ANNUAL

RESEARCH REPORT

FISCAL YEAR 2022

WASHINGTON STATE UNIVERSITY

Greetings!

Research at Washington State University confronts complex problems and drives innovation to develop knowledge that enriches the quality of life for all. We are excited to highlight the outstanding research, scholarship, and creative activities conducted by WSU faculty, staff, and students and their collaborators during fiscal year 2022.

Here are a few of the exceptional breakthroughs and discoveries that made a significant impact during Fiscal Year 2022. Examples of research highlighted in this report include:

- WSU scientists move one-step closer to solving the mystery of aging and cancer by identifying the potential role that 'junk DNA' sequences have on cell activity.
- Research by WSU physicists indicates that there may be intermediate-mass black holes at the center of dense star clusters located throughout the universe.
- An investigation to be conducted by WSU faculty thanks to a $1.4 million grant from the Institute of Education Sciences to refine and expand an assessment that helps address truancy in K-12 schools.
- An economic study highlights that sports betting at tribal casinos in Washington is on track to become a $94 million industry in the next five years.

WSU research set a record of $368.3 million in total research and development (R&D) expenditures, as reported by the National Science Foundation. We also continued to set a record $15,162,235 in royalty income, which includes continued licensing revenue from the success of the Cosmic Crisp® apple. The top federal funding agencies for research at WSU included the U.S. Department of Agriculture, the Department of Health and Human Services, the Department of Energy, the National Science Foundation, and the Department of Education.

We also celebrate honors recognizing our faculty's research accomplishments. Biochemistry professor John Browse and anthropology professor Tim Kohler were elected to the National Academy of Sciences in recognition of their achievements in original research. Matthew McCluskey has been named a Senior Member of the National Academy of Inventors. Five WSU faculty members were elected to the Washington State Academy of Sciences (WSAS) and two faculty members to the WSAS Board. Other major achievements include the recognition of Dogan Gursoy, Dan "Annie" Du, Kris Kowdley, and Yuehe Lin as 2021 Highly Cited Researchers. Talea Anderson, scholarly communication librarian in WSU Libraries, has been selected as an Andrew W. Mellon Fellow for Diversity, Inclusion, and Cultural Heritage through the Rare Book School (RBS) at the University of Virginia.

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. Michael Wolcott
Interim Vice President for Research, WSU

Top Research Stories

Systems approach assesses public health impacts of changing climate, environmental policies

A team co-led by a WSU scientist proposes an approach to understand and minimize health impacts from human-caused changes to the climate and environment in a new study published in the journal One Earth.

Based at WSU Vancouver, lead author **Deepti Singh**, assistant professor in the School of the Environment, drew on hundreds of studies of climate change, air quality, agriculture, and public health to propose a "systems lens," or scientific approach, that connects health risks with simultaneous environmental changes driven by human practices.

The health consequences of air pollution, climate change, and transformations in agriculture are often discussed separately. These issues are all related—they often have similar sources, and the impacts of each one of these environmental factors affects the others. For example, agricultural activities contribute to air pollution and affect regional climate patterns, while yields and quality of crops are sensitive to air quality and climate conditions.

Collaborating with researchers at Columbia University, the Indian School of Business, Boston University, and the University of Delaware, Singh studied the situation in South Asia, where rapid industrialization and modern farming practices have aided economic development and increased food production, but also compromised multiple dimensions of human health.

The scientists reviewed multiple examples of health impacts from changes in climate, air quality, and agricultural output, as well as co-benefits and unintended negative consequences of efforts to curb emissions and save water, for example. They found these examples share the need for better tools and local, high-resolution data on health, weather, emissions, air pollution, and land use to better measure human and environmental impacts.

Use of fossil fuels, burning of crop residue, and changes to the landscape from expansion and intensification of agriculture have contributed to extremely poor air quality in South Asia, changed the main source of rainfall – the Indian summer monsoon, and also increased health risks for nearly a quarter of the world's population living in the region.

Additionally, more frequent and intense heat waves and floods have killed thousands, displaced millions, lowered labor productivity, and caused disease outbreaks. Severe air pollution has contributed to increased heart and lung diseases as well as millions of premature deaths and weakened monsoonal rains. At the same time, air pollution and climate change have reduced yields of important food crops, affecting food security.

