weigh the pros and cons.

AMERICA'S ROCKY ROAD TO NUCLEAR ACCEPTANCE

To understand America's shifting relationship with nuclear power, it's important to understand its historical evolution.

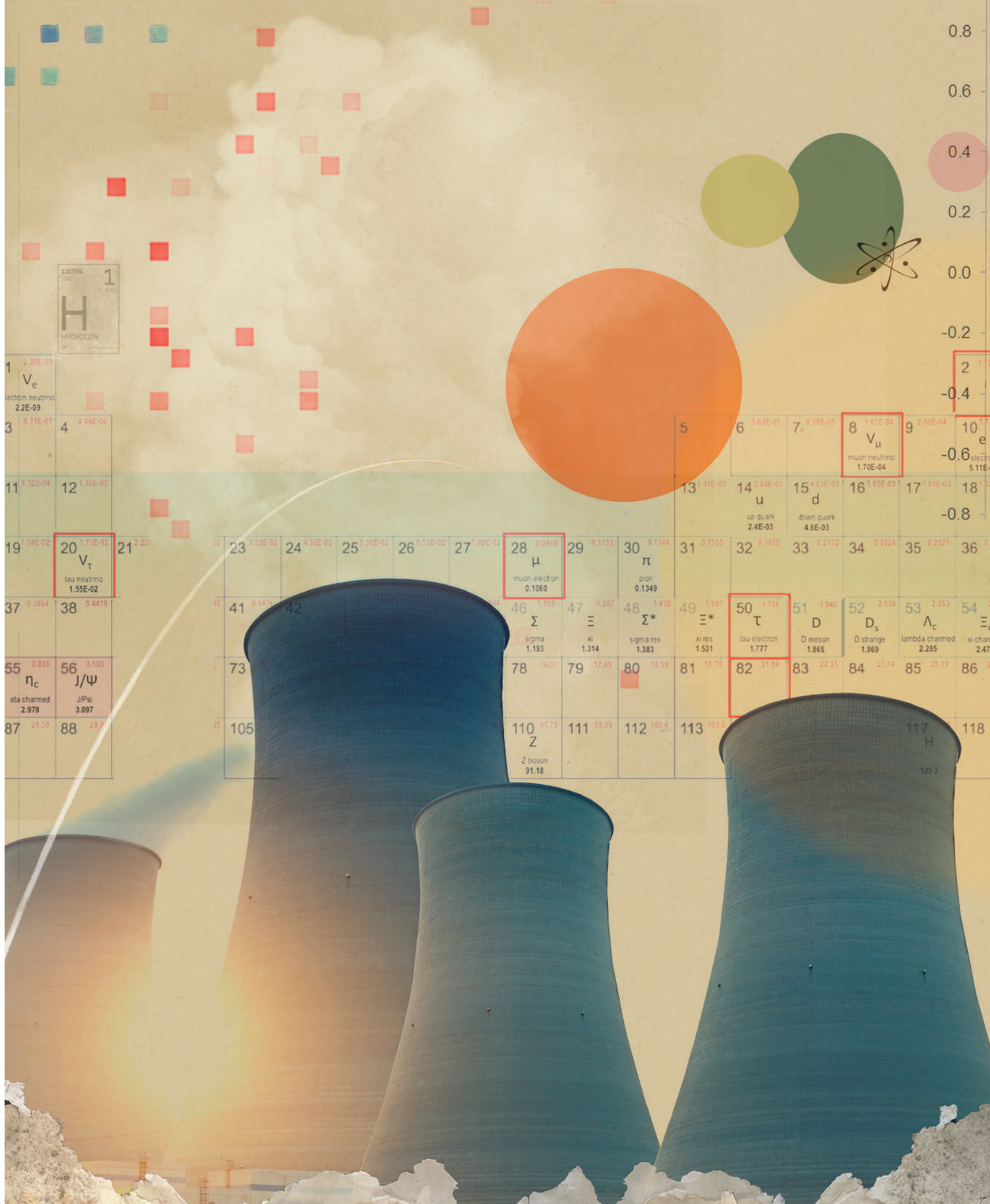
In 1953, in the aftermath of the bombing of Hiroshima and Nagasaki at the end of World War II and the controversial U.S. nuclear tests of the early 1950s, President Dwight D. Eisenhower delivered his "Atoms for Peace" speech advocating peaceful nuclear energy use. By 1954, with ample uranium to satisfy military needs, the U.S. concentrated on promoting peaceful nuclear applications. This led to a 1955 United Nations-sponsored international conference on nuclear power, creating the impetus for U.S. utilities to order more than 50 reactors to meet the country's growing energy demands.

Indeed, officials with the U.S. Atomic Energy Commission, a government agency established after World War II to foster and control the development of atomic science and technology for peaceful purposes, had high hopes that 1,000 nuclear plants would be in operation by the year 2000.

Those hopes turned out to be short-lived as the National Environmental Policy Act of 1969 and the subsequent establishment of environmental agencies gave political clout to the growing lobby of anti-nuclear movements. All 41 reactors ordered after 1973 were canceled, according to the International Atomic Energy Agency (IAEA). By April 1976, Gallup reported that 60% of Americans opposed the construction of more plants.

"Much of the original opposition to nuclear energy wasn't an objection to the technology itself, but a skepticism of authority that came out of the anti-war and civil rights movements," says Jennifer Bernstein, a visiting scholar at USC Dornsife's Spatial Sciences Institute who tracks changing attitudes toward nuclear energy.

"Another major cause of opposition to nuclear power,"





Bernstein says, "is a lack of understanding resulting from the fact that scientists have long failed to communicate information in a way that is accessible and relatable."

STARING DOWN THE MOUTH OF A NUCLEAR REACTOR

But perhaps the greatest barrier to the growth of nuclear power in the U.S. has been concern over safety in the wake of the near meltdown at Three Mile Island in Pennsylvania in 1979 and the nuclear disasters at Chernobyl, in what is now Ukraine, in 1986 and Fukushima, Japan, in 2011.

The accident at Three Mile Island led to increased opposition to new nuclear plants in the U.S. and halted their construction for almost 30 years. Two months after the accident at Chernobyl, opposition in the U.S. to expanding nuclear power plants rose to 73%, according to Gallup.

USC Dornsife's Najmedin Meshkati is a nuclear expert who vividly remembers staring down the mouth of the Chernobyl nuclear power plant's No. 3 reactor, clad only in a business suit. It was May 1997, 11 years after an accident triggered the nuclear disaster that transformed Chernobyl into a byword for human and environmental tragedy.

The professor of international relations, who holds a joint appointment at the USC Viterbi School of Engineering, where he is a professor of civil and environmental engineering, and industrial and systems engineering, had been invited by the plant's general manager to inspect the facility.

