

Annual Report of Research

2019



Oregon State
University

Collaborating for Success

Solutions stem from strong partnerships



BY IREM Y. TUMER, INTERIM VICE PRESIDENT FOR RESEARCH

Like many major organizations and businesses, Oregon State University thrives on collaboration. Working closely with faculty researchers, OSU leaders and other partners has given me a new appreciation for the power of conversation, communication and the open exchange of ideas. This give-and-take leads to fruitful — and often unexpected — results.

Having moved to OSU 13 years ago from NASA's highly collaborative Ames Research Center, it is difficult for me to imagine a place where colleagues work in their offices alone. Whether in serendipitous encounters or in formal gatherings, the sharing of fresh, new and inspiring perspectives fuels our amazingly productive research enterprise.

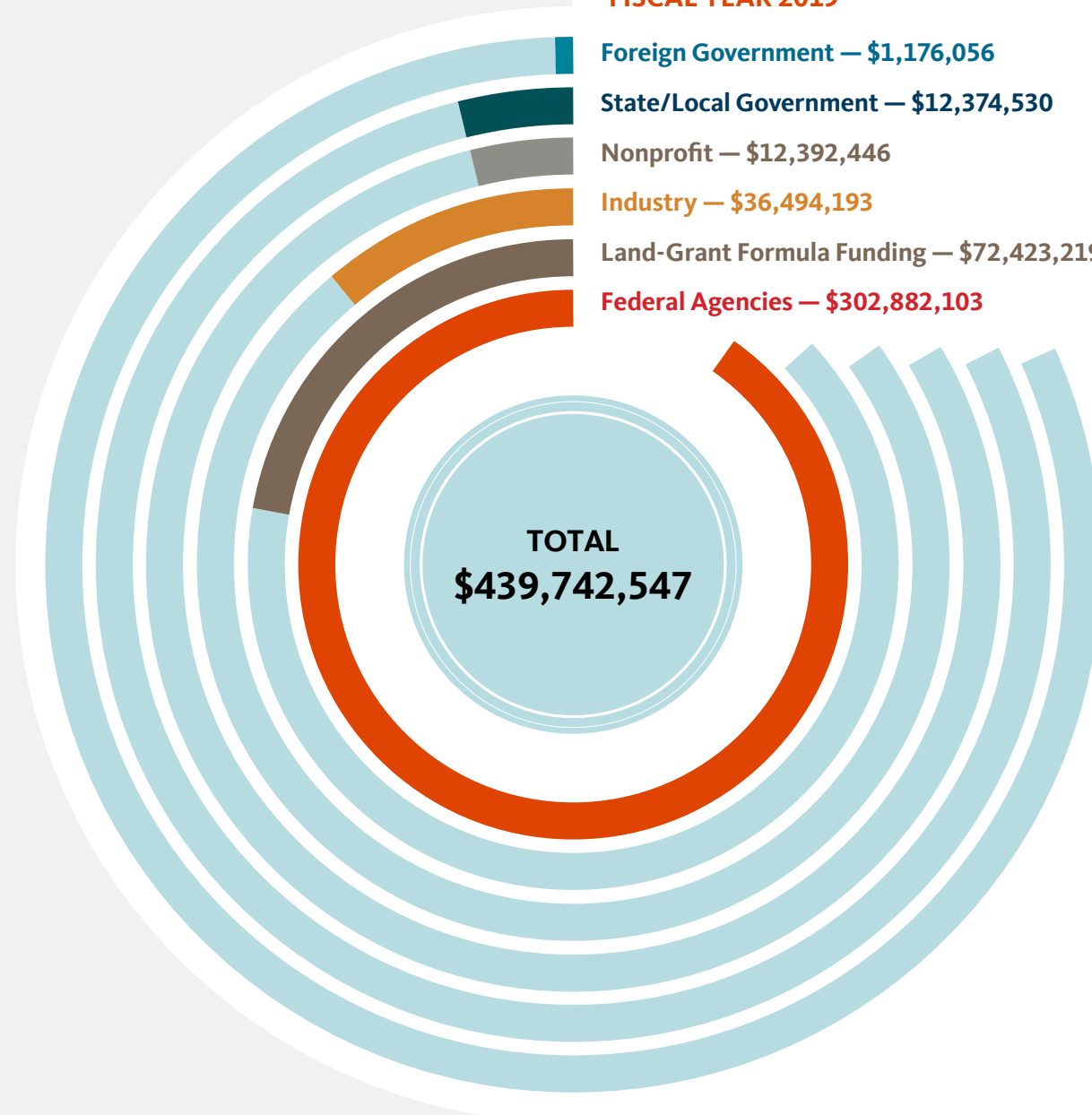
This dynamic — part art, part science — derives from the OSU community's commitment to probe and seek solutions to some of our planet's most vexing issues: water availability, food production, infectious diseases, disaster response and climate change. Much of this work occurs at the intersection of diverse disciplines: science and liberal arts, engineering and human health, technology and music. Together, we inspire new ways of thinking, generate economic and social benefits and ultimately save lives.