The study points out how useful and effective policy responses need to take multiple factors and the complex interactions within our Earth system into account, and highlights potential problems with simplistic approaches, which are useful for understanding the impacts of changes in our environment impacts but may be insufficient for guiding real-world policy. ▮

Air pollution obscures India's capital city of Delhi. Examining South Asia in particular, a team of researchers has proposed a new approach to understanding and mitigate health impacts from the interlinked factors of climate, air quality, and agricultural land use patterns (Photo by Mark Danielson).


Photo by Dylan de Jonge on Unsplash.

Alcohol ads can influence men and women to sexually coerce partners

An experimental study revealed that alcohol advertising featuring objectified women encouraged not just some male but also female college students to manipulate others for sex.

The study, led by **Stacey J.T. Hust**, professor in WSU's Murrow College of Communication, found that both young men and women who expressed strong beliefs in gender stereotypes were more likely to sexually coerce. This connection was particularly strong with young men viewing alcohol ads featuring highly objectified female models.

The researchers also found that women who wanted to be like the female models in the ads were more likely to report intentions to sexually coerce without even using alcohol.

The study, published in the Journal of Interpersonal Violence, tested different alcohol ads on about 1,200 college students. One set of participants saw real advertisements featuring highly objectified women such as models wearing little or no clothing. Another set viewed ads that were changed to lessen the objectification, such as adding a dress to a model who appeared in the original ad in a bikini.

The participants answered questions about their perceptions of the ads, their beliefs in gender stereotypes, sex-related alcohol expectancies and their own sexual coercion intentions with or without alcohol.

Sexual coercion covers a range of negative and illegal behaviors from lying and verbally pressuring someone to plying potential partners with alcohol to have sex. For instance, some of the questions on the study asked participants whether they would pretend to like someone just to have sex with them or if they would have sex with someone even if they felt their partner would feel used afterwards.

Interestingly, the researchers found that the alcohol ads did not have an effect on all the participants' sexual coercion intentions. Rather, they only had a negative influence when the participants had certain perceptions, such as belief in gender stereotypes or women's wishful identification with the depicted models.

The study adds evidence to previous research linking gender stereotypes, such as seeing men as sexually aggressive and women as submissive, to sexual coercion and other sexually violent behaviors.

Most programs that talk about sexual violence focus on consent or bystander intervention, which is good, but there's a wealth of studies out there that also show a tie to gender stereotypical beliefs. If prevention programs are established that debunk gender stereotypes when kids are young, then hopefully over time it can impact these negative behaviors.

Starting earlier with media literacy education would help too, Hust added, noting that ads for non-alcoholic beverages often use similar appeals and strategies to those used by alcohol ads. ▮

Top Research Stories

Hyperbaric oxygen therapy helps treat opioid addiction

Hyperbaric oxygen therapy may help people being treated for opioid addiction reduce their methadone dose and better manage pain and withdrawal symptoms, according to a pair of studies led by WSU scientists.

The research team recruited participants enrolled in a local opioid treatment program to test the effects of hyperbaric oxygen therapy, a treatment that involves breathing pure oxygen in a pressurized environment.

Published in the Journal of Addictions Nursing, the first paper describes a pilot study of 31 participants that showed that those who had received hyperbaric oxygen therapy as part of a planned methadone taper were able to maintain a significantly larger dose reduction of 4.3 mg three months after the study, as compared to 0.25 mg in participants who did not receive the therapy. They also reported half the level of withdrawal symptoms experienced by control participants after only one day of hyperbaric oxygen therapy.

Study co-author **Matthew Layton**, a professor in the WSU Elson S. Floyd College of Medicine, said the team's findings suggest that hyperbaric oxygen therapy could potentially be used as a non-pharmacological tool to help people step down their methadone treatment.

The second study, which was published in Pain Management Nursing, was a small randomized controlled trial of eight participants that looked more closely at withdrawal symptom relief. It found that participants in the hyperbaric oxygen therapy treatment group reported lower pain intensity and drug cravings than control participants who had been given an oxygen mixture equivalent to room air delivered at normal atmospheric pressure. The researchers also saw improvements in other outcomes, such as sleep quality and mood.