As Meshkati surveyed the desolate landscape and heard the wind whistle through the deserted buildings, he realized the eeriness of the environment was matched only by the plant management's complete disregard for his safety. This negligence, he concluded, might reflect something bigger: the lack of rigor that led to the accident. "That was the moment," he says, "that I realized the magnitude of the disaster."

Fourteen years later, Meshkati — then a member of a National Academy of Sciences/National Research Council committee studying the lessons learned from the Fukushima nuclear accident — found himself in Japan inspecting the plant's nuclear reactors just nine months after the earthquake and tsunami that triggered the disaster.

To his relief, he was provided with protective clothing prior to this plant visit and later scanned for radiation exposure.

Despite the improved safety protocols, the visit left an enduring impression. "Driving through the area was like driving through a ghost town," Meshkati says of the experience, describing it as "one of the most transformative and sobering moments of my life."

"Looking back, it always makes me think about the unthinkable."

After inspecting Chernobyl and Fukushima, Meshkati, who emphasizes the importance of interdisciplinary research to ensure safety and well-being, is convinced that the biggest risks to nuclear power plants are human and organizational factors.

"Three Mile Island, Chernobyl and Fukushima — the common denominator for all three accidents was the poor safety culture leading to deficiencies in the system's protective defenses," he says.

DIVIDED OPINION

Over time, opinions about nuclear power in the U.S. have shifted. In 2010, Gallup found that 62% of Americans were in favor of nuclear energy — the highest level of support since the Three Mile Island accident. However, by 2012, a year after the Fukushima disaster, support had dipped to 57%. On balance, between 2004 and 2015, a majority of Americans (ranging from 52% to 67%) favored nuclear power due to increasing oil and gas prices. Nuclear energy was seen as a cost-effective alternative during this period. However, as gas prices declined, support for nuclear power also waned, dropping to 44% in 2016.

> "Much of the original opposition to nuclear energy wasn't an objection to the technology itself, but a skepticism of authority that came out of the anti-war and civil rights movements."

Other countries are much less divided than America on the issue of nuclear power. Sweden, Austria and Ireland stand firmly against it. China and India, however, have readily incorporated nuclear power as part of their energy mix, although the world's two most populous nations generate a mere 3% to 5% of their electricity from nuclear reactors.

Many other nations welcome the use of nuclear power as a clean energy source. The most notable example is France, which derives 70% of its energy from nuclear power. The 1973 oil crisis nudged France toward energy independence, prompting the country to build 56 reactors during the '80s and '90s.

Russia's invasion of Ukraine and its move to cut off European gas supplies gave countries such as Germany — which had begun phasing out nuclear power more than 20 years ago — pause for thought. As a result of Russia's actions, Germany announced in September 2022 it would delay the closure of its remaining nuclear power plants until April 15, 2023, to ensure an independent energy supply. Despite opposition, Germany held to its deadline and began the process of shuttering its three remaining plants.

The announcement came the day before a meeting of G7 nations at which leaders of influential nuclear trade associations in the U.S., France, Canada, Japan and the United Kingdom announced they would work together to create independent supply chains for nuclear fuels that are not reliant on Russia.

Then there is Ukraine itself, which gets half its electricity from its 15 reactors at four plants. As the country struggles under severe Russian bombardment, the danger of a nuclear disaster weighs heavily on the beleaguered nation — and its neighbors.

Clearly, interest in nuclear power varies significantly among countries. Some are turning to nuclear power to provide energy independence and what they consider to be greener energy without the climate-heating emissions of fossil fuels. Others are wary of the dangers of nuclear waste disposal and the risk of nuclear disaster.

A NEW BEGINNING?

As the world's largest producer of nuclear power, the U.S. accounts for more than 30% of worldwide nuclear generation of electricity. Its 92 nuclear reactors across

ILLUSTRATIONS BY DANA SMITH FOR USC DORNSIFE MAGAZINE

52 facilities currently generate 20% of the country's energy supply. However, only one of these plants was built in the last 25 years, reflecting enduring concerns over cost and safety.

> "Nuclear plants will need meticulous design and disciplined construction, operation and monitoring."

But as climate change and the war in Ukraine pose energy challenges, coupled with higher oil prices, the popularity of nuclear power is rising once again in the U.S. following its 2016 dip. According to a 2022 Gallup survey, just over half of Americans are now in favor.

"Democrats and environmental organizations that have previously opposed nuclear are increasingly acknowledging its potential," says Monica Dean, climate and sustainability practice director of USC Dornsife's Public Exchange. President Biden's $1.2 trillion Infrastructure Investment and Jobs Act includes significant funding for nuclear facilities.

Fear of power outages and the desire for energy security and reliability have already turned the tide in California, where the state legislature decided in September 2022 to keep the Diablo Canyon nuclear power plant in San Luis Obispo running for five years or more past its scheduled closure date.

But while support for nuclear power is growing, Dean says "the challenge for its proponents is that you still have entire generations, traumatized by nuclear accidents, who don't see it as the most desirable option."

A DOUBLE-EDGED SWORD

Decarbonization and energy reliability and independence have created opportunities for new nuclear technology, including small module reactors (SMRs). "These reactors can be mass-produced, shipped in pieces, and assembled on-site for better quality control," Meshkati says.

"However," he cautions, "we haven't seen all the risks yet."

Anna Weichselbraun, a USC Berggruen Fellow and anthropologist based at USC Dornsife, is also concerned. Unlike large industrial reactors, the construction of SMRs can be difficult to track with satellites. Weichselbraun points out this will make it harder for the IAEA to track their movement and prevent their use in the construction of nuclear weapons.

SAFETY IS PARAMOUNT

Another key concern is the storage of nuclear waste, which can remain radioactive for tens of thousands, or even millions, of years.

Currently, the U.S. does not have any nationally designated long-term storage for high-level radioactive waste from its commercial nuclear power plants. Public and political opposition closed the nation's proposed high-level nuclear waste disposal site, located in Yucca Mountain, Nevada, in 2009. Each plant must now store its waste on-site in dry casks.

"It is our collective, societal obligation to deal with nuclear waste management," says Vincent Ialenti, a former USC Berggruen Fellow and a social anthropologist. An expert on Finnish culture, Ialenti found that Finland's high level of trust in the competency of its government agencies, domestic engineers, civil servants and scientists allowed it to secure public support for constructing what may become the first deep-geologic repository for disposing of spent nuclear fuel from commercial power plants in operation anywhere in the world. It should be noted that there are repositories for low- and intermediate-level radioactive waste.

In the U.S., Ialenti says, that trust component is missing. Dean agrees.

"What we need are education efforts to help build trust and support for the advancements in technology, like SMRs, that offer significant safety advantages," she says. "Until that happens, nuclear will continue to be held back by the same question: It failed before — why should anyone trust it now?"

That question also extends to how and where nuclear plants are constructed. John Vidale, Dean's Professor of Earth Sciences and former director of the Southern California Earthquake Center, based at USC Dornsife, notes that seismic issues pose a multifaceted risk.