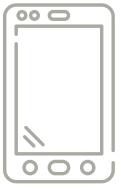
In my role at OSU, I am honored to help lead endeavors that achieved a 15% increase in research funding in the last fiscal year. This accomplishment reflects constant collaboration and relationship building, key elements of the university's foundation, established 150 years ago to serve Oregon — and now serving the nation and the world.

ON THE COVER: Viviana Perez, right, and Andrew Drake, an undergraduate in her lab, study the biochemistry of aging. They explore the mechanisms by which the drug rapamycin can slow aging and improve health in mice. Perez is an associate professor in the Department of Biochemistry and Biophysics in the College of Science and the Linus Pauling Institute. (Photo: Hannah O'Leary)

SUMMARY OF RESEARCH GRANTS AND CONTRACTS AWARDED

FISCAL YEAR 2019





Safety in Numbers

HazAdapt sets a new bar for emergency response

In 2017, Ginny Katz had an epiphany. Personalized, location-based communication software, such as apps used in social media platforms, could assist people in large public emergencies. Earthquakes and active-shooter situations can generate a flood of appeals for help, overwhelm the 911 emergency response system and delay effective responses. She saw a need for improvement.

Katz is a Ph.D. student in human geography at Oregon State University and advised by Assistant Professor James Watson, who directs the Socio-Environmental Analysis (SEA) Lab in the College of Earth, Ocean, and Atmospheric Sciences.

She created a startup company, HazAdapt, to help the public and emergency managers foster personal and community resilience. With a boost from the University Venture Development Fund in the Oregon State University Advantage program, Katz refined her goals and studied the market for emergency management software. The market serving students and university professionals alone is estimated at \$150 million a year.

Her collaborators include graduate students and professors Margaret Burnett and Anita Sarma in OSU's School of Electrical Engineering and Computer Science.

"I have been surprised and thankful. The people I share this dream with have jumped on it heart and soul," says Katz.

Virginia Katz, left.



HAZARDS:
The dangerous event, risk, or item

Types: *Active Shooter*, Fire, Chemical Exposure

HAZARD TABLE			
Type	ID	Treatment Info	Response Protocol

Standard Response per HAZARD

Situation *Factors*

[Hazard(s)] *Single or Multiple / Same type or different types*

[Place] *Location of People there*
Reports within 50 Feet of each other

[Time] *When MM/DD/YYYY 00:00*
Reports within 30 min of each other

USER REPORTS / ALERTS

USER → EMERGENCY MANAGER

Info Sent

Hazard Type: *Active Shooter*
Time: *12:01pm Aug 11, 2017*
Location: *Latitude / Longitude / Library*
Sender Info: *Name, Activation, Training, Trust, Phone number*

EM ALERTS / ALERTS

EMERGENCY MANAGER → Internal Response → External Response

External Response: *EMS, Fire, Police*

Out of the Shadows

Global Hemp Innovation Center revives research on ancient crop



Jay Noller



Oregon State University officials have launched the nation's largest research center devoted to the study of hemp. Under the leadership of Jay Noller, former head of the Crop and Soil Science Department, the hemp center will coordinate research in Oregon and other parts of the United States and with partners in Europe and China.

For example, researchers will use a \$1 million gift from a private company, Oregon CBD, to study hemp genomics. Among the potential benefits are better disease resistance, higher productivity and more predictable product quality.

"We want to understand how to efficiently and sustainably grow hemp. Multiuse hemp is what we are excited about globally," says Noller. Such uses could include:

- Fiber materials for textiles and construction.
- An alternative to gravel in concrete.
- Hemp oils for health and wellness applications.
- Hemp grain in foods.