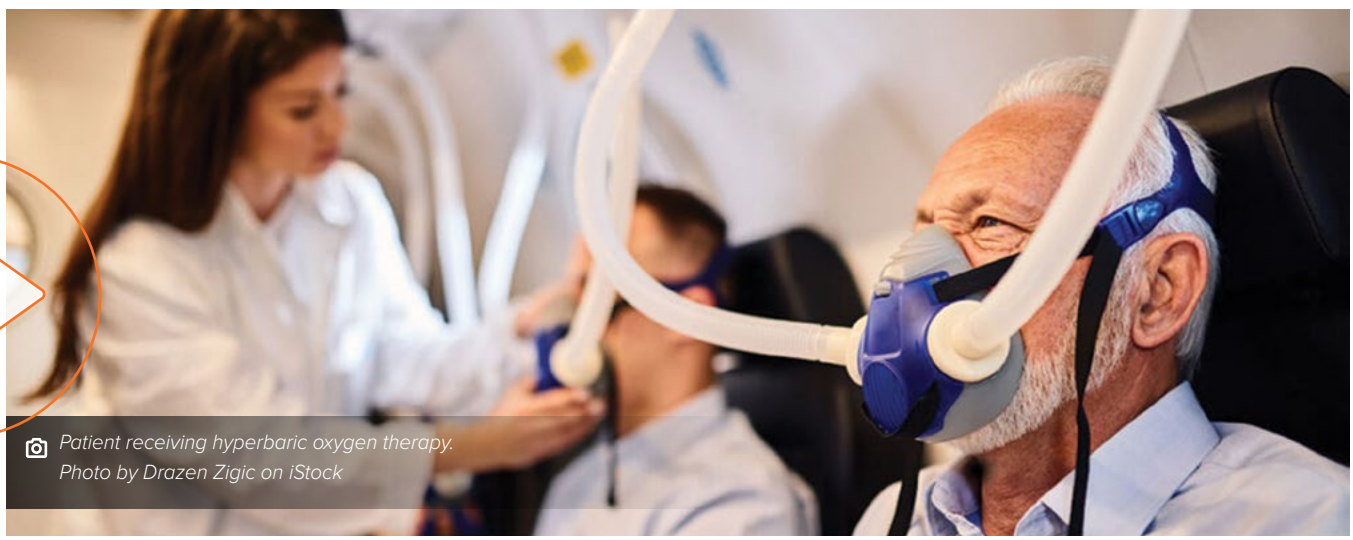
First author Marian Wilson, an associate professor in the WSU College of Nursing and an expert on pain and opioid use disorder, said easing withdrawal symptoms is critical to keep people from resuming illegal drug use or dropping out of methadone treatment.

Based on the collective findings from the two studies, the researchers are pursuing funding for a clinical trial to confirm their findings in a larger sample of participants, who would be followed for several years.

The idea for the two studies came from earlier research by co-author and WSU College of Arts and Sciences professor Raymond Quock that showed that hyperbaric oxygen therapy provided pain relief and reduced physical signs of opioid withdrawal in mice.

In addition to Layton, Wilson, Quock and others at WSU, collaborators on these studies included Karen Stanek, the medical director for the Spokane Hyperbaric Center and Alvina Jesse, a program manager with the Spokane Regional Health District.

Funding for this work came from the State of Washington's Initiative Measure No. 171, which was administered through the university's Alcohol and Drug Abuse Research Program.



Patient receiving hyperbaric oxygen therapy. Photo by Drazen Zigic on iStock

Astronomers identify likely location of medium sized black holes

Intermediate-mass black holes are notoriously hard to find, but a new study indicates there may be some at the center of dense star clusters located throughout the universe.

The study, published in the Astrophysical Journal, sheds new light on when and where black holes of about 100–100,000 solar masses could form and how they came into being.

For decades, astronomers have detected smaller black holes equal in mass either to a few suns or giant black holes with mass similar to millions of suns but the missing-link of black holes in between those sizes have eluded discovery.

The existence of these intermediate-sized or massive black holes has long been theorized but finding them has proven difficult as the light emitted by objects falling into them is not easy to detect.

To address this challenge, the research team led by **Vivienne Baldassare**, lead author of the study and an assistant professor of physics and astronomy, used the Chandra X-Ray Observatory, the world's most powerful X-ray telescope, to look for X-ray signatures of black holes in nuclear star clusters in 108 different galaxies.