"Even though the motion in future earthquakes can now be probabilistically estimated and factored into construction, so many engineered structures have failed in unexpected ways," Vidale says. "Nuclear plants will need meticulous design and disciplined construction, operation and monitoring."

IS DIVERSITY THE ANSWER?

So, what is the future of nuclear power in the U.S.? Although safety concerns persist, recent cost reductions and advances in technology and waste storage, coupled with the introduction of climate-change funding and a shifting global landscape, have collectively contributed to the growing appeal of nuclear power as a clean, safe and independent energy source.

Renewables, however, like solar and wind, are giving nuclear power a run for its money. Nuclear power costs between 5 cents and 15 cents per kilowatt-hour (kWh), while according to the International Renewable Energy Agency, the global average cost of solar and wind in 2020 was around 5 cents per kWh.

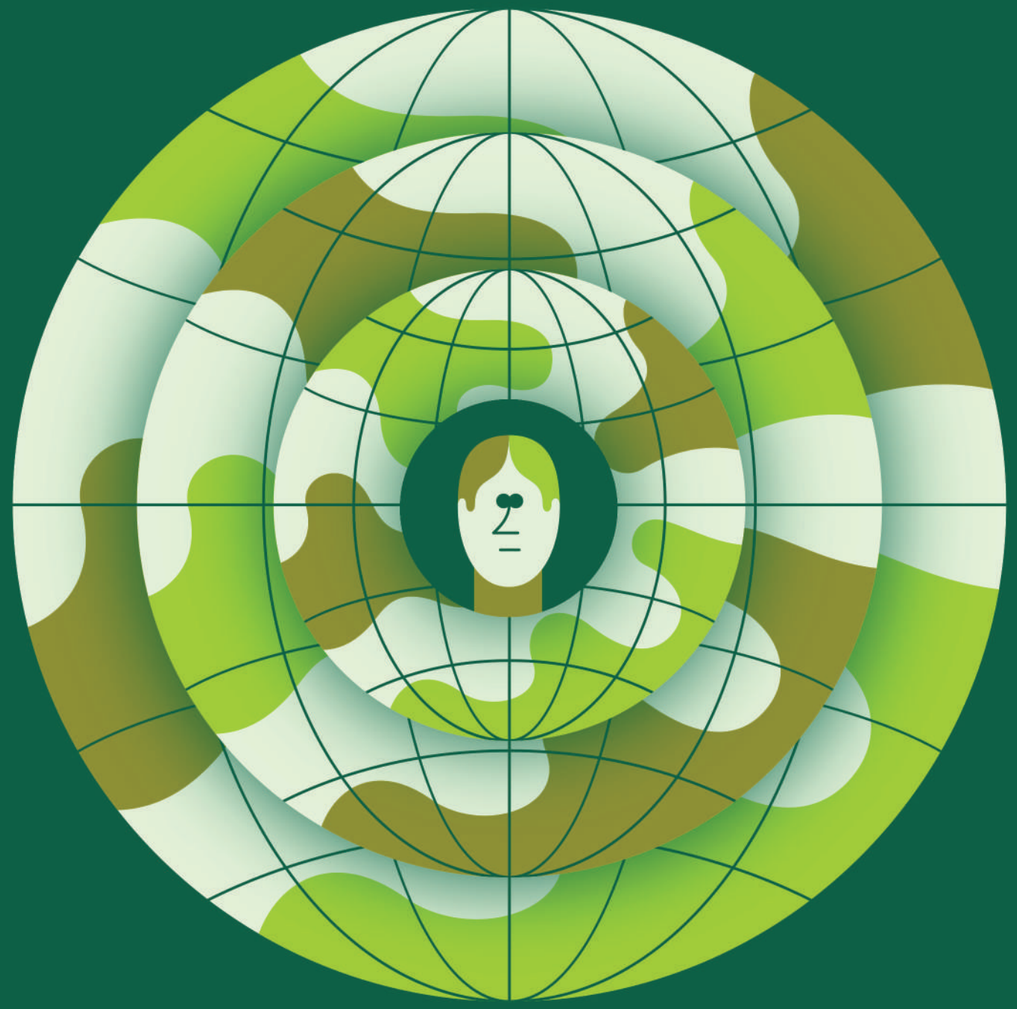
That's a significant saving. However, the reliability of wind and solar is constrained by fluctuating power output due to weather patterns and daily availability of sunlight. Dean emphasizes that achieving the ambitious climate targets set around the world — such as the Biden administration's goal of 80% renewable energy by 2030 and 100% carbon-free by 2035 — requires the deployment of carbon-free energy solutions. These solutions also need to be available now and capable of generating dependable power to consistently meet demand. Nuclear power ticks all these boxes.

Dean underscored her statement by pointing out that, according to the International Energy Agency, in 2022, the decline in nuclear power generation due to both maintenance and continued phaseouts led to an increase in carbon emissions. "Removing nuclear energy from the renewable energy mix is actually hurting our efforts at limiting warming," Dean says.

Bernstein, the visiting scholar who tracks changing attitudes regarding nuclear energy, believes that people may accept some level of risk associated with nuclear power if it provides clean and reliable energy. "It's a trade-off that many people may find acceptable," she says. "Let's not forget, emissions from tailpipes are killing people every day. Nuclear energy is not."



The Human Factor



Individual attitudes toward renewable energy and climate change are based on myriad psychological factors that range from the straightforward to the obscure. So, what motivates us to make positive changes?

By Meredith McGroarty

Comprehending the scope of climate change can feel like trying to connect an ever-expanding set of dots. Disparate indicators, such as rising global temperatures, retreating glaciers and increasingly severe weather events, are frequent reminders that life on Earth is shifting. This constant influx of worrying news can make people feel overwhelmed, confused and fatalistic, unsure of how — or if — they can help offset transformations taking place regionally, let alone half a world away.

USC Dornsife scholars are conducting research to better understand how people obtain and process information on climate change and make decisions regarding energy use. By examining the role that external factors — such as the pricing and availability of alternative sources of energy — and internal motivations, including self-identity and personal beliefs, play in driving these choices, they are finding valuable insights to help shift the conversation.

"Individual behavior change in the direction of more climate-friendly decision-making is crucial for the future of our planet," says Joe Árvai, Dana and David Dornsife Chair and Wrigley Institute director. "To encourage positive action, we need to look at what motivates people to make important daily changes, such as investing in non-fossil fuel-based vehicles or cutting back on things like eating meat."

A BALANCED APPROACH

Árvai, professor of psychology and biological sciences, explains that good decision-making often involves a balance of analysis and emotion. For people to make environmentally friendly energy decisions, these ways of thinking need to inform one another. Having the critical thinking skills necessary to discern good information from false, and being able to process data to understand how individual behavior can contribute to — or mitigate — climate change are two abilities necessary for calculation. At the same time, engaging our emotions helps us determine what we do or do not like, what does and does not excite us, and what feels like the right thing to do for our neighbors and the planet.