OSU is already recognized internationally for expertise in hemp cultivation, says Alan Sams, dean of the College of Agricultural Sciences. "We believe that Oregon State University is uniquely positioned to serve the global need for research-based understanding of hemp as a crop and for its use in new products."

The decision to create the center follows discussions with state and federal officials and congressional passage of the 2018 Farm Bill, which decriminalized hemp cultivation.

BY THE NUMBERS

40

OSU faculty in 19 academic disciplines engaged in hemp research and Extension

1,342

Oregon growers licensed in 2019 to raise hemp

46,219

Acres licensed for hemp production in Oregon in 2019

\$22 billion

The market for hemp-derived cannabidiol (CBD) by 2022
(Source, the Brightfield Group)

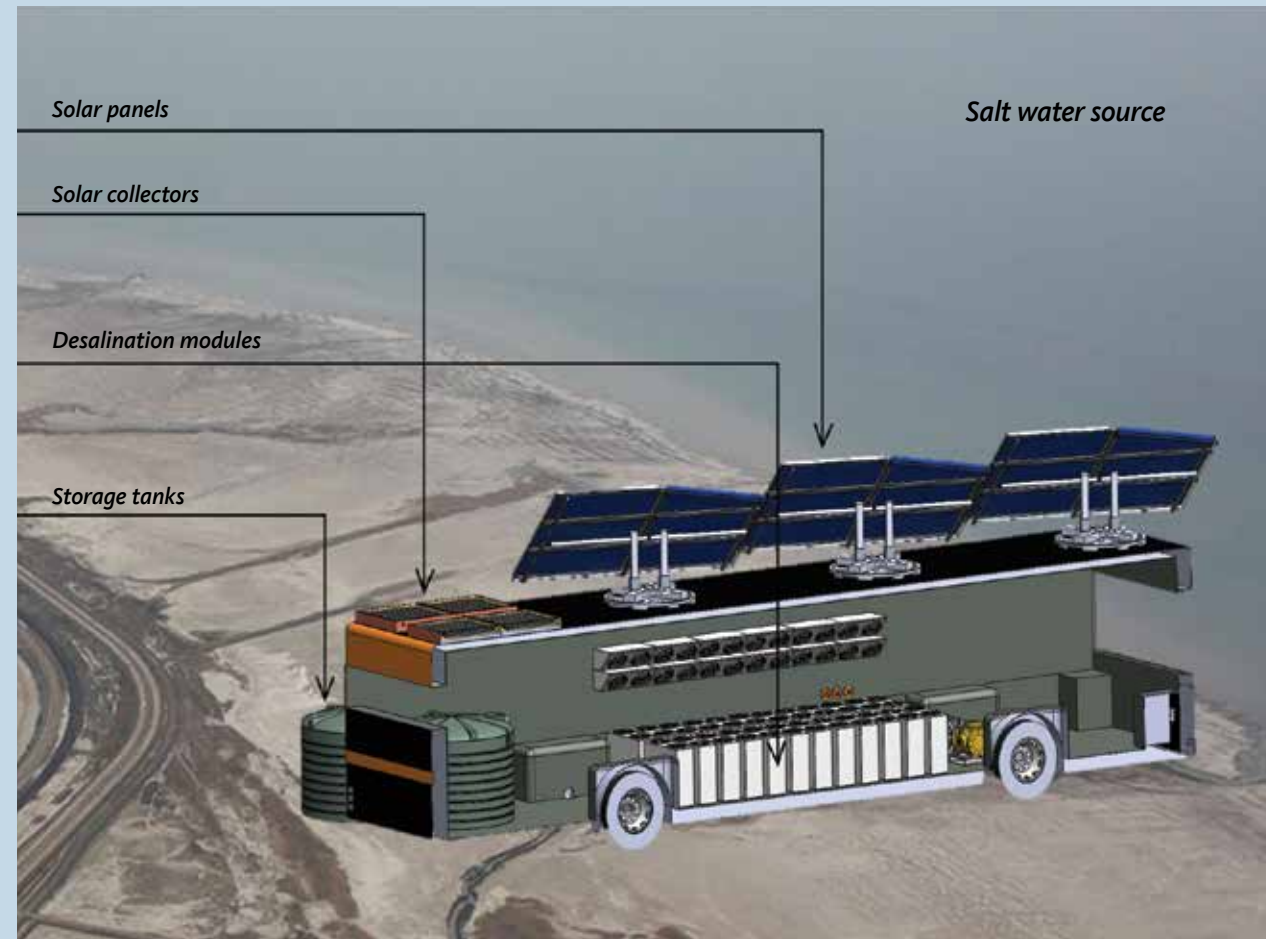
Drinking Water from the Sea

Modular technology could replace energy-hungry desalination



Bahman Abbasi

When Oregon State University-Cascades researcher Bahman Abbasi sees industrial-scale, fossil-fuel powered water desalination, he envisions an energy-efficient alternative: portable systems that can be set up where needed and powered by a range of heat sources, including the sun. Abbasi leads a multi-university team taking an innovative approach to desalination as part of a \$21 million U.S. Department of Energy (DOE) program.



“We need to make water production very modular and portable, so it’s closer to the point of consumption,” he told *Engineering Out Loud*, a podcast produced by the OSU College of Engineering.