Nuclear star clusters are found at the center of most small or low-mass galaxies and are the densest known stellar environments. Previous research has identified the presence of black holes in nuclear star clusters but little is known about the specific properties that make these regions conducive for the formation of black holes.

Baldassare and colleagues' analysis showed that nuclear star clusters that were above a certain mass and density threshold emitted the X-ray signatures indicative of a black hole at twice the rate of those below the threshold. Their work also provides the first observational evidence supporting the theory that intermediate-sized black holes can form in nuclear star clusters.

The research team's work not only suggests that intermediate-sized black holes can form in nuclear star clusters but also provides a mechanism by which they could potentially form throughout cosmic time rather than just during the first few billion years of the universe.

Moving forward, the researchers plan to continue using Chandra to collect x-ray measurements of nuclear star clusters with the ultimate goal of learning more about the specific conditions where massive black holes can form. ▮

Galaxy NGC 1385 is one of the 29 galaxies in the sample that showed evidence for growing black holes near their centers (photo by NASA/ESA/STScI).

Top Research Stories

Research identifies potential role of 'junk DNA' sequence in aging, cancer

A research team led by **Jiyue Zhu**, a professor in the College of Pharmacy and Pharmaceutical Sciences, identified a DNA region known as VNTR2-1 that appears to drive the activity of the telomerase gene, which has been shown to prevent aging in certain types of cells, including reproductive cells and cancer cells. The study was published in the journal Proceedings of the National Academy of Sciences.

Knowing how the telomerase gene is regulated and activated and why it is only active in certain types of cells could someday be the key to understanding how humans age, as well as how to stop the spread of cancer.

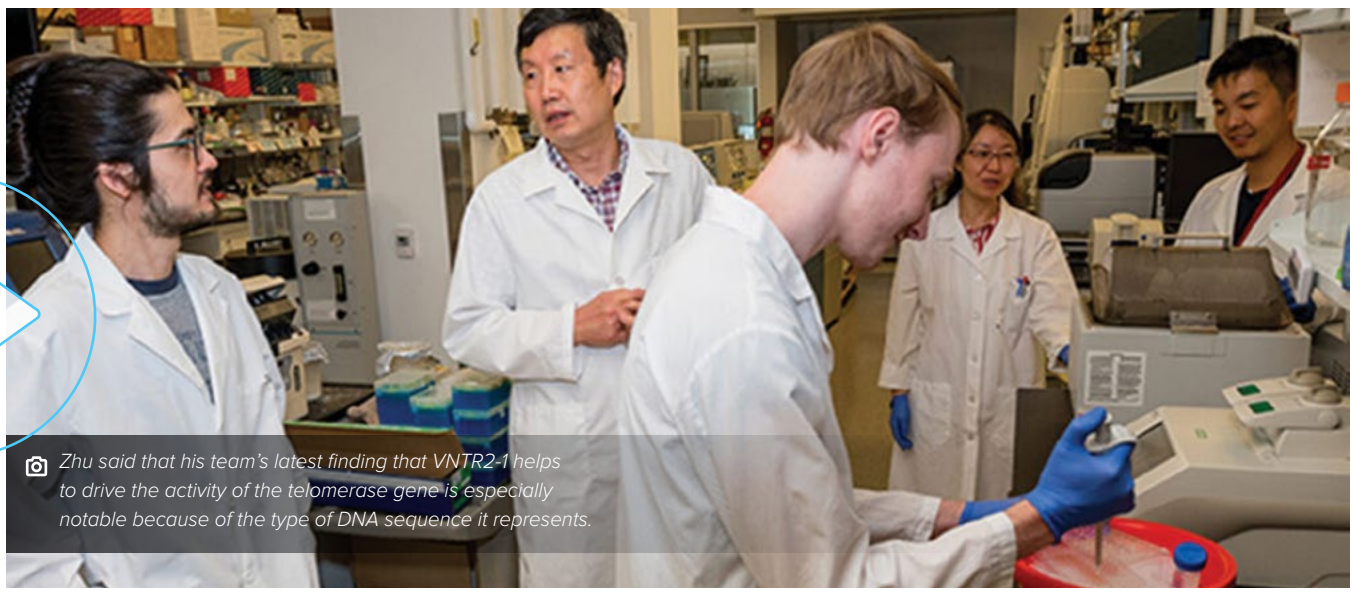
Almost 50% of our genome consists of repetitive DNA that does not code for protein. These DNA sequences tend to be considered as 'junk DNA' or dark matters in our genome, and they are difficult to study. The study describes that one of those units enhances the activity of the telomerase gene.