Once people understand the interplay between analysis and emotion, organizations such as companies and governments can work to develop strategies that trigger both so that people can make better decisions in their daily lives.

"We are looking at decision support tools, ones you might find in a showroom or in a search engine, that help people understand the range of goals in play when they are contemplating a 'green' decision," Árvai says. "What kinds of data, comparisons and trade-offs are going to help people make the choice that makes the most sense for them given their values and financial realities?" While not everyone can afford an electric vehicle, almost everyone can make small steps in a greener direction, he adds.

"You need to figure out who you're talking to, what they care about, and what trade-offs they are willing to make given their current situation. And then you need to show what's possible within that range of opportunities and constraints," Árvai says. "If we're going to promote and facilitate a more climate-friendly lifestyle, the most important thing we can do is respect people and meet them where they are."

APPEALING TO A BROADER CONSUMER BASE

Diversity in energy messaging is necessary to reach a broad swath of the population. But one of the issues in this arena is the fact that renewable energy items like electric vehicles and solar panels do not fit seamlessly into the lives of most people, particularly those at the lower end of the socioeconomic spectrum, says Dean's Professor of Psychology Daphna Oyserman, professor of psychology and education. Currently, Oyserman explains, "living green" is still packaged and viewed as a luxury lifestyle choice, available to those who can afford to buy a luxury electric vehicle or hire a landscaping team to craft a garden filled with native plants.

Measures such as rebates for electric vehicles and tax breaks for the installation of solar panels have helped increase affordability, but people on lower incomes — who likely live in a rented home with no access to a vehicle charging station or solar panels — are often left out. In addition, decisions such as whether to purchase an energy-saving appliance can be economically challenging for low-income households, since many of these devices cost more than their wasteful counterparts.

"If energy-efficient appliances and cars are more expensive, then taking care of the environment is being framed as a kind of boutique identity," Oyserman says. She adds that there is a double impact to such a situation: Those who cannot afford to adopt these measures may end up feeling that environmentalism is not part of their social identity, but something that is owned by people who do not look like them. That is why some activists have tried to connect environmentalism with pollution concerns — having access to clean air and water is not something people can do alone; it requires active engagement in the political process.

Financial incentives that give property owners, including landlords, an impetus to install energy-saving items such as electric vehicle chargers and solar panels are one step toward greater adoption of environmentally friendly behaviors, Oyserman says. But this will take time, given that more alternative energy infrastructure will need to be developed before the cost can start to decrease. Individual choices are important, but engaging in the political process is often overlooked as an efficient way to engage in environmentally friendly behavior.

IN WHOSE BACKYARD?

Developing this infrastructure, however, is not without its own complications and requires the acquiescence of another set of individuals: those who live in communities adjacent to proposed renewable energy plants. Jennifer Bernstein, a visiting scholar at USC Dornsife's Spatial Sciences Institute, says that individual and community sentiment regarding such projects is often complicated and tricky to gauge.

"There's a dichotomy between the fact that we all want renewable energy, but folks who advocate the most for the renewables are often the ones who think that they need to be developed somewhere else, far away," she says.

Bernstein notes that when determining where to locate renewable energy plants, spatial scientists focus not only on quantifiable metrics, such as waste or pollution output, but also on how such factories affect — and are received by — people living nearby. Some lower-income areas respond well to the prospect of extra jobs, Bernstein explains, while wealthier retirees might need to be persuaded that the impact on their lives will be minimal.

Although people may have an initial, knee-jerk negative reaction to an industrial solar or wind plant in their own neighborhood, these concerns may not last, she says.

"I've looked at attitudes toward nuclear power, and there's something called a 'good-neighbor effect,' where the people who live closest to nuclear plants are the most supportive of them," Bernstein says. "I think communication between residents, developers and scientists would go a long way toward dismantling these presumptions people have about industrial energy development."

ENGAGING THE EMOTIONS

We can publish data on severe weather events, wildfires and rising temperatures all day long, but until we connect with people emotionally, they are unlikely to take consistent steps toward fighting climate change, Árvai says.

"A lot of people in government or at private companies look at climate change as a math problem that can be 'solved' by looking at things like cost or carbon footprint," he says. "But viewing it in this way increases psychological distance from it, which may make people feel less compelled to act. We need to look at climate change not just as a math problem to be solved, but as a human problem we can work through together."

ILLUSTRATIONS BY GREG MABLY FOR USC DORNSIFE MAGAZINE

The Library That Oil Built



Irish American oil tycoon and philanthropist Edward L. Doheny Sr., with trowel in hand, performs the groundbreaking for USC's Edward L. Doheny Jr. Memorial Library in June 1931. Doheny donated $1.1 million ($20 million in 2023 dollars) to build the library at USC after the tragic shooting of his son, alumnus Edward "Ned" L. Doheny Jr., in 1929.

PHOTO COURTESY OF THE USC DIGITAL LIBRARY / LIBRARY EXHIBITS COLLECTION

With an entrance flanked by statues of Dante Alighieri and William Shakespeare, USC's Edward L. Doheny Jr. Memorial Library is a monument to great thinkers. It's also a reminder of Los Angeles' days as a booming oil town.

Hollywood may get all the glory now, but oil was once just as essential to L.A.'s meteoric rise to wealth and power.

The Los Angeles Oil Field, a narrow strip stretching from just south of what is now Dodger Stadium, to Vermont Avenue and Third Street, was once the most productive in California. At its peak in 1901, it was pumping out oil at a rate of 1.8 million barrels a year.

The oil boom was fortuitous for the nascent city, which, nestled in a basin surrounded by high mountains, was difficult to access. The lure of oil meant crucial infrastructure got built swiftly while the migrants who poured into the city, with dreams of striking it rich, provided invaluable labor.

Edward Doheny was the first Angeleno to make his fortune from oil. In 1892, he and his business partner, Charles Canfield, drilled the first productive well in the Los Angeles Oil Field, on the spot now occupied by the Echo Park Indoor Pool. Enormous wealth followed, but also personal tragedy.

In 1929, Doheny's son, Edward "Ned" Doheny, a USC alumnus, was tragically shot and killed. In 1932, Doheny and his second wife, Carrie "Estelle" Doheny, donated $1.1 million (around $20 million in 2023 dollars) to USC to build a library that would bear his son's name.

Estelle helped with design and furnishings, instructing that all the furniture be made in California. Doheny himself helped lay the cornerstone, and construction was complete within a year.

The stories of USC's past, such as this one about the origins of the Doheny Library, are getting special attention this summer. With funding from the USC Undergraduate Student Government, students from the USC Dornsife Van Hunnick History Department are embarking on research projects centered around USC.