The assistant professor of mechanical engineering worked as an associate at Booz Allen Hamilton and a technical adviser to DOE before joining OSU-Cascades in Bend in 2017.

“Fresh water is an increasingly scarce resource in many regions around the globe,” says Abbasi. “Our goal is to develop a transportable and off-grid desalination system that can be used along coast-

lines, other bodies of water, or in conjunction with existing desalination plants to deliver fresh drinking water to water-stressed communities, particularly those most in need.”

The team includes researchers at Michigan State University, the University of Maryland and the University of Nevada-Reno. Undergraduate students in the energy systems engineering program at OSU-Cascades contributed to the design of the proposed system.

Is There a Pill for That?



Jessina McGregor

Overuse of antibiotics threatens health

Antibiotics have saved millions of lives, but penicillin discoverer Alexander Fleming hadn't even left the stage with his 1945 Nobel Prize before warning that, if used improperly, an antibiotic would help illness-causing microorganisms evolve to become drug resistant.

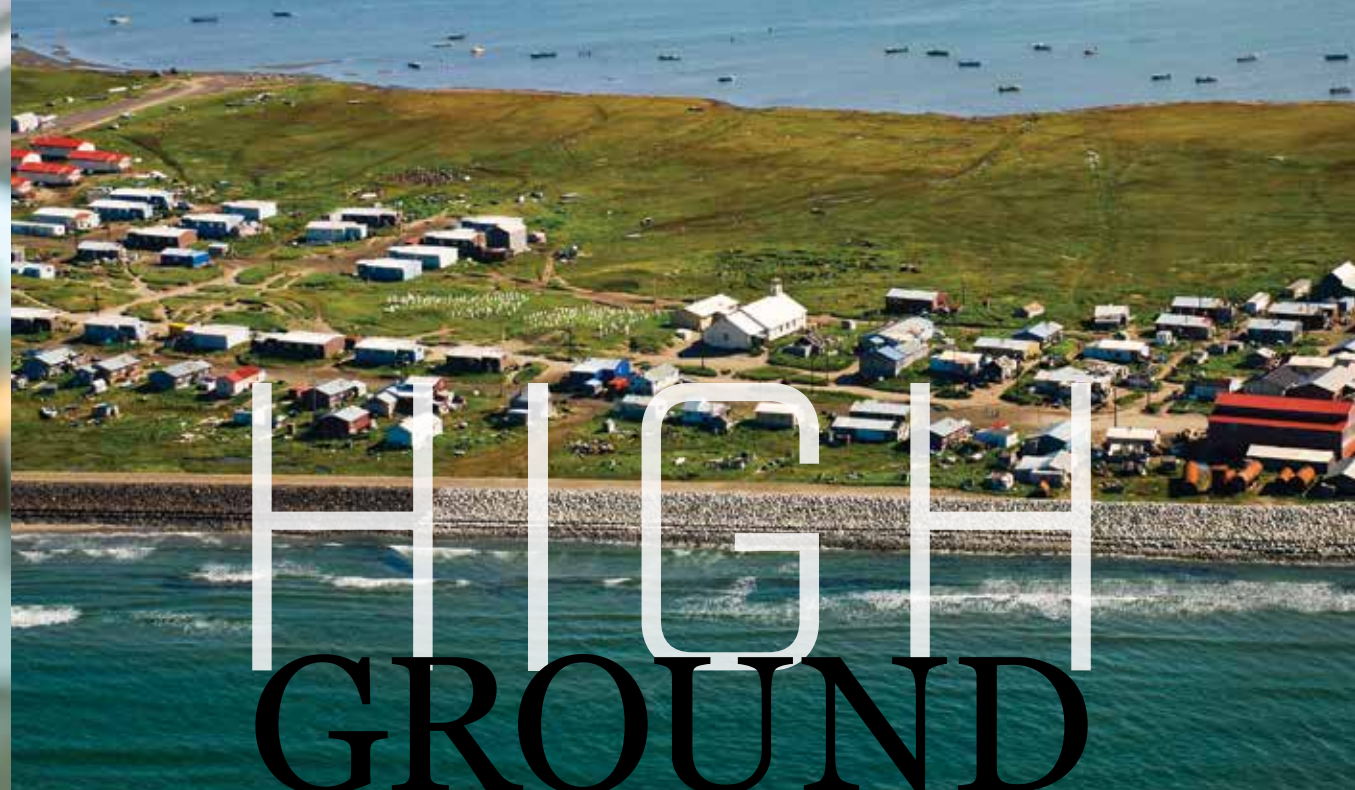
Fleming's prediction has come true. Antibiotic resistance is a growing global threat. Every year, 2 million people in the United States are infected with drug-resistant bacteria. The annual toll is up to 100,000 deaths and health-care costs of more than \$20 billion.