Their finding is based on a series of experiments that found that deleting the DNA sequence from human melanoma cells caused telomeres to shorten, cells to age, and tumors to stop growing. Subsequently, they conducted a study that looked at the length of the sequence in DNA samples taken from Caucasian and African American centenarians and control participants in the Georgia Centenarian Study, a study that followed a group of people aged 100 or above between 1988 and 2008. The researchers found that the length of the sequence ranged from as short as 53 repeats—or copies—of the DNA to as long as 160 repeats.

Since very short sequences were found only in African American participants, they looked more closely at that group and found that there were relatively few centenarians with a short VNTR2-1 sequence as compared to control participants. However, having a shorter sequence does not necessarily mean a shorter lifespan, because it means the telomerase gene is less active and the telomere length may be shorter, which could make you less likely to develop cancer.

In addition to Zhu, authors on the paper include co-first authors Tao Xu and De Cheng and others at WSU, as well as collaborators at Northeast Forestry University in China; Pennsylvania State University; and North Carolina State University.

Funding for this study came from the National Institutes of Health's National Institute of General Medical Sciences, the Melanoma Research Alliance, and the Health Sciences and Services Authority of Spokane County.



Zhu said that his team's latest finding that VNTR2-1 helps to drive the activity of the telomerase gene is especially notable because of the type of DNA sequence it represents.

WSU faculty receive $1.4 million grant for assessment addressing truancy in schools

Several WSU faculty are the recipients of a $1.4 million grant from the Institute of Education Sciences to refine and expand an assessment that helps address truancy in K-12 schools.

The Washington Assessment of the Risks and Needs of Students program, also known as WARNS, uses evidence-driven procedures to track and improve interventions with students. The program was developed in 2008 to assess students on a scale of six needs that have been linked to truancy, delinquency and/or dropping out of school: aggression-defiance, depression-anxiety, substance abuse, peer deviance, family environment and school engagement. More than 150 school districts in Washington state and across the nation are now using the tool.

Paul Strand, WSU Tri-Cities professor of psychology, **Brian French**, Regents Professor and the Berry Family Distinguished professor, **Nick Lovrich**, WSU Regents professor emeritus, and **Bruce Austin**, research associate in educational psychology and the Learning and Performance Research Center, have worked since 2014 to evaluate and refine WARNS. With the grant, the group is also adding the following members to their team to help refine the tool: Chad Gotch and Marcus Poppen, both WSU associate professors in education, Mary Roduta Roberts, an associate professor of occupational therapy at the University of Alberta, Zach Queen, a software programmer, and several graduate students.

French said what makes the program so successful is its ability to hone-in on issues that lead to truancy early in a student's educational path. Schools can develop a plan for how to address those issues and increase the student's likelihood of being successful. He said what was made especially clear amid the COVID-19 pandemic is the need to get information to counselors regarding student issues at home and other external factors that prevent students' current and future success.

The grant is allowing the team to update the instrument in a few ways. A variety of new issues have arisen that have impacted school attendance and performance in recent years. Examples include the prevalence of vaping and social media use.

Additionally, the team aims to improve the middle school version of the instrument to tailor it further for issues that pertain to that specific age demographic.

More than 10,000 assessments have been given through the program. As a result of improvements through the grant, several states beyond Washington are now using WARNS.

Schools use the data from the assessment to develop and implement a plan for at-risk students through school community truancy boards to help prevent and/or correct student behavior. ▮

Top Research Stories

Increased take-home methadone during pandemic did not worsen outcomes

Relaxing limits on take-home doses of methadone—a medication used to treat opioid addiction—does not appear to lead to worse treatment outcomes, according to a study led by WSU researchers.

Published in the American Journal of Drug and Alcohol Abuse, the study looked at the impact of a temporary policy change allowing providers to send patients home with additional methadone doses during the COVID-19 pandemic. Previously, federal regulations allowed take-home privileges only for established patients who have proven themselves stable, a measure intended to reduce risk of patients selling the provided methadone.