"Our archives hold a vast amount of material for students to explore, from back issues of the *Daily Trojan* to faculty papers," says Lindsay O'Neill, associate professor (teaching) of history. "Students could use these sources to understand a diverse set of issues, such as ideas surrounding class and race, perceptions of sports or student attitudes toward past presidents. The opportunities are almost endless. We look forward to seeing what students come up with." —*M.C.*

Faculty News

CHRIS BELCHER, assistant professor (teaching) of writing and gender and sexuality studies, received the 2023–2024 Barnard Library Research Award.

ALICE BAUMGARTNER, assistant professor of history, received a National Endowment for the Humanities Fellowship.

YOUNGMIN CHOE, associate professor of East Asian languages and cultures, was awarded an Arts Writers Grant by the Andy Warhol Foundation.

MELISSA DANIELS-RAUTERKUS, associate professor of English, received the 2021 SAMLA 93 Award for her monograph *Afro-Realisms and the Romances of Race: Rethinking Blackness in the African American Novel.*

ROBIN COSTE LEWIS, writer-in-residence, received an NAACP Image Award for Outstanding Literary Work – Poetry for her new collection *To the Realization of Perfect Helplessness* (Knopf Doubleday Publishing Group, 2022).

MEGAN FIESER, Gabilan Assistant Professor of Chemistry, was named a Cottrell Scholar by the Research Corporation for Science Advancement.

SUSAN FORSBURG, Distinguished Professor of Biological Sciences, was named a Fellow of the American Society for Biochemistry and Molecular Biology.

SCOTT FRASER, Director of Science Initiatives and Provost Professor of Biological Sciences, Biomedical Engineering, Physiology and Biophysics, Stem Cell Biology and Regenerative Medicine, Pediatrics, Radiology, Ophthalmology and Quantitative and Computational Biology, received the Outstanding Researcher Award from SoCalBio.

VERA GLUSCEVIC, Gabilan Assistant Professor of Physics and Astronomy, was named a Cottrell Scholar by the Research Corporation for Science Advancement.

JOSHUA GOLDSTEIN, professor of history and East Asian languages and cultures, received the Joseph Levenson Prize (China, Post-1900) for his book *Remains of the Everyday: A Century of Recycling in Beijing* (University of California Press, 2020).

CHRISTIAN GROSE, professor of political science and public policy, received the 2023 Joseph L. Bernd JOP Best Paper Award for his article, "Social Lobbying," published last year in *The Journal of Politics.*

JOHN HAWTHORNE, Linda MacDonald Hilf Chair in Philosophy and professor of philosophy, and **JEFFREY RUSSELL, professor of philosophy**, received an Alvin Platinga Prize honorable mention from the American Philosophical Association for their essay "Multiple Universes and Self-Locating Evidence," co-authored with Yoaav Isaacs of Baylor University and published in *Philosophical Review.*

DAVID HUTCHINS, George and Louise Kawamoto Chair in Biological Sciences and professor of biological sciences, received the John H. Martin Award from the Association for the Sciences of Limnology and Oceanography.

JACQUES HYMANS, associate professor of international relations, has earned a Fulbright-Hays Faculty Research Abroad Fellowship.

CLIFFORD JOHNSON, professor of physics and astronomy, received the Andrew Gemant Award from the American Institute of Physics.

EMILY LIMAN, professor of biological sciences, received the 2023 Kenneth S. Cole Award from the Biophysical Society for her research achievements in the field of membrane biophysics.

DERRICK MORTON, assistant professor of biological sciences, received a 2023 Sloan Research Fellowship from the Alfred P. Sloan Foundation.

DAPHNA OYSERMAN, Dean's Professor of Psychology and professor of psychology and education, was elected a member of Nationale Akademie der Wissenschaften Leopoldina, Germany's National Academy of Sciences.

NATHAN PERL-ROSENTHAL, associate professor of history, spatial sciences and law, received a National Endowment for the Humanities Fellowship.

HILARY SCHOR, professor of English, comparative literature and law, received a National Endowment for the Humanities Fellowship.

NORBERT SCHWARZ, Provost Professor of Psychology and Marketing, received the Distinguished Scientific Contribution Award of the Attitudes and Social Influence Interest Section of the Society for Personality and Social Psychology.

Looking for Alumni News, Alumni Canon and Faculty Canon?
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HONORS

Van Cleve and Rohs Honored

A philosopher and a computational biologist are recognized for their exceptional scholarship.



VAN CLEVE PHOTO BY MIKE GLIER; ROHS PHOTO BY JODYE ALCON

James Van Cleve, professor of philosophy, joins a storied group of luminaries after being elected to the American Academy of Arts and Sciences.

The prestigious academy, founded in 1780, serves as a research center convening leaders from across disciplines, professions and perspectives to address significant challenges while also recognizing and celebrating the excellence of its diverse members.

Van Cleve is the 28th faculty member at USC Dornsife to be elected to the academy, which this year also adds author Zadie Smith, conductor Gustavo Dudamel and entertainment industry notables Shonda Rhimes, Michelle Yeoh and Lin-Manuel Miranda.

Named to USC Dornsife's full-time faculty in 2005, Van Cleve studies current problems in metaphysics and the philosophy of perception as well as early modern philosophers. —*D.S.J.*



Remo Rohs, professor of quantitative and computational biology, chemistry, physics and astronomy, and computer science, has been elected a fellow of the American Association for the Advancement of Science.

Rohs, founding chair of the Department of Quantitative and Computational Biology, uses computational and experimental approaches, including artificial intelligence (AI), to understand mechanisms of gene regulation. Such mechanisms describe how proteins that regulate genes, called transcription factors, detect and interact with specific regions of the genome.

"My lab deciphers gene regulatory mechanisms through AI, machine learning and biophysics to understand development, aging and disease, and to develop drugs," he says. —*A.B.*

L.A. Poet wins Chowdhury Prize

Victoria Chang is the first poet to win USC Dornsife's Chowdhury Prize in Literature.



Hailed by critics as an exciting voice in contemporary poetry, Victoria Chang is the winner of the 2023 Chowdhury Prize in Literature.

Awarded by USC Dornsife's Department of English, with the support of the Subir and Malini Chowdhury Foundation and in collaboration with Kenyon College and *The Kenyon Review*, the $20,000 annual prize honors an accomplished mid-career writer considered to have significant potential for future achievement. It is the first international literary award of its kind on the West Coast.

In awarding the prize, the distinguished panel of judges described Chang as a deft stylist who isn't afraid to work across genres or to adapt forms as diverse as the obituary or the letter in service of her aesthetic ends. The result is a body of work that continually surprises, allowing readers to see both Chang and themselves anew.

A Guggenheim Fellow and the recipient of numerous literary honors, Chang is the author of six collections of poetry, including the award-winning *OBIT* (Copper Canyon Press, 2020) and *The Trees Witness Everything* (Copper Canyon Press, 2022), two books for young readers, and the nonfiction work *Dear Memory: Letters on Writing, Silence, and Grief* (Milkweed Editions, 2021).