Oregon State University's Jessina McGregor, an associate professor in the College of Pharmacy, would like to reduce these sobering numbers. As a national researcher in antibiotic stewardship, she studies

whether prescribers are following best practices designed to slow down resistance and avoid exposing patients to possible side effects.

In 2019, McGregor and her collaborators found that antibiotics prescribed by dentists, who write 10% of all antibiotic prescriptions in the U.S. as a preemptive strike against infection, are unnecessary 81% of the time. McGregor has also co-authored a Society for Healthcare Epidemiology white paper on antibiotic stewardship research that provides a road map for the most-needed areas of study.

"Antibiotics are frequently used across all health-care settings, and much of the use is not needed," she says. "But defining 'appropriate antibiotic use' is challenging without good data from well-designed studies. Our work aims to optimize care for individual patients and limit the spread of drug resistance."



It takes a village to move out of the flood zone



Elizabeth Marino

When a flood strikes, federal agencies may help homeowners by buying out their homes. In some cases, properties deemed vulnerable to future floods may be purchased and turned into parklands so that residents can move out of harm's way. That's been done in Texas, the Midwest and elsewhere.

However, Elizabeth Marino, assistant professor of anthropology at OSU-Cascades in Bend, says such solutions may not work in locations where residents want to relocate together — as a community. With a \$750,000 three-year grant from the National Science Foundation, Marino leads an evaluation of relocation policies, other case studies of moving and their application in Shishmaref, a native Inupiat village in Alaska.

Shishmaref is threatened with flooding by rising sea levels and erosion from wave action and storms. "If tribes want to relocate, they often want to relocate near or on traditional territory," says Marino. "There's an implied ethnocentrism to policies that apply to the nuclear family rather than to the community."

For her graduate work, Marino lived in Shishmaref and interviewed people about flood risks. Her book *Fierce Climate, Sacred Ground: An Ethnography of Climate Change in Shishmaref, Alaska* was published in 2015 by the University of Alaska Press.

GROWING Partnerships

New lab focuses on the future of wood

Forestry, engineering and design are driving the next generation of wood products in the A.A. “Red” Emmerson Advanced Wood Products Laboratory. The 17,500-square-foot lab, part of the Oregon Forest Science Complex, opened in October. It is the home of the TallWood Design Institute, an interdisciplinary partnership between OSU’s colleges of Forestry and Engineering and the University of Oregon’s College of Design. TallWood’s focus is the advancement of structural wood products and mass timber design in constructing high-rise and other multistory buildings. “Our mission is to use this space as a model of how we can pair Oregon’s intellectual capacity with our natural resources and capitalize on our spirit of innovation,” said Anthony C. Davis, interim dean of the College of Forestry.



Oregon State University
Research Office

A312 Kerr Administration Building
Corvallis, OR 97331-2140
T: 541-737-3467 | F: 541-737-9041