

**FISCAL YEAR 2020
ANNUAL RESEARCH REPORT**



WASHINGTON STATE
UNIVERSITY

Greetings!

Research, scholarship, and creative activity, including the pursuit of new knowledge, is an essential part of Washington State University's land-grant mission. Our researchers untangle complex problems and apply new knowledge to create solutions that enrich the quality of life for us all. While many newsworthy research developments and breakthroughs happened throughout fiscal year 2020, the COVID-19 pandemic set the course of science and propelled researchers at home and abroad to the forefront of discovery. Research conducted by WSU faculty, staff, and students has played a vital role in our understanding of COVID-19 and, therefore, has positively impacted the people of our state, region, nation, and world.

While the pandemic shifted the way we live, work, and interact with other people, another pivotal moment, the death of George Floyd, shaped the course of the year and society as a whole, which renewed a racial justice movement and sparked the largest racial justice protests in the United States since the civil rights movement. The protests led to a major shift in the country, especially in raising awareness about racism and police brutality.

While COVID-19 amplified existing significant economic, gender, and racial inequalities, both in research and our everyday lives, George Floyd's death provided an opportunity for society to become conscious of personal biases and systemic racism, setting forth a path to create real and lasting change.

Over the years, WSU scientists have studied the effects of inequality in an array of areas, presenting solutions for going forward. As part of the Office of Research's commitment to supporting our Black, Indigenous, and People of Color (BIPOC) research community, this report highlights research conducted by our BIPOC researchers and the research that impacts these communities. In the pages that follow, we feature research with high impact that tackles challenges around inequality and promotes diversity throughout society.

Additionally, we also celebrate the incredible achievements of our entire research community, despite being one of the most challenging years in recent history. While FY2020 ended significantly different than it began, WSU scientists continued to conduct research with high societal impact. In FY2020, research and development (R&D) expenditures totaled \$335.2 million. WSU also set a record \$6,488,304 in royalty income, which includes licensing revenue from the successful launch of the Cosmic Crisp® apple.

We also celebrated milestones reached by our researchers, including the election of eight WSU faculty members to the Washington State Academy of Sciences. Other major achievements include Sue Brannon Clark receiving the 2020 Glenn T. Seaborg Award for Nuclear Chemistry, Yuehe Lin being named a fellow of the National Academy of Inventors, and Anastasia Tucker chosen for an Andrew W. Mellow Fellowship for Diversity, Inclusion, and Cultural Heritage.

To learn more about the life-changing research, scholarship, and creative activity unfolding at WSU, please read on—and stay up to date on all WSU research and services offered by the Office of Research by visiting research.wsu.edu.



Dr. Christopher J. Keane
Vice President for Research, WSU
Vice Chancellor for Research, WSU Pullman



Most Notable Research Stories

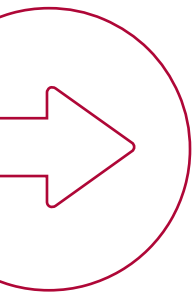
Strategic Research Investment Program (FY2017–FY2021)

In 2016, WSU strategically invested resources into research, academic, and student success programs with the potential for a wide societal impact. The research component, referred to as the Strategic Research Investment Program, funded four research projects for the period FY2017–FY2021:

- ▶ Functional Genomics Initiative
- ▶ Health Equity Research Collaborative (HERC)
- ▶ Nutritional Genomics and Smart Foods for Optimal Nutrition and Health in Diverse Populations
- ▶ Maximizing the Potential for Green Stormwater Infrastructure to Save Energy and Provide Clean Water for People and the Fish They Eat

The program has hired 16 researchers with four hires still pending. As a result of the program, a total of \$11 million has been invested into these key areas of research including \$3.5 million provided to support the Center for Institutional Research Computing, which provides state-of-the-art high-performance computing resources and expertise to advance computational and data-intensive research across WSU. The program has garnered \$209 million in research awards with a return on investment of 19. As a result of the success of the program, the Strategic Research Investment Program will be a model for future hiring in key initiatives, programs, and research strengths.

Some salient achievements for each project are:



The **Functional Genomics Initiative (FGI)** has enhanced key core facilities to further the functional genomics program as well as evolved into well-utilized campus resources, increasing competitiveness of over 20 research groups. To date, the FGI has received over \$43 million in research grants and published 27 collaborative articles. Additionally, Jon Oatley's work on surrogate sires was featured in a *Nature* editorial and has received worldwide [press attention](#). In addition, this group established a task force on policy development for gene editing in livestock by joint efforts of the Association of Public and Land-Grant Universities and the American Association of Veterinary Medical Colleges. Another accomplishment is the expansion of research collaborations benefitting livestock production systems of Sub-Saharan Africa.

The **Health Equity Research Collaborative (HERC)** established a network of collaborations with community health centers throughout Washington that serve poor, Hispanic, and rural populations. In conjunction with the Institute for Research and Education to Advance Community Health (IREACH), HERC established a practice-based research network linking hospitals and clinics, which will allow for electronic record sharing for research purposes. During this period, HERC has received \$109 million in research grants and has 88 collaborative publications.

The **Nutritional Genomics and Smart Foods** project, now known as the **soil to society** initiative, had a goal to establish WSU as a world leader in this area. To date, the team has received \$57 million in research awards and has authored 61 collaborative articles. Additionally, a graduate certificate in human nutrition and development is being developed to complement the existing graduate certificate in sustainable agriculture. Kevin Murphy, the project's director, received national recognition when elected the 2019 chair of the Crop Science Society of America's Division of Biomedical, Health Beneficial, and Nutritionally Enhanced Plants.

The **Green Stormwater Infrastructure** project has received \$47 million in research grants and published 12 collaborative articles, including Jenifer McIntyre's co-led "Ubiquitous Tire Rubber-Derived Chemical Induces Acute Mortality in Coho Salmon," accepted in *Science*. The stormwater team has made progress in expanding its messaging and has continued student stormwater training and graduation from the School of the Environment.



Washington State University Responds to COVID-19 Global Pandemic

Researchers at Washington State University are constantly overcoming challenges, typically within their field. But this year, researchers also had to pivot research, scholarship, and creative activities to the uncertainties of a pandemic. In March 2020, the World Health Organization declared COVID-19 a global pandemic. As a result, Washington state Governor Jay Inslee issued a “Stay Home, Stay Healthy” order. Research activities ramped down shortly thereafter as research institutions grappled with the beginnings of now common mitigation strategies to prevent the spread of COVID-19: social distancing, masking, increased sanitation and hygiene, personal protective equipment (PPE) use, testing, contact tracing, vaccination, and other public health measures.

The impact was different for each research activity. Some research activities were essential and safety decisions were made quickly to continue work, such as research involving the well-being of animals or preserving key plant, tissue, cell-line, environmental, or other samples. Other groups were able to quickly pivot their research to address aspects of the pandemic. Finally, some research interests halted entirely, most notably projects involving human subjects.

WSU's research expertise and extensive research infrastructure has provided essential support to the university

system-wide and the local and regional community throughout the pandemic. Faculty with expertise in infectious disease, immunology, epidemiological modeling, health sciences, and other areas assisted and advised university leadership to make science-informed decisions incorporating the best available data in practice and policy. The Washington Animal Disease Diagnostic Laboratory formed WSU One Health Diagnostics, in partnership with Incyte Diagnostics, to provide molecular laboratory testing for the SARS-CoV-2 virus at the request of the Washington State Department of Health, performing more than 80,000 tests on regional diagnostic samples. WSU researchers and staff also tested wastewater from the Pullman campus and local K–12 schools for COVID-19 to quickly identify and contain potential infections before they became outbreaks. In late spring 2020, the Office of Research led efforts with faculty, staff, students, and administration to develop guidance released later in June describing the process for a staged return to on-site research, scholarship, and creative activity. The result was an increase in on-site research activities, consistent with cognizant public health and WSU general guidance. Research personnel were therefore the first sector of university personnel to return on-site. Nuanced guidance was further developed to assist research activities specific to human subjects, monitoring activities for safety,

and projects that required careful review by subject matter experts.