While the researchers saw the average number of methadone take-home doses nearly double during the pandemic, they found no significant changes in treatment outcomes. There was no rise in the number of patients experiencing emergency department visits, whether overdose-related or for other reasons. There was also no notable increase in the number of patients who tested negative for methadone.

Ofer Amram, an associate professor in the WSU Elson S. Floyd College of Medicine and lead study author, says the research highlights the need to consider permanently loosening the restrictions on methadone take-home doses, which would help many people who are struggling to access opioid treatment.

The study was based on data from 183 patients treated at a methadone clinic in Spokane County, Washington. Methadone take-home doses from the clinic rose from 11.4 doses per 30 days in the eight months prior to the pandemic policy change to 22.3 doses per 30 days in the eight months following.

Methadone can only be prescribed and dispensed by federally approved opioid treatment programs, and there are only about 1,800 such programs around the country. This makes requiring daily visits to get methadone especially difficult for individuals who live far from a treatment program.

In a previously published study of patients attending the same clinic involved in this study—the only publicly funded methadone clinic in Eastern Washington—Amram and his coauthors showed that patients who lived closer to the clinic continued with treatment better than those who lived further away. Yet take-home limitations pose challenges even for those who live close to a treatment clinic but don't have reliable access to transportation or find that daily visits take too much time away from employment.

Amram's co-authors on the study, "The impact of relaxation of methadone take-home protocols on treatment outcomes in the COVID-19 era," include Solmaz Amiri, Victoria Panwala and Robert Lutz of the WSU College of Medicine; Paul J. Joudrey of the Yale School of Medicine and Eugenia Socias of the University of British Columbia Faculty of Medicine.

The study was supported by a WSU faculty seed grant and the university's Alcohol and Drug Abuse Research Program. ∎

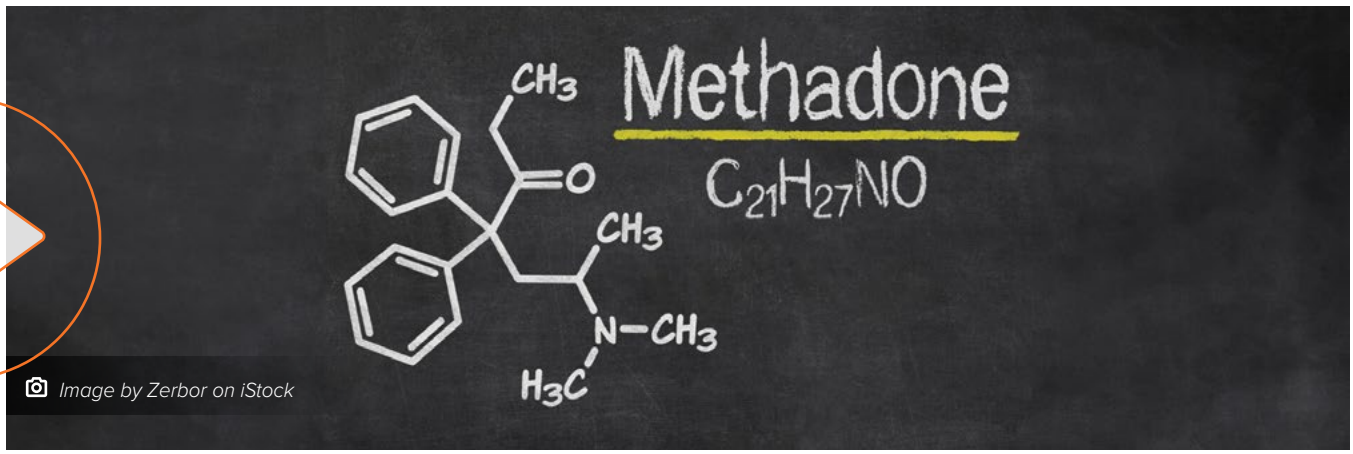


Image by Zerbor on iStock

Washington sports betting poised for rapid growth

Sports betting at tribal casinos is on track to become a $94 million industry in Washington state in the next five years, reflecting residents' enthusiasm for professional and collegiate sports and their interest in wagering, a WSU study found.

About 59% of Washington residents surveyed last summer described themselves as sports fans. A small number – about 5% – said they placed wagers on games at least once per month, mostly through office pools and sportsbooks. But nearly 14% said they were likely to participate in Washington's