"Victoria Chang's poetry and prose engage in powerful and deeply intimate conversations with grieving, always interrogating and testing the limits of memory," said University Professor David St. John, professor of English and comparative literature and chair of the Department of English at USC Dornsife. "She is one of our most public champions of the crucial importance of poetry in the life of contemporary culture."

The Chowdhury Prize administrator, David Ulin, professor of the practice of English at USC Dornsife and former *Los Angeles Times* book editor and book critic, said that the hallmark of Chang's writing is the willingness to confront difficult realities, including the specter of loss, familial and otherwise.

"Nuanced, insightful and unrelenting, her writing walks the line between her personal experience and the core humanity we all share," said Ulin, who is editor-in-chief of USC Dornsife's literary journal *Air/Light*.

Chang was honored at a gala ceremony at Town and Gown on USC's University Park campus on April 18.

"It's such an honor to receive the Chowdhury Prize in Literature because it is a prize that acknowledges the work I've made but also really focuses on the future, on possibility," she said.

"So much of being a writer is writing on a piece of paper alone, in isolation, without recognition or encouragement. The Chowdhury Prize in Literature provides that important gentle hand on my back to keep going, to keep putting words together in interesting ways, to keep trying to translate the human experience, my own unique personal experiences." —*S.B.*

CONGRATULATIONS to the winner of the second *USC Dornsife Magazine Creative* Writing Contest — Emma Ashley, a senior majoring in creative writing and French. Her winning entry, "Wet Season," was the unanimous choice of the contest's judges: Dana Johnson, professor of English and director of the USC Dornsife PhD Program in Creative Writing and Literature; David Ulin, professor of the practice of English and editor-in-chief of USC Dornsife's literary magazine *Air/Light*; and Susan Bell, editor-in-chief of *USC Dornsife Magazine*.

The contest, which for the first time was open to USC Dornsife alumni as well as USC Dornsife students, attracted 27 entries from nine alumni and 17 students across a diverse range of majors. The brief was to write a maximum of 500 words inspired by the theme of this issue, "Energy," in any of the following genres: fiction, poetry, memoir or essay.

WHAT THE JUDGES SAID ABOUT THE WINNER:

"'Wet Season' is a beautifully evocative meditation on human connection and impermanence, making something as ordinary as dirt particles that float in the air moving and resonant."

DANA JOHNSON, professor of English and director of the USC Dornsife PhD Program in Creative Writing and Literature

"With 'Wet Season,' Emma Ashley has written a poem that is stylistically sophisticated, emotionally energetic, and evocative of the deepest human feelings of loss and longing. It's a lovely, understated piece of work."

DAVID ULIN, professor of the practice of English and editor-in-chief of USC Dornsife's literary magazine *Air/Light*

"Emma Ashley's moving poem beautifully evokes deeply meaningful feelings of loss, nostalgia and mortality, deftly conveyed through such seemingly mundane objects as a steaming kettle and a tuna sandwich."

SUSAN BELL, editor-in-chief of *USC Dornsife Magazine*

To read the second and third place winning entries visit: **dornsife.usc.edu/runners-up**.

Wet Season

By Emma Ashley

When I die will I steam like a tea kettle?
The one at my grandmother's house is silver

and whistles; in the night
its music bounded in stone and moonlit

woods. In this quiet dark I'd
sneak to the shower room

for the wetness of water droplets
hot on my legs, the easy bliss of a

showerhead, the puckering chill of the tile
against my back, reclined.

In Chicago it's white and plastic,
flimsy, as if it would melt

the moment my eyes
unfocused, steam turning stale wooden cabinets

to mulch. Back then, you'd come downstairs
to make a tuna sandwich

as I waited for the water to boil.
Now I forget to respond to your messages

and I can't even imagine dying,
I don't know what it would look like;

would you steam like that screaming kettle in the woods?
In California it's raining,

dirt particles suspended in the air
weighed down by new humidity, washed

away, drops jump through
the gap under my door.

They leave a big wet mark, I wait for it to
evaporate in the cold –

and where is the summer we were promised?
Where are the grandchildren?

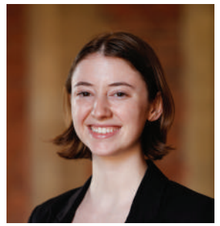
When I finally call you back over
the timefolds, you talk about the poems

you've been writing, the satisfaction, the fear, emergent
and punishing now in this last season.



ILLUSTRATION: ISTOCK; ASHLEY PHOTO BY WILL CHIANG

PHOTO BY PAT CRAY



Emma Ashley, a senior studying creative writing and French, is originally from Oak Park, Illinois. Always interested in the shape of space and time, Ashley was inspired to write her winning entry, the previously unpublished poem "Wet Season," as a way to think about the distances between herself and her loved ones, both across the world and over the years.

Ashley started writing poetry in 2019 during her freshman year at USC Dornsife, finding relief in the art as a practice of reflection. She continued writing during the pandemic and says she has since "fallen in love with the process of careful and loving reflection that poetry requires." Now in her final year at USC Dornsife, Ashley is the recipient of the 2023 Silverman Family Memorial Award for poetry and plans to continue pursuing her journey as a poet after she graduates. Her work has appeared in *Palaver Arts Magazine* and *Zeniada Magazine*.

Please note that the *USC Dornsife Magazine* Creative Writing Contest will be on hiatus during the magazine redesign but will resume in 2024. Please be on the lookout for contest details online at dornsife.usc.edu and in your alumni and student e-newsletters.

USC DORNSIFE SCHOLARS IN THE NEWS

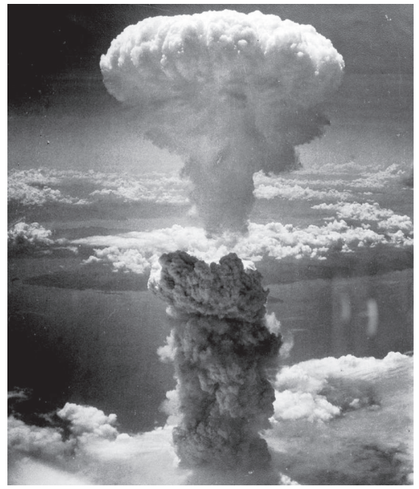
ORANGE COUNTY REGISTER



"We have three incredible historians from USC help us out: one who knows everything about L.A. history [William Deverell], one who knows L.A.'s Mexican community history [Natalia Molina], and one who was our legal expert [Elizabeth Logan]."

MICHAEL BEGLER, the showrunner of HBO's *Perry Mason*, in an interview about the acclaimed, noir-inspired show, set in 1930s Los Angeles.

EUROPA PRESS



"Large-scale nuclear strikes are considered unfeasible. Strategic nuclear weapons are losing their deterrent value in a war between nuclear powers."

NINA SRINIVASAN RATHBUN, professor (teaching) of international relations, in a story regarding tactical nuclear weapon deployment.



LAIST

"If someone told me I had a one-in-a-thousand chance to win the Super Lotto, you know I'm playing. And yet people are like, 'Ah, it won't happen this year.'"

WILL COWAN, environmental historian, in a story about L.A.'s devastating 1862 "megaflood." Megafloods have a one-in-a-thousand chance of occurring every year.

AXIOS



"What's really interesting about colorblindness is that it sounds perfect. In theory. But in reality, colorblindness is a way to obfuscate systemic inequality."

HAJAR YAZDIHA, assistant professor of sociology, in a story regarding the weaponization of the words of Martin Luther King Jr.

MONEY

"At least temporarily it does appear to restore a sense of control and reduce any residual sadness that people might be experiencing."

JORGE BARRAZA, director of the Master of Science in Applied Psychology program and assistant professor (teaching) of psychology, in a story that explores why online shopping makes people happy.



BBC

"You really have to ask yourself … why would this happen in humans and not chimpanzees, not bonobos, not gorillas?"

TINA LASISI, postdoctoral researcher in quantitative and computational biology, in a story that explores why humans don't have fur.



PERRY MASON PHOTOGRAPH BY MERRICK MORTON/HBO; NUCLEAR BOMB, MEGAFLOODS AND MARTIN LUTHER KING JR. IMAGES SOURCE: WIKIMEDIA COMMONS; WIKIMEDIA COMMONS; CREDIT CARD AND CHIMPANZEE IMAGES SOURCE: ISTOCK

ALSULTANY ILLUSTRATION BY KHALIAH REED; CHINA IMAGES COURTESY OF ISTOCK; DORNSIFE DIALOGUES IMAGE BY JAN MATEJKO; ORR PHOTO BY WENDY MALECK / COURTESY OF USC DIGITAL ARCHIVES

THE WRAP

"We're starting to see Muslims in a context that has nothing to do with terrorism. We're finally seeing some examples of Muslims as complicated people."

EVELYN ALSULTANY, professor of American studies and ethnicity, in a story about changes in the representation of Muslims on TV, following former President Trump's travel ban.



SPECTRUM NEWS ONE



"The European Union and Macron himself went in, hoping … that they could convince China that their long-term interest laid more with the Europeans and Americans than with Russia, and China flatly said, 'no.'"

ROBERT ENGLISH, associate professor of international relations, Slavic languages and literatures, and environmental studies, regarding an April summit between the leaders of France and China.



DORNSIFE DIALOGUE

"Comedy and violence have a very interesting relationship to one another. When you do well, you 'knocked them dead,' 'you killed that.' And then if you did wrong, 'you bombed.'"

CRUZ ARROYO, PhD candidate in English and scholar of stand-up comedy, in the Dornsife Dialogues event titled "Stand-Up Comedy: Its Historic Influence on Society."

REMEMBERING



Devoted Trojan

Religion professor helped launch some of USC's most distinctive programs.

Professor Emeritus of Religion John Orr helped usher in a number of programs that define USC's commitment to the surrounding community and to academic curiosity. Orr passed away on Feb. 25 at 89.

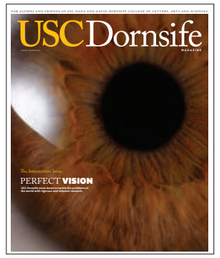
After receiving his PhD from Yale Divinity School, Orr joined USC Dornsife's School of Religion in 1967. He became director in 1970. He was a co-investigator for a National Endowment for the Humanities grant that launched the university's Thematic Option program, which continues today.

From 1981 to 1988, Orr served as Dean of the USC Rossier School of Education. Under his leadership, the school partnered with the USC Suzanne Dworak-Peck School of Social Work and the university at large to launch the Inter-Professional Initiative, the predecessor to the USC Family of Schools. The program now helps provide quality education to some 17,000 students in the neighborhoods surrounding the USC campuses.

Orr returned to the School of Religion in 1988. In the wake of the Rodney King uprising of 1992, he worked with Donald Miller, Leonard K. Firestone Professor of Religion, on a research project exploring how faith communities in Los Angeles were building a more just metropolis. Their report attracted the attention of the James Irvine Foundation, which provided funding to create the USC Dornsife Center for Religion and Civic Culture.

For Miller, Orr's decades-long work at USC reflected one of his core values. "Loyalty was a prime value for John. I think this came from a philosopher that he read and valued, Josiah Royce. The basic idea of loyalty is, if you're going to have a community, people need to be loyal to each other and to the values of that community." —*M.C.*

TELL US WHAT YOU THINK

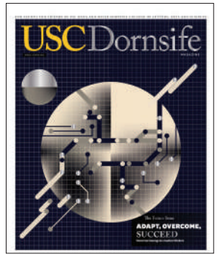




















Magazine Redesign

We are excited to announce that *USC Dornsife Magazine*, which hasn't had a design refresh in 12 years, is about to experience a makeover. You'll see it reflected in the Spring/Summer 2024 issue (we won't publish a Fall/Winter issue this year).

THIS IS YOUR ALUMNI MAGAZINE — AND YOU HAVE A SAY IN THE PROCESS

Before we embark on the redesign, we would love to get your feedback on what you value in the magazine, what you would like to see change and what you would like to stay the same. Please take a few moments to answer some brief questions — the survey should take no more than five minutes.

Complete the survey online at **survey.usc.edu/dornsife-magazine**, scan the QR code to the left or fill out the printed survey on the facing page and mail it to:

USC Dornsife Magazine
USC Dornsife College of Letters, Arts and Sciences
1150 S. Olive Street, T2400
Los Angeles, CA 90015-2400

ENTER TO WIN OUR PRIZE DRAWING

Once you have completed the survey, you may then choose to enter a random drawing for the chance to win a **$250 USC Bookstores gift card** or **two tickets to the Nov. 4 USC Dornsife Homecoming Picnic, plus two tickets to the game**.

Although we do request your first name for the prize drawing, your personal information will not be tied to your answers, so please provide your honest opinions.

Thank you for participating in the 2023 *USC Dornsife Magazine* Readership Survey.

The deadline to complete the survey is Aug. 31.

The winners of the random drawing will be notified by Sept. 15.

To fill out the survey online visit:
survey.usc.edu/dornsife-magazine

2023 USC DORNSIFE MAGAZINE READERSHIP SURVEY

Generally speaking, how much do you enjoy or not enjoy reading *USC Dornsife Magazine*? CHECK ONE ANSWER.
☐Enjoy a great deal ☐Enjoy somewhat ☐It depends on the topic ☐Don't enjoy very much ☐Don't enjoy at all

What do you enjoy most about *USC Dornsife Magazine*? IN A FEW WORDS OR SENTENCES, PLEASE WRITE YOUR ANSWER BELOW.

Do you agree or disagree? "Reading *USC Dornsife Magazine* strengthens my pride in being part of USC Dornsife." CHECK ONE ANSWER.
☐Strongly Agree ☐Agree ☐Neither agree nor disagree ☐Disagree ☐Strongly disagree ☐I rarely or never read it

Generally speaking, do you prefer to read *USC Dornsife Magazine*: CHECK ONE ANSWER.
☐In print **(ANSWER NEXT QUESTION)** ☐Online **(SKIP NEXT QUESTION)** ☐Both online and in print **(SKIP NEXT QUESTION)**

ANSWER THIS QUESTION ONLY IF YOU READ THE MAGAZINE IN PRINT, NOT ONLINE
If you read *USC Dornsife Magazine* only in print, is that more because:
☐You prefer to read it in print instead of online ☐You were not aware that it is available online

When you read an issue of *USC Dornsife Magazine*, do you generally: CHECK ONE ANSWER.
☐Read every article ☐Read the articles that most interest you ☐Skim it ☐Mostly just look at the pictures

When you read an issue of the magazine, how much time do you typically spend overall? CHECK ONE ANSWER.
☐1-14 minutes ☐15-29 minutes ☐30 minutes to 60 minutes ☐More than 60 minutes

Do you display the current issue of the magazine on a coffee table or somewhere else in your home? CHECK ONE ANSWER.
☐Yes ☐No

Based on the issues you have read, how would you rate the overall quality of *USC Dornsife Magazine*? CHECK ONE ANSWER.
☐Excellent ☐Very good ☐Good ☐Fair ☐Poor ☐Not sure

In *USC Dornsife Magazine*, do you prefer to read: CHECK ONE ANSWER.
☐Reporting about recent USC Dornsife projects and events ☐Journalistic articles on timely topics that draw on expertise/insights of USC Dornsife scholars
☐No preference, or both equally

As you may know, Alumni News (including Engagements, Marriages, Births and Deaths; and Alumni Canon) is no longer listed in the magazine but can be found online. Which do you prefer? CHECK ONE ANSWER.
☐Alumni News updates in the magazine twice a year ☐Continuous access to Alumni News updates online

Generally speaking, if you found a magazine topic or story interesting, how likely would you be to watch or read additional online content about it on the *USC Dornsife Magazine* website? CHECK ONE ANSWER.
☐Very likely ☐Somewhat likely ☐Neither likely nor unlikely ☐Somewhat unlikely ☐Very unlikely

Has reading *USC Dornsife Magazine* ever inspired you to: CHECK ALL THAT APPLY.
☐Attend an alumni/USC function or connect with an alumni organization ☐Recommend USC Dornsife to students/their parents ☐Consider a USC Dornsife education for yourself or a family member ☐Volunteer to mentor or create an internship/job opportunity for current students ☐Make a gift/contribution or leave a legacy to USC Dornsife ☐Support specific research at USC Dornsife

Have you ever shared an issue of *USC Dornsife Magazine* and/or individual articles from the magazine with other people and/or on social media? CHECK ONE ANSWER.
☐Yes **(ANSWER THE NEXT THREE QUESTIONS)** ☐No **(SKIP TO FIRST QUESTION ON THE NEXT PAGE)**

How often have you shared articles or the magazine with others? CHECK ONE ANSWER.
☐Every issue ☐Most issues ☐Occasionally

With whom did you share the magazine or articles from the magazine? CHECK ALL THAT APPLY.
☐Family members ☐Friends ☐Co-workers ☐USC Dornsife alumni ☐Social media ☐Other

How did you share the magazine or articles from the magazine? CHECK ALL THAT APPLY.
☐Via a social media post ☐By emailing link to online version of magazine/article ☐By clipping and mailing an article
☐By scanning and emailing an article ☐By lending or gifting the print issue

2023 USC DORNSIFE MAGAZINE **READERSHIP SURVEY** (continued)

To help us understand what we are doing well and where we might do better, please let us know how you feel about the quality of the following aspects of *USC Dornsife Magazine*, based on as many issues as you may have read.
PLACE ONE CHECK MARK IN EACH ROW, CORRESPONDING TO YOUR RATING OF THE QUALITY OF THAT ELEMENT.

	Excellent	Very good	Good	Fair	Poor	Not sure
Story topics						
Writing						
Cover design						
Illustrations						
Photography						

Which of the following topics, if any, would you be most interested in reading about as the theme for an upcoming issue of *USC Dornsife Magazine*? CHECK ALL THAT APPLY.
☐California ☐Climate ☐Environment ☐Health and wellness ☐History ☐Imagination ☐Leadership ☐Pop culture ☐Science ☐Sustainability
Other (please write in your answer)_____

The following content items have not been included, or do not always appear, in *USC Dornsife Magazine*. How often would you prefer to see each type of item included in future issues? PLACE ONE CHECK MARK IN EACH ROW.

	Always	Often	Occasionally	Never
Alumni profiles				
Faculty profiles				
Student profiles				
More innovative storytelling such as photo essays, Q&As, etc.				
Puzzles/Quizzes				
Other (please specify)				

In a few words or sentences, do you have any overall suggestions for improving *USC Dornsife Magazine*? PLEASE WRITE YOUR SUGGESTIONS CLEARLY BELOW.

_____

_____

_____

Thank you for filling out our survey. We have just a few more questions about you.

Which of the following describes your affiliation with USC Dornsife? CHECK ALL THAT APPLY.
I am ☐An alumnus/a ☐A parent of current and/or former USC Dornsife student(s) ☐A current USC Dornsife student (undergraduate/graduate)
☐A USC faculty/staff member ☐A USC Dornsife friend/donor ☐Not affiliated with USC Dornsife ☐ Other (please specify) _____

In which year were you born? _____

With which groups, if any, do you identify? CHECK ALL THAT APPLY.
☐Asian/Pacific Islander/Desi American ☐Black/African American ☐Latinx/Hispanic ☐Middle Eastern/North African
☐Native American/Indigenous/Native Hawaiian ☐White ☐First-generation college student ☐LGBTQIA+ ☐Other (please specify) _____
☐Prefer not to answer

With which gender do you most align? CHECK ALL THAT APPLY.
☐Woman ☐Man ☐Transgender ☐Gender nonconforming ☐Non-binary ☐Genderqueer ☐Another identity ☐Prefer not to answer

What is the zip code of your main U.S. residence? (Or country, if outside the U.S.) _____

If you would like to be entered into a random drawing for a $250 USC Bookstores gift card or two tickets to the Nov. 4 USC Dornsife Homecoming Picnic, plus two tickets to the game, please provide your first name and at least one way to contact you (email, telephone or mailing address).

First name: _____ Email: _____ Telephone: _____

Mailing address: _____

PHOTO BY MIKE TIGER



RIDE ON!
A student skateboarder harnesses kinetic energy and momentum to perform an ollie outside the Allan Hancock Building on USC's University Park Campus.

USC Dornsife
Dana and David Dornsife
College of Letters, Arts and Sciences

University of Southern California
SCT-2400
Los Angeles, California 90089

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Life Moment

ALL POWER TO THE CLASS OF 2023



PHOTO BY ILIANA GARCIA