COVID-19-related research revealed inequalities highlighted by the pandemic. Female scientists reported a larger decline in research time than their male peers. Suyeon Lee and Sara Waters demonstrated that Asian Americans have experienced **elevated racial discrimination** during the COVID-19 pandemic, including hate crimes, microaggressions, and vicarious discrimination. These experiences are associated with poorer self-reported mental and physical health. Additionally, research by Courtney Meehan and collaborators established the **safety** of breastfeeding infants of women diagnosed with COVID-19, as their data did not demonstrate **maternal-to-child transmission** of SARS-CoV-2 via milk. Researchers also provided expertise to inform WSU operational activities via committees and publication. Eric Lofgren served as an infectious disease epidemiology scientific advisor to leadership while continuing to **understand** the pandemic's effect on **hospital networks, incarceration dynamics,** and **sporting events** using mathematical and computational models of disease transmission. These are a few examples of the WSU research commitment to bringing practical benefits to the state, nation, and global community, as our land-grant ideals support the pursuit of research with broad societal impact.

Most Notable Research Stories

Language is power

The Center for Digital Scholarship and Curation at WSU develops collaborative projects between scholars, students, and diverse community members with an emphasis on ethical curation and equitable access.

One project is the co-curated and managed Plateau Peoples' Web Portal, a trove of Native American culture and a resource for teachers and community members working together to revitalize Native languages and cultures.

Kim Christen, director and professor in the digital technology and culture program in the **College of Arts and Sciences** and director of the Center for Digital Scholarship and Curation, prefers the term revitalization to preservation because preservation conjures the idea that these materials and languages are not ongoing, critical parts of living cultures. The word also invokes a past in which the US government simultaneously sought to document disappearing Native

languages while at the same time promoting genocide.

Native children were forced into boarding schools that engaged in a brutal program of assimilation. Speaking a Native language was forbidden. Since languages carry religious knowledge, knowledge of kin and knowledge of place, these policies enacted cultural violence and traumas that extend to the present.


Someone can't learn the full extent of an Indigenous language except through social and cultural immersion because words come from the landscape, relationships, and the accumulated knowledge that results from living in and being related to a place for many millennia.

Christen and her colleagues work with Native educators to create curricula that get students out on the land to learn the language and the knowledge that goes with it. Indigenous communities are

asking, "How do we use our language to empower the next generations to extend knowledge, to build relationships, and to define how we want to live with the environment and others?"

Revitalization projects also emphasize how Indigenous people decide what they want to share. Instead of research models where Indigenous peoples are subjects, projects of digital repatriation focus on collaborations that make Indigenous knowledge a central concern.

Native peoples have long known that not all cultural knowledge should be shared the same way. The trauma of historical events, such as the experience of Indian boarding schools, for example, can be retriggered by something as seemingly benign as a photograph of an old building. So, Christen and her team developed software and a purposeful, collaborative workflow that respects Native knowledge and what should be shared.



*Kim Christen,
director and professor
in the digital technology
and culture program
in the College of Arts
and Sciences*

The Asian giant hornet, the world's largest species of hornet.

Photo courtesy WSDA



WSU scientists enlist citizens in hunt for giant, bee-killing hornet

More than two inches long, the world's largest hornet carries a painful, sometimes lethal sting and an appetite for honeybees. It's also the newest insect invader of Washington state.

The Asian giant hornet, *Vespa mandarina*, is unmistakable. Adults are 1.5 to 2 inches long, with a large yellow or orange head and a black-and-yellow-striped abdomen.

They are a significant predator of honeybees. Attacking hives, a single hornet can kill dozens of honeybees in minutes. A group of 30 hornets can destroy an entire hive of 30,000 bees in less than four hours.

Susan Cobey, bee breeder with the **College of Agricultural, Human, and Natural Resource Sciences'** Department of Entomology; Todd Murray, a WSU Extension entomologist and invasive species specialist; and other WSU scientists are bracing for the giant hornet's emergence.

Researchers are working with the Washington State Department of Agriculture (WSDA), beekeepers, and citizens to find it, study it, and help roll back its spread.

In the first-ever sightings in the United States, WSDA verified two reports of the Asian giant hornet in December 2019 near Blaine, Washington, and received two probable but unconfirmed reports from sites in Custer, Washington.

At home in the forests and low mountains of eastern and southeast Asia, the hornet feeds on large insects, including native wasps and bees. In Japan, the hornet devastates the European honey colonies which have no effective defense, unlike Japan's native Asian honeybee colonies which suffocate the hornet scouts in a heat ball. Their stings are big and painful, with a potent neurotoxin. Multiple stings can kill humans, even if they're not allergic.

The Asian giant hornet's life cycle begins in April, when queens emerge from hibernation, feed on plant sap and fruit, and look for an underground den to build their nests. Once established, colonies grow and send out workers to find food and prey, becoming a threat to honeybees in the fall as their protein needs heighten.

Beekeepers, WSU Master Gardener volunteers, and other Extension clients are often the first detectors of invasive species. WSU scientists are now spreading awareness of the hornet to citizens and developing a fact sheet to help people identify and safely encounter the insects.

Scientists with the WSDA Pest Program are taking the lead on finding, trapping, and eradicating the pest. The agency plans to collaborate with local beekeepers and WSU Extension scientists and entomologists, with WSU focusing its efforts on management advice for beekeepers.

Most Notable Research Stories

Premature mortality linked to race and socioeconomic deprivation in Washington

Researchers at the **Eelson S. Floyd College of Medicine** released a report in *Health & Place* showing that premature mortality—death occurring before the age of 65—is three to eight times more likely among people of color from low-income neighborhoods compared to more-affluent Whites in Washington.

The study, which examined all registered deaths in Washington from 2011 to 2015, found that the combination of race and neighborhood socioeconomic disadvantage exponentially increased the incidence of premature death.

While socioeconomic deprivation alone was a predictor of premature mortality in the largely White (92 percent) population of Washington decedents—premature deaths were about one and a half times more common in Whites from more deprived areas than affluent areas—area deprivation was associated with more extreme likelihood of premature death for some racial categories.

Premature deaths among American Indian/Alaska Native, Black, and multiracial decedents from deprived areas were about three times more common than for more-affluent Whites. Deaths among Native Hawaiian/Pacific Islanders from deprived areas were nearly eight times as likely to be premature compared to deaths of more-affluent Whites. The one exception was Asian decedents who showed only a modest association between premature death and deprivation.

Pablo Monsivais, associate professor in the Department of Nutrition and Exercise Physiology, and his team analyzed the data, supplied by the Washington State Department of Health, of more than 240,000 deaths that occurred from 2011 to 2015 for which they could obtain the last residential address for individuals at the time of their death. Using those addresses, they classified each decedent's exposure to socioeconomic deprivation, as well as race, education, gender, and other

characteristics. Nearly one-quarter (23.5 percent) of all deaths were premature. Cancer and heart disease were the leading causes of premature death.

The research was funded in part by the Health Equity Research Center, an interdisciplinary network of WSU faculty, staff, and students working to understand the factors that promote health resilience and decrease health risks associated with poverty, discrimination, and poor access to health care.

Though further research is needed to identify the environmental and policy-related factors that may contribute to premature death among these populations, Monsivais and his team note that poor housing conditions, absence of healthy living facilities, lack of access to health and social services, and stress from financial insecurity likely play a part in the premature death disparities.





WSU researchers advance fuel cell technology

WSU researchers have made a key advance in solid oxide fuel cells (SOFCs) that could make the highly energy-efficient, low-polluting technology a more viable alternative to gasoline combustion engines for powering cars.

Led by Qusay Bkour, PhD graduate, and Su Ha, professor in the **Voiland College of Engineering and Architecture** School of Chemical Engineering and Bioengineering, the researchers have developed a unique and inexpensive nanoparticle catalyst that allows the fuel cell to convert logistic liquid fuels such as gasoline to electricity without stalling out during the electrochemical process. The research could result in highly efficient gasoline-powered cars that produce low carbon dioxide emissions that contribute to global warming.

Fuel cells offer a clean and highly efficient way to convert the chemical energy in fuels directly into electrical energy. They

are similar to batteries in that they have an anode, cathode, and electrolyte.

Unlike batteries which only deliver electricity they have previously stored, fuel cells can deliver a continuous flow of electricity as long as they have fuel. Because they run on electrochemical reactions instead of making a piston do mechanical work, fuel cells can be more efficient than the combustion engines in our cars. When hydrogen is used as fuel, the only waste product is water.

Fuel cells that run on gasoline tend to build up carbon within the cell, stopping the conversion reaction. Other chemicals that are common in liquid fuels, such as sulfur, also stop the reactions and deactivate the fuel cell.

For their SOFC fuel cell, the WSU team used an inexpensive catalyst made from nickel and then added nanoparticles of

the element molybdenum. Testing their molybdenum-doped catalyst, their fuel cell was able to run for 24 hours straight without failing. The system was resistant to carbon build-up and sulfur poisoning. In contrast, a plain nickel-based catalyst failed in an hour.

Liquid fuel cell technology has tremendous opportunities for various power-hungry markets, including transportation applications. The researchers are now making bridges with the automotive industry to build fuel cells that can run under real-world and longer-lasting conditions. The work was funded by the Office of Naval Research and Washington's Joint Center for Deployment and Research in Earth Abundant Materials (JCDREAM).

In addition to WSU, the research team included the University of Massachusetts Lowell, Stony Brook University, Brookhaven National Laboratory, Foshan University, and Pacific Northwest National Laboratory.

Most Notable Research Stories



WSU professor leads investigation into Islamophobia online

Muslim political candidates face a toxic online environment polluted by a small number of users that succeed in disseminating hatred through a web of automated bots and sock puppet accounts, new research led by a Murrow College researcher shows.

#Islamophobia: Stoking Fear and Prejudice in the 2018 Midterms was published by the Social Science Research Council, which helped fund the project, and its Media & Democracy program.

In the study, Lawrence Pintak, professor of communications in the **Edward R. Murrow College of Communication**, and his team examined more than 113,000 tweets posted in the lead-up to the 2018 midterm election mentioning then-congressional candidates Ilhan Omar,

Rashida Tlaib, and Omar Qudrat. Omar and Tlaib, both Democrats, were elected to represent Minnesota and Michigan, respectively, while Qudrat, a California Republican, lost his bid for Congress.

At least half of the tweets mentioning Omar, who immigrated to the United States when she was 12 years old, contained overtly Islamophobic or xenophobic language or other forms of hate speech. Around one in three tweets mentioning Tlaib, a United States-born Palestinian American, contained similar language. Qudrat's status as a conservative and former US military terrorism prosecutor in Afghanistan didn't prevent him from being similarly harassed online.

The most striking finding concerned the fact that much of the anti-Muslim narrative was

driven by a small handful of accounts. Their tweets were disseminated through throngs of automated bots and sock puppet accounts that conceal the true identity of their owners. The fact that more than 10 percent of accounts in Omar's and Tlaib's networks were suspended for violating Twitter's standards or were deleted less than a year after the election underscores the online presence of anti-Muslim actors.

These findings demonstrate that Islamophobia is not a widespread national sentiment, it's a form of manufactured outrage to which social media gives a vastly outsized voice. The research team included Brian J. Bowe of Western Washington University and Jonathan Albright of Columbia University.

Grizzlies show remarkable gene control before and during hibernation

Large hibernators such as bears have evolved to adapt to and reverse metabolic stressors they face each year before and during hibernation to essentially become immune to these ill effects.

New RNA sequencing-based genetic research conducted at WSU's Bear Research, Education, and Conservation Center shows grizzlies express a larger number of genes in preparation for and during hibernation to cope with such stressors than any other species studied.

The work was led by Heiko Jansen, professor in the **College of Veterinary Medicine** Department of Integrative Physiology and Neuroscience, in Pullman, Washington, home of the only university-based captive grizzly bear population in the world. WSU scientists biopsied muscle, liver, and fat tissues for the study.

Through sequencing RNAs, the team looked at hyperphagia, the period right

before hibernation when bears begin eating in excess in order to store energy as fat, and subsequent hibernation across six bears. Bears at this time of year would be considered morbidly obese by human standards.

All three tissues studied had dynamic gene expression changes occurring during hibernation. Perhaps more importantly, they discovered there was a subset of the same genes in all three tissues making the same changes at the same time.

Fat fuels hibernation and probably orchestrates the sparing of other tissues. But, despite the calorie intake and fat accumulation, bears do not suffer negative effects like people do. Furthermore, they reverse the process by switching genes on and off based upon the season.

Fasting a bear during the active season as if it is time to hibernate does not make the same genes switch on and off like it would in late fall. Feed a bear in

hibernation, and the genes can't be fooled then either; hibernation continues.

Fat tissue is metabolically active, being driven by the expression of over 1,000 unique genes in fat during hibernation as compared to the level of expression seen during the normal seasonal activities.

During the active period and subsequent hyperphagia, the genetic expression varied among the tissues studied. While many genes in fat were being differentially expressed, there were no genes being expressed like that in muscle tissue and only three were expressed differentially in liver tissue.

Differential gene expression also means genes may be upregulated or downregulated depending on the gene. Of the genes expressed in fatty tissue, more than 2,000 were upregulated and about 1,800 were downregulated in hibernation compared to the active season.



Most Notable Research Stories



Brick and mortar is here to stay

WSU's **Carson College of Business** found that nearly half of Pacific Northwest (PNW) consumers do most or all their shopping in-store, demonstrating the staying power of brick-and-mortar stores in the region.

According to the college's third annual holiday retail survey, 43 percent of consumers in the region prefer to do their shopping in-store, while only 17 percent prefer to shop mostly online—even though most consumers think Cyber Monday is the best day to find great deals.

The survey, conducted in partnership with Edelman, examined more than 1,700 PNW consumers' perceptions and attitudes toward the holiday shopping season and sought to understand how and where consumers are planning to do their shopping.

Key findings include:

- ▶ Consumers turn toward Cyber Monday for the best deals, while Black Friday continues to lose its allure.
 - Seventy-six percent of consumers plan to shop on Cyber Monday, while 56 percent plan to shop on Black Friday.
- Sixty-three percent agree Black Friday sales and promotions are overwhelming, and 58 percent agree there are better deals after Black Friday.
- Forty-nine percent of Baby Boomers think the best deals can be found during Cyber Monday, while 73 percent of Gen Z are excited for Cyber Monday deals.
- ▶ Consumers continue to prioritize spending time with family on Thanksgiving over shopping.
 - Only 26 percent of consumers are likely to shop on Thanksgiving.
 - Fifty-seven percent of those who plan to shop on Thanksgiving will shop online.
- ▶ The driving factors behind shopping in-store vs. online are propelled by quality service in-store and better savings online.
 - Sixty-eight percent like shopping in-store because they can see and feel products in-person, and 44 percent find inspiration for gift buying by walking around a store or mall.
- Eighty-one percent shop in-store at discount retailers, and 59 percent shop in-store at home improvement stores.
- ▶ PNW residents are thrifty and budget-conscious but may splurge more for the holidays.
 - While most consumers shop discount retailers (81 percent) and thrift stores (42 percent), the majority (51 percent) will likely go beyond their budget for holiday gifts.
 - Ninety percent don't think a lot needs to be spent on holidays, but only 49 percent have a strict budget.
- ▶ Small businesses may benefit from shoppers' appreciation for the perks of supporting local and a positive in-store experience.
 - Eighty-one percent of residents say local and small businesses provide better service than big box retailers.
 - Thirty-eight percent of Gen Z are aware of Small Business Saturday, while 62 percent of all consumers are familiar with it.

New research brings light to adversities Latinx school administrators face

New results published in the *Educational Administration Quarterly* show Latinx educational leaders have a unique ability to understand social justice leadership, as well as support current and aspiring leaders of color who seek to promote equity in their own work.

Many have lived experience through childhoods and educational histories that are fraught with inequity.

The research is being led by WSU Vancouver's Katherine Rodela, an assistant professor in the **College of Education**.

As part of her research, Rodela explored the stories of four Latinx school administrators across three districts in the Pacific Northwest.

The research started after Latinx leaders and teachers came to her to share their experiences. They explained how they often were the only people of color in their district. Many times, they were called to be an interpreter or to take on other roles. Being alone like this can be hard.

The experiences these Latinx leaders and teachers faced growing up shaped how they make their leadership decisions. Being able to take these unique struggles and turn them into strengths that work to improve the environments of their students is what Rodela describes as community cultural wealth.

Issues of racism in the schools, along with poverty and financial hardships growing up, were all experiences her participants faced. Each of her participants felt these issues

were "normal" for them. They often see themselves in their students.

For those who are not people of color, she hopes they will reflect on her research and take note of what they can do differently.

Each participant sees their differences as strengths in serving the families and students in their community. Racial, gender, and language identities play a part in the way they work toward equity in particular spaces.

Rodela plans on continuing her research with people of color and bringing awareness to their experiences. Her goals are to diversify the educator pipeline, build a strong supportive network, and continue to build a supportive community for people of color.



Most Notable Research Stories



Most teens report using marijuana less often after legalization

Only one group of teenagers used marijuana more often after retail sales were legalized in Washington than they did before—high school seniors who work 11 or more hours per week, according to research led by Janessa Graves, assistant professor in the **College of Nursing**.

Marijuana use went down significantly among 8th and 10th graders after legalization, and among 12th graders who didn't work. It stayed nearly even for high school seniors who work less than 11 hours per week.

The research on marijuana use and employment appears in the *Journal of Adolescent Health*.

Washington was one of the first states to approve legalization of marijuana for retail sale, with recreational cannabis stores opening in mid-2014.

The authors were interested in knowing whether legalization in Washington made a difference in marijuana use among 8th, 10th, and 12th graders who work in jobs that don't include household chores, yard work, or babysitting. They used data from the state's biennial Healthy Youth Survey from 2010 and 2016 in their study.

No matter what grade the students were in, those who worked 11 or more hours per week reported using marijuana more often than their nonworking peers.

Post-legalization, 4.8 percent of nonworking 8th graders reported using pot within the last 30 days, while 20.8 percent of their working peers did. Among 10th graders, 13.9 percent reported using marijuana within the last 30 days in 2016, versus 33.2 percent of 10th graders who worked 11 or more hours per week. The difference for 12th graders was 20.5 percent nonworking versus 36.7 percent working.

Teenagers who work usually come into contact with adults who aren't their coaches, teachers, and parents, and they are often exposed to adult substance use. In addition, working teens have more disposable income than their nonworking peers, the study notes.

Kids learn a lot by working, in terms of responsibility. But there are also pretty good data showing that kids who work engage in adult-like behaviors earlier. For any parent of working kids, it's important to know the quality of management and supervision at the child's job.

The study also suggests that employers could take action by advertising and enforcing zero-tolerance policies of adult employees providing substances or endorsing substance use to their adolescent coworkers.

Study identifies a potential new target for treatment of gout

Researchers have identified a new therapeutic target for the treatment of gout, a common type of arthritis that causes episodes of painful and stiff joints.

Their study suggests that blocking a signaling molecule known as TAK1 can suppress inflammation caused by gout. The research lays the foundation for the development of potential new treatment strategies that could significantly improve the quality of life of millions of people around the world who suffer from the condition.

Gout is caused by high blood levels of uric acid, a natural waste product from the digestion of foods that contain purines. Elevated uric acid levels can lead to the formation of monosodium uric acid (MSU) crystals that accumulate in joints. The immune system perceives these crystals as a threat and launches an immune response against them that increases the production of interleukin-1-beta (IL-1-beta), a cytokine protein that causes inflammation and triggers intense pain and swelling.

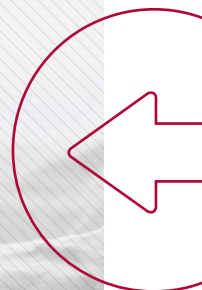
One of those proteins activated by IL-1-beta—TAK1—caught the interest of a research team led by Salah-Uddin Ahmed, professor of pharmaceutical sciences in the **College of Pharmacy and Pharmaceutical Sciences**, when their previous study suggested its key role in the regulation of IL-1-beta inflammation in rheumatoid arthritis. They designed a study to identify the molecular mechanism by which MSU crystals produce IL-1-beta inflammation and the role of TAK1 in this process. Using two different cell lines of human macrophages, they found that MSU crystals could directly activate TAK1 and other proteins that were previously thought to be dependent on IL-1-beta signaling for activation.

Researchers already knew that MSU crystals activate what is known as the inflammasome pathway, which produces IL-1-beta. However, the study found that MSU crystals also use an alternate pathway that triggers inflammation through TAK1.

Next, they showed that the use of a chemical that inhibits TAK1 could completely suppress any inflammation caused by MSU crystals, both in healthy human macrophage cells and a rodent model of gout.

Pending further research to confirm their findings in cells taken from patients with gout, the discovery could eventually be used to develop TAK1 inhibitor drugs to help patients manage gout flare-ups. It could also eventually be tested in other diseases that involve IL-1-beta mediated inflammation, such as multiple sclerosis, inflammatory bowel disease, and type 1 diabetes.

Ahmed's coauthors on the study include primary author Anil K. Singh, Mahamudul Haque, and Kayla O'Sullivan of WSU's College of Pharmacy and Pharmaceutical Sciences; Mukesh Chourasia of Amity University's Institute of Biotechnology in India; and Madhu M. Ouseph of the Stanford University School of Medicine.



University Achievements

WSU expands protein biotechnology program through a \$2.3 million NIH grant

The National Institute of General Medical Sciences at the National Institutes of Health (NIH) has awarded WSU NIH Protein Biotechnology Training Program with a \$2.3 million grant over the next five years to support training of doctoral graduate students. Renewing this competitive grant brings the total NIH investment into the program to more than \$10.4 million since it began in 1989, as one of the first nine NIH training grant programs in biotechnology.

This long-running training program provides essential support for interdisciplinary research and graduate education at WSU. Aligned with WSU's land-grant mission,

the training program produces versatile, adaptable scientists and engineers that are poised for productive careers developing biotechnological solutions to complex problems.

The NIH grant provides highly competitive stipends, tuition, and other support for 10 new graduate students per year. The grant is part of a broad partnership in biotechnology between NIH and five WSU academic degree programs (molecular biosciences, chemical engineering and bioengineering, immunology and infectious diseases, molecular plant sciences, and chemistry) located in four WSU colleges.

This nationally competitive program is the only biotechnology training program that has been funded continuously since 1989. WSU's program is unique in bringing together talented researchers and students from diverse areas and has fostered several collaborations, including working on problems related to wound healing, large scale protein production, and cultivating fastidious pathogens like the bacteria that cause citrus greening disease. More than 150 trainees have participated in the program and 45 are currently working toward their doctoral degrees.

WSU named a top producer of Fulbright US scholars

For the first time in its history, WSU was recognized as a top producer of Fulbright US scholars.

Seven WSU faculty members received Fulbright awards for 2019–2020, giving them the opportunity to teach and conduct research abroad as part of the cultural exchange initiative.

WSU supports the Fulbright program through the WSU Fulbright Academy, which helps faculty and students prepare competitive applications to become a Fulbright scholar. The academy also welcomes international Fulbright scholars to WSU. Visiting scholars work and study in partnership with WSU's leading faculty as they use the university's research facilities, exchange ideas, and increase mutual understanding between countries.

Each year, the US Department of State's Bureau of Educational and Cultural Affairs announces the top producing institutions for the Fulbright Program,

the US government's flagship international educational exchange program. The list is published annually by *The Chronicle for Higher Education*.

In 2019, three WSU students were named Fulbright scholars: Ryan Booth, a history doctoral student who studied in India; Melanie Kirby, a master's degree candidate and WSU's first National Geographic Storytelling Fellowship honoree who is researching bees in Spain; and Garrett Snedeker, a senior studying music in the United Kingdom.

WSU students regularly receive recognition in the form of national awards. Three STEM undergraduates this year alone received awards from the Barry Goldwater Scholarship and Excellence in Education Program, raising WSU's total number of recipients since 1990 to 41. Kristian Gubsch—one of the Goldwater recipients—was also the first WSU student to receive a Marshall Scholarship, one of only 46 American students to receive the award.

The Fulbright Program was created to increase mutual understanding between the peoples of the United States and other countries. The primary source of funding for the Fulbright Program is an annual appropriation made by the US Congress to the US Department of State's Bureau of Educational and Cultural Affairs. More than 2,200 US students and more than 900 US college and university faculty and administrators are awarded Fulbright grants annually. In addition, some 4,000 Fulbright foreign students and visiting scholars come to the United States annually to study, lecture, conduct research, or teach their native language.

Since its inception in 1946, the Fulbright Program has given over 390,000 students, scholars, teachers, artists, and professionals of all backgrounds and fields the opportunity to study, teach and conduct research, exchange ideas, and contribute to finding solutions to important international problems.

New doctoral program in Kenya focuses on mitigating the spread of emerging diseases

WSU researchers want to ensure when the next coronavirus pandemic occurs, medical professionals in Kenya have the training and tools to identify and mitigate the infection as soon as possible.

The WSU Paul G. Allen School for Global Health has been awarded a nearly \$1 million, four-year grant from National Institutes of Health to establish a new interdisciplinary doctoral training program in Nairobi, Kenya.

The new Zoonotic and Emerging Infectious Diseases Training Program will address a significant need by strengthening in-country research capacity for detection and response to zoonotic diseases, meaning those diseases that can be transmitted from animals to humans.

The Allen School is partnering with the University of Nairobi College of Health Sciences, the Faculty of Veterinary Medicine, and the Kenya Medical Research Institute. The program will leverage the team's ongoing infectious

disease program to identify emerging viruses such as coronaviruses, influenza viruses, Rift valley fever, and currently unknown causes of acute febrile disease and respiratory illnesses.

By detecting emerging infections and educating students and trainees, the program's staff protect humans and animals that could become infected or could be at risk of infection.

The training program includes two tracks—one for up to six physicians and veterinarians to earn their doctorate and a two-year course program for up to 10 ministerial or government personnel.

While the doctoral track is more traditional, the two-year program will take people who already work for Ministry of Health or Veterinary Services and provide them with additional expertise while not detracting from their full-time responsibilities.

Kariuki Njenga, who is leading WSU's COVID-19 response effort in Kenya,

together with the Kenya Ministry of Health and the United States' Centers for Disease Control and Prevention (CDC), said the program is designed to identify and address education gaps.

Njenga, a native Kenyan who received his bachelor of veterinary medicine at the University of Nairobi, said the program provides in-the-lab experience as well as the opportunity to participate in well-designed field studies.

Due to frequent interaction with livestock and wildlife, Kenya is a hot spot for zoonotic diseases.

Two-thirds of the Kenyan population are farmers and 80 percent of Kenyan farmers own livestock. In addition, wildlife is abundant and as the population increases, interactions between livestock and wildlife increase.

The program supports the WSU's One Health mission—the premise that human health is directly tied to the health of animals and the environment.



University Achievements



WSU College of Nursing celebrates 50th anniversary

The WSU College of Nursing celebrated the 50th anniversary of its founding in 1969.

From the first class of 37 students, the program has produced over 10,000 graduates with more than 80 percent staying in Washington after graduation. The college has expanded from one cramped location in Spokane's historic Carnegie Library to campuses and sites statewide. Now based on the WSU Health Sciences Spokane campus, it offers a range of degree options and its faculty have brought more than \$14 million in research funding to WSU in the past few years.

The college's greatest impact has been in reaching underserved citizens with free vaccination clinics and health screenings offered by students and faculty at schools, health fairs, and homeless shelters. It's in the People's Clinic that cared for the uninsured and under-insured in Spokane for a decade, and in the Ronald McDonald Care Mobile, a traveling clinic for children

staffed by college nurses. It's in outreach and support programs that have existed since the college's founding to serve students from rural areas and people of color.

WSU's nursing program began as the Intercollegiate Center for Nursing Education (ICNE), a consortium of Washington State University, Eastern Washington University, Whitworth College, and the now-closed Fort Wright College. Students spent their first two years at their home campuses and their last two years studying nursing, a model that's still used today.

The College of Nursing grew from a handful of visionary nurse leaders living in Spokane to today's largest brick-and-mortar nursing program in the state with over 1,000 enrolled students. The consortium of four schools was the first such program in the country. Rather than totally relying on textbooks and old-fashioned lectures, students learn skills via simulation using

high-tech mannequins and through flexible online programs.

The WSU-led consortium still includes Eastern Washington University (EWU) and Whitworth University. College of Nursing faculty were instrumental in forging agreements with Washington's community colleges to help students transfer seamlessly into the nursing program. Today, students from Whitworth, EWU, and community college transfers make up roughly 70 percent of each incoming class in the Bachelor of Science in nursing program.

ICNE opened a satellite program in Yakima in 1981, and nursing programs were part of WSU's expansion to the Tri-Cities and Vancouver in 1989.

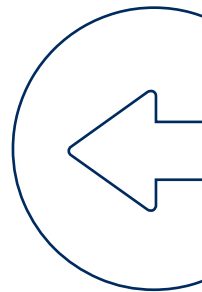
Nursing faculty at WSU are leading researchers in the fields of addiction, concussion, Native American health care, and the use of smart-home technology in health care.

Faculty Achievements and Recognition

Eight WSU faculty elected to Washington State Academy of Sciences

More than a third of the 2020 class of new members in the Washington State Academy of Sciences (WSAS) are from WSU.

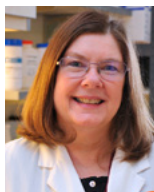
WSAS announced 21 new members, including eight from WSU. The honor recognizes new members for their outstanding records of scientific and technical achievement, as well as their willingness to work on behalf of the Academy to bring the best available science to bear on issues within the state of Washington.



These WSU faculty members are elected to the WSAS membership:



Baszler



Brayton



Griner Hill



MacLean



McDonell



McPherson



Mealey



Zhang

Timothy Baszler, professor in the Paul G. Allen School for Global Health, College of Veterinary Medicine; and executive director of the Washington Animal Diseases Diagnostic Laboratory

Kelly Brayton, professor and chair of the Department of Veterinary Microbiology and Pathology, College of Veterinary Medicine

Laura Griner Hill, senior vice provost for faculty development and affairs and professor of human development in the College of Agricultural, Human, and Natural Resource Sciences

Alair MacLean, professor of sociology in the College of Arts and Sciences

Michael McDonell, professor in the Elson S. Floyd College of Medicine and director of the WSU Center for Cannabis Policy, Research, and Outreach.

Sterling McPherson, assistant dean for research, associate professor, and director of Biostatistics and Clinical Trial Design in the Elson S. Floyd College of Medicine

Katrina Mealey, Regents Professor in the College of Veterinary Medicine

Qin Zhang, professor and director of the Center for Precision and Automated Agricultural Systems in the College of Agricultural, Human, and Natural Resource Sciences

Faculty Achievements and Recognition

Four WSU faculty named AAAS fellows



Clark



Okita



Reganold



Thomashow

Four WSU faculty members—**Aurora Clark**, **Thomas Okita**, **John Reganold**, and **Linda Thomashow**—were recently elected as fellows of the American Association for the Advancement of Science (AAAS), a high honor recognizing their contributions to science and technology. A total of 443 scholars from a range of disciplines were chosen by their peers on the Council of AAAS to become new fellows.

Aurora Clark, professor of chemistry and director of the Center for Institutional Research Computing, researches the modeling of complex, multicomponent solutions for providing the basic science needed to help solve many industrial problems. Her work has contributed to development of remediation strategies for the nuclear waste site in Hanford, Washington.

Thomas W. Okita, Regents Professor of molecular plant sciences, is internationally recognized for his seminal contributions to the study of starch regulation and RNA localization in plants. He is continuing research in these areas through two major

programs in his lab: one centering on how RNAs are targeted to specific subdomains of the cortical endoplasmic reticulum, the main site of protein synthesis in plant cells, and another focuses on how an enzyme involved in starch metabolism modulates photosynthesis.

John P. Reganold, Regents Professor of soil science and agroecology, is a world-renowned soil scientist. His scholarly work includes analyzing soil health and the environmental, economic, and social sustainability of farming systems, as well as evaluating and developing metrics for global food production systems and prime agricultural lands. Scientists at other institutions now utilize his on-farm techniques for conducting comparative assessments of the sustainability of contrasting farming systems.

Linda S. Thomashow, a research geneticist with the US Department of Agriculture's Agricultural Research Service and a WSU adjunct professor in plant pathology and molecular plant sciences, conducts research on plant-microbe interactions in the rhizosphere, the area of soil surrounding plant roots; the role of antibiotics produced by root-associated bacteria; root colonization; and microbial genomics. Her recent studies have focused on the production of phenazine antibiotics in semi-arid soils of the Pacific Northwest, their ecosystem-wide distribution, and their influence on biofilm formation and nutrient turnover on wheat roots.

Researchers receive NSF CAREER awards

Venera Arnaoudova, Anamika Dubey, and Subhanshu Gupta, faculty members in the School of Electrical Engineering and Computer Science (EECS), have received faculty early career awards from the National Science Foundation. The five-year grants, which are about \$500,000 each, are intended to provide significant research support to young faculty beginning their careers who have the potential to serve as academic role models in research and education.

Demand for graduates in computer science and engineering has skyrocketed in the past decade. Arnaoudova, Dubey, and Gupta were all hired as part of a state-funded faculty expansion to help meet that growing need. Since 2015, research expenditures in WSU's School of Electrical Engineering and Computer Science have nearly doubled, as have the number of graduates from its program.



Dubey

Anamika Dubey

Power system outages due to natural disasters cost a staggering \$18–33 billion per year and cause significant safety and security concerns, especially during extended outages and extreme weather events. The need for resilience is particularly critical for the aging mid- and low-voltage power distribution systems, responsible for approximately 90 percent of outages. Leveraging recent smart grid advances, Dubey's project will develop a plan to manage disruptions and improve the resilience of power distribution systems. The proposed innovations add flexibility for bottom-up restoration using distributed energy resources (DERs) and enhanced distribution automation capabilities, allowing for faster recovery of critical services during natural disasters. The project aims to improve public safety and reduce the cost of natural disasters to the economy, encourage DER integration, and help reduce the US carbon footprint. The project will also include a well-integrated education plan to address the critical need for a skilled, interdisciplinary, and inclusive workforce for a future power distribution grid.



Gupta

Subhanshu Gupta

Large antenna arrays made of hundreds of antenna elements promise to provide unprecedented spatial resolutions for critical infrastructure technology as well as for exciting futuristic ideas like holographic surfaces, autonomous vehicles, deep-space exploration, and smart cities. However, the signal processing for these large-scale arrays requires large amounts of energy and can be inaccurate. Additionally, because of the highly complex signal processing required, conventional transceivers don't work well. Gupta's project will be working to enable the next generation of multi-antenna array systems that will be more precise, energy efficient, and faster, using novel integrated circuits and systems design techniques and multiparameter optimization algorithms by developing true-time-delay based spatial signal processors for large antenna arrays.



Arnaoudova

Venera Arnaoudova

Software developers spend most of their time reading and understanding software. While academic and industry experts have published information on best practices in the field, the information is largely based on the experts' own opinion and experience rather than scientific evidence. Arnaoudova's research will study how human behavior impacts the cost and quality of software development. This project specifically targets practices related to software design, code, and review. Researchers will evaluate the impact of existing practices on developers, use objective measures to identify new software development practices, and develop better guidelines for software development and maintenance. At the same time, they will be working to incorporate the findings of this project into the curriculum to create a better trained workforce in software development.

Faculty Achievements and Recognition

WSU nuclear chemist honored with Seaborg award



Brannon Clark

Sue Brannon Clark, a Battelle fellow at PNNL and Regents Professor at WSU, is the 2020 recipient of the Glenn T. Seaborg Award for Nuclear Chemistry from the American Chemical Society (ACS).

An internationally renowned leader in nuclear chemistry, Clark's outstanding career-long contributions include advancing innovation in nuclear safeguards and forensics, developing landmark nuclear research capabilities, and working toward resolving the national legacy of radioactive waste.

Clark's recent research has focused on the chemistry needed to retrieve high-level radioactive waste from the Hanford waste tanks in south-central Washington. The results are being used to enable the start-up of waste processing at Hanford, as early as 2022. Her research on uranium and associated actinides and fission products will enable safe disposal of commercial spent nuclear fuel once a geologic disposal facility is identified.

She has been a member of ACS, the world's largest professional scientific society, since 1984. In addition to holding several leadership positions with the organization, she received the ACS Francis P. Garvan–John M. Olin Medal in 2012 for her contributions to understanding the chemistry that governs the behavior of actinides in the environment and her tireless efforts to bring gender diversity to university chemistry departments.

Hospitality professor recognized for Chinese tourism research



Chi

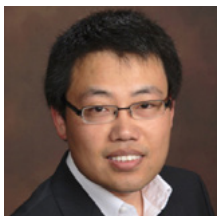
Christina Chi, professor of hospitality business management in the Carson College of Business, has spent more than a decade collaborating on tourism research with academics in China, where a growing middle class is fueling demand for leisure travel.

Chi's contributions to the field were recognized by the International Association for China Tourism Studies (IACS), which has named her as a fellow. The association's 31 fellows represent scholars at research institutions worldwide.

Chi has worked with Chinese researchers to publish dozens of studies in top-tier hospitality and tourism journals. She studies destination image and tourist behavior. Her research also delves into sustainability and social responsibility in tourism development at UNESCO World Heritage sites and fragile natural areas.

IACS is an international academic association focused on the growing importance of Chinese tourism research and its contribution to worldwide tourism scholarship.

WSU Vancouver professor wins US Department of Energy award



Xuechen Zhang, associate professor of computer science in the School of Engineering and Computer Science at WSU Vancouver, was named a Tier 2 Gold winner of the US Department of Energy's (DOE) first Electricity Industry Technology and Practices Innovation Challenge.

The challenge was designed to tap into American ingenuity for ideas about how to make the nation's electric grid stronger and more resilient. Through the challenge, the DOE sought ideas from industry, academia, and other innovators for concepts that include technologies or solutions that address existing or emerging vulnerabilities and threats to the electric sector or mitigate interdependencies between the electricity sector and other sectors.

Zhang

The DOE awarded more than \$300,000 to seven winning submissions in two tiers. Zhang and his research team were awarded \$25,000 for "QoS-Aware Data-Driven Analytics for Next Generation Synchrophasor Workflows."

Proposed technologies and solutions were reviewed on criteria including technical merit and viability, potential to mature and implement, innovation and transformation, and potential magnitude of impact.

Two WSU faculty named 2019 Highly Cited Researchers



Kowdley



Lin

Professors **Kris Kowdley** and **Yuehe Lin** have been named Highly Cited Researchers for 2019 by Web of Science Group.

The group's annual list identifies scientists who have produced multiple papers ranking in the top 1 percent by citations for their field and year of publication, demonstrating significant research influence among their peers.

Kris Kowdley, clinical faculty at Elson S. Floyd College of Medicine, is an internationally recognized liver disease expert. His laboratory program focuses on the role of iron as a co-factor in many liver diseases, ranging from hepatitis C, hemochromatosis, and his scholarly work has been cited nearly 41,000 times, according to Google Scholar.

Yuehe Lin is a leader in the bioengineering and biomedical nanotechnology fields. His work includes the development of nanomaterials and nanobioelectronic devices for disease diagnosis and drug delivery. He has produced nearly 500 publications which have been cited more than 65,000 times, according to Google Scholar. Lin is a professor in the School of Mechanical and Materials Engineering and a laboratory fellow at the Pacific Northwest National Laboratory.

Faculty Achievements and Recognition

CDSC archivist Anastasia Tucker earns Mellon Fellowship



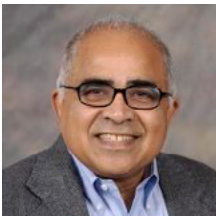
Tucker

Anastasia Tucker, education and outreach archivist in the WSU Center for Digital Scholarship and Curation (CDSC), has been chosen from among more than 60 candidates for an Andrew W. Mellon Fellowship for Diversity, Inclusion, and Cultural Heritage. Fellows will participate in a three-year program that includes an orientation, coursework through award sponsor Rare Book School at the University of Virginia, community symposia, and other activities relating to multicultural collections and trainings.

Tucker provides support for several ongoing projects administered by the CDSC, a center jointly run by the WSU Libraries and WSU College of Arts and Sciences. She coordinates content on the Sustainable Heritage Network, a repository of resources with a focus on the preservation of cultural heritage items in tribal archives, libraries, and museums, and delivers trainings on digital scholarship platforms to a wide audience, including WSU students, faculty, and staff.

Selected fellows identify with diverse racial or ethnic communities and/or work primarily with collections that document minority, immigrant, and non-Western cultural traditions. They will strive to raise awareness about multicultural collections within their profession while also building bridges with local community members and the broader public.

Anjan Bose elected to Chinese Academy of Engineering



Tucker

Anjan Bose, a Regents Professor and distinguished professor in power in the School of Electrical Engineering and Computer Science, has been elected to the Chinese Academy of Engineering as one of 29 foreign members in recognition of his contributions to the field and promotion of Chinese-American cooperation.

His expertise lies in the operation and control of electrical power grids. Although China has the largest electric power infrastructure in the world, Bose is the first non-Chinese electrical power engineer elected to their academy.

He was elected to the US National Academy of Engineering in 2003 and the Indian National Academy of Engineering in 2005. He is active in several international professional societies that have recognized his accomplishments with many awards.

Partha Pande named IEEE fellow



Pande

Partha Pande, professor and director of the School of Electrical Engineering and Computer Science and the Boeing Centennial Chair in Computer Engineering, has been named a fellow by the Institute of Electrical and Electronics Engineers (IEEE) for his contributions to network-on-chip architectures for manycore computing.

Pande conducts research in network-on-chip (NoC) technology, which is becoming the state-of-the-art communications method for manycore chips and could greatly improve the energy efficiency of data centers and other enterprises that require high-performance computers.

IEEE fellow is the highest grade of membership and is recognized by the technical community as a prestigious honor and an important career achievement. The IEEE is the world's leading professional association for advancing technology for humanity. Through its 400,000 plus members in 160 countries, the association is a leading authority

on a wide variety of areas ranging from aerospace systems, computers, and telecommunications to biomedical engineering, electric power, and consumer electronics.

Carson College researcher receives Emerald Literati Award



Gunasti

Kunter Gunasti, assistant professor of marketing in the Carson College of Business, has been named a 2019 Emerald Literati Award winner for a research paper he coauthored on consumer preferences for copycat brands.

His paper, "Original Brands in Competition Against High Quality Copycats," earned the distinction of a Highly Commended Paper at the 2019 Awards of Excellence, sponsored by Emerald Publishing.

For more than 25 years, the Emerald Literati Awards for Excellence celebrate and reward the outstanding contributions made by Emerald's scholarly community.

"Original Brands in Competition Against High Quality Copycats" was published in the *European Journal of Marketing*. Gunasti coauthored the paper with Hang Nguyen, associate professor of marketing at Michigan State University.

Faculty Achievements and Recognition

Yuehe Lin recognized by Electrochemical Society, National Academy of Inventors



Lin

Yuehe Lin, professor in the Voiland College of Engineering and Architecture School of Mechanical and Materials Engineering, has been named a fellow of the Electrochemical Society (ECS) for his leadership and contributions to the fields of sensors and electrocatalysis.

The ECS was founded in 1902. Every year, up to 15 renowned scientists and engineers are designated as fellows of the professional society, which includes about 8,000 members. The fellows are selected based on their technological contributions in the field of electrochemical and solid-state science and technology, as well as their active involvement in the society.

Lin has been an ECS member since 1998. He has been actively serving the society, delivering five keynote lectures, organizing symposia, and chairing sessions in nanotechnology and nanosensors.

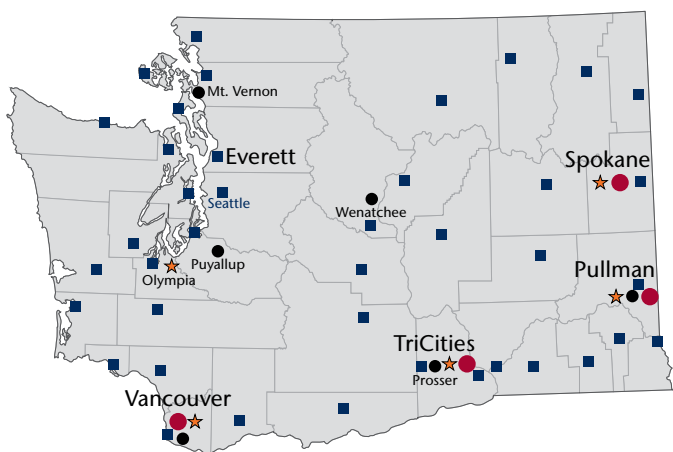
Additionally, Lin has been named a fellow of the National Academy of Inventors (NAI).

Lin is one of 168 NAI fellows for 2019, which is the highest professional distinction accorded solely to academic inventors. The program includes more than 1,000 fellows from 250 universities around the world that hold more than 41,500 US patents.

With WSU since 2013, Lin, who also holds a joint appointment at Pacific Northwest National Laboratory, conducts research in nanotechnology, particularly development of small-scale devices, materials and analytical systems for biomedical diagnosis, drug delivery, and energy and environmental applications.

He has received funding from the National Institutes of Health, US Centers for Disease Control and Prevention and US Departments of Energy and Defense. He holds more than 20 patents, some of which have been licensed to industrial partners for commercialization.

Advancing research statewide



Washington State University faculty conduct research at campuses across the state. Extension offices in each of Washington's 39 counties turn research into action for local industry and communities.

- **Research centers, institutes, and core facilities** - More than 30 research centers and institutes bridge disciplines to answer difficult questions. Core facilities support investigations with instrumentation and services.
- **Research and extension centers** - Agricultural and natural resource research at four strategically located centers is supported largely by state and federal research grants and contracts. Public investment in these centers yields enormous returns in land productivity, disease-resistant crops, and the conservation and safer use of natural resources.
- ★ **Libraries** - WSU serves the state with eight libraries at five locations: Pullman, Spokane, Tri-Cities, Vancouver, and Olympia.
- **Extension offices** - WSU Extension leverages research to find solutions to local issues.

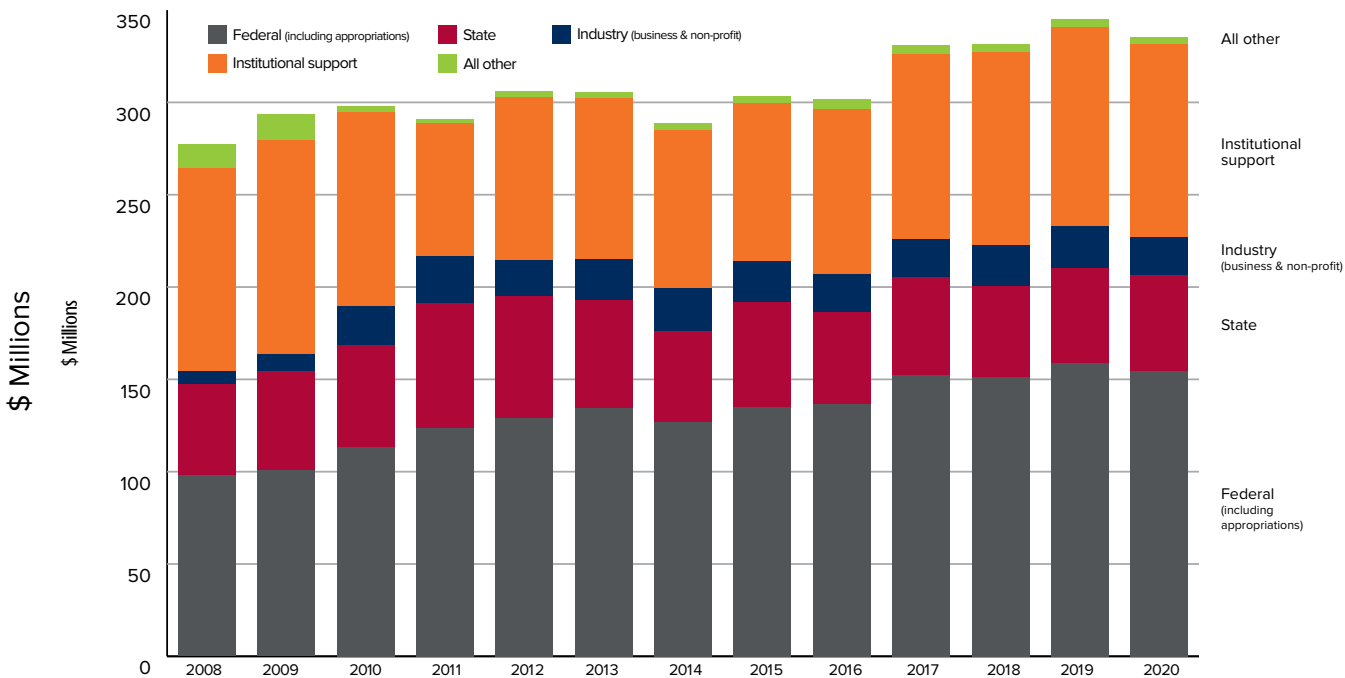
Facts & Figures

Facts & figures

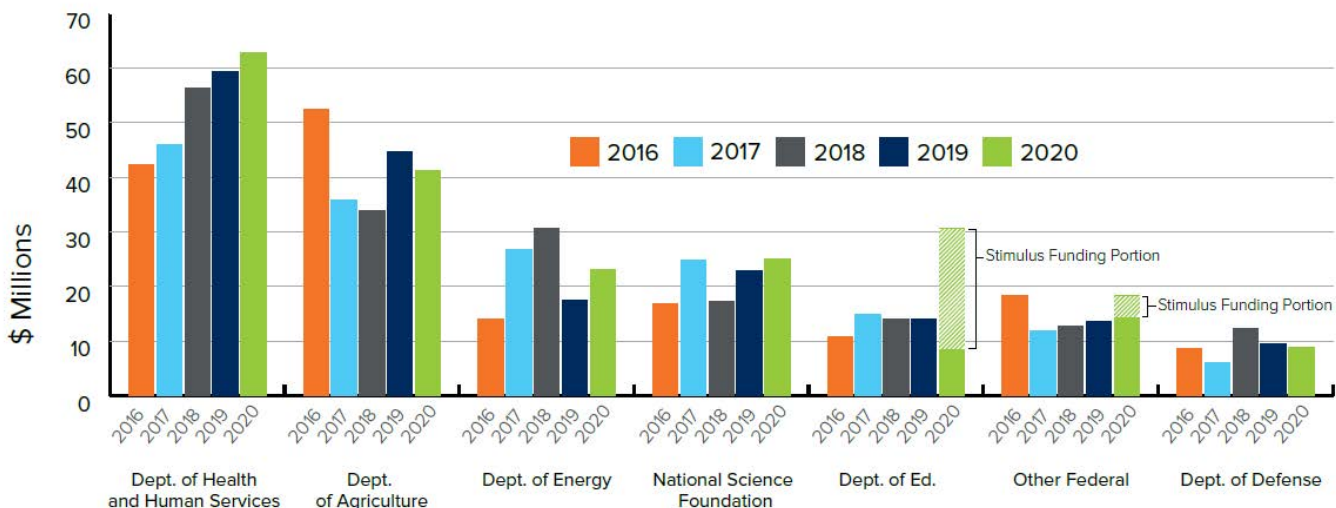
WSU Research Expenditures

\$335.2 million total for FY2020

Please note: Figures in this graph differ from the NSF HERD Report to reflect recent corrections with data calculations within WSU. Not all corrections are reflected in the NSF HERD report online.



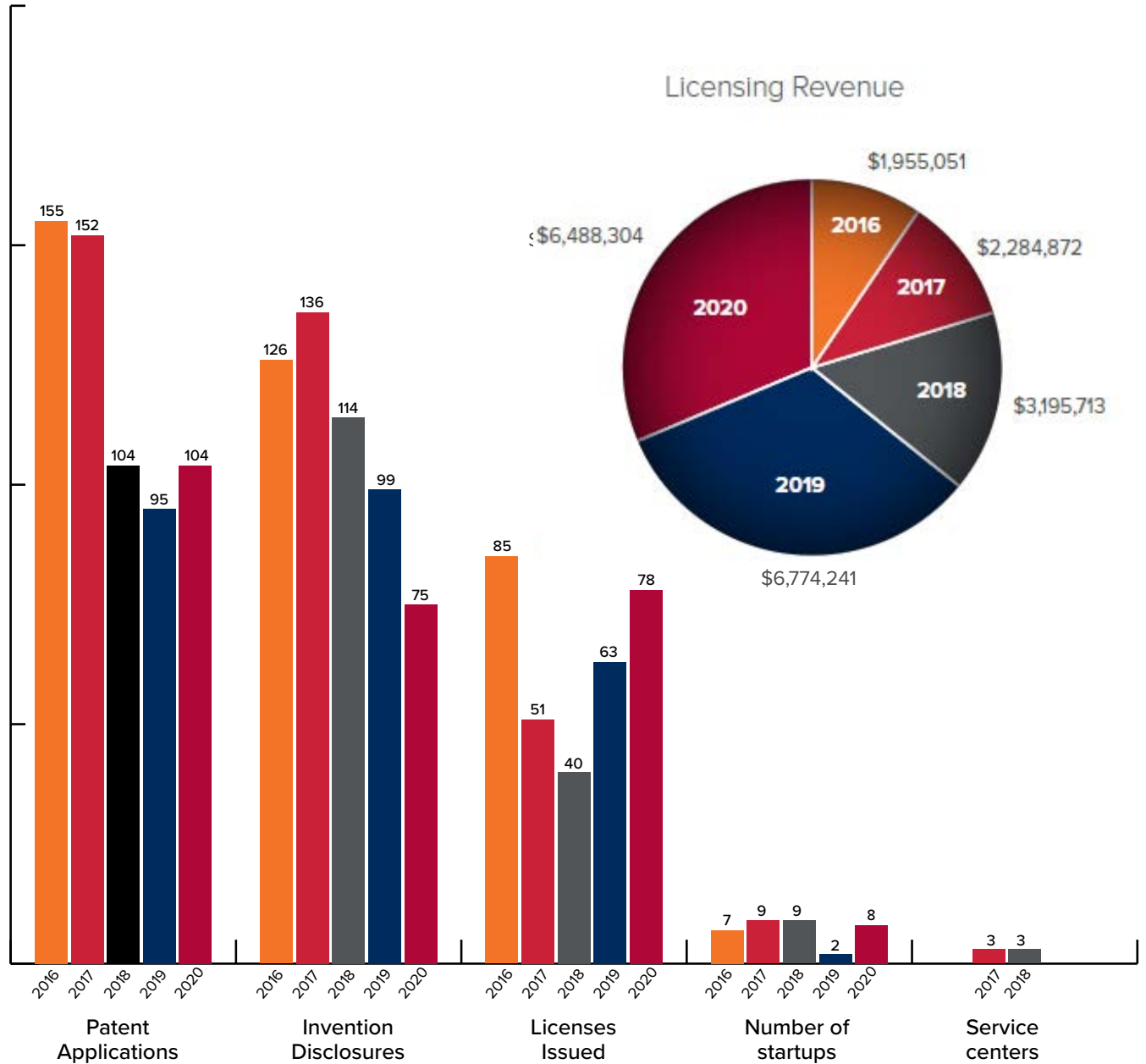
Trends in Federal Awards



Facts & Figures

Facts & figures

Commercialization on the Rise FY16–FY20





Everett | Extension | Global | Pullman | Spokane | Tri-Cities | Vancouver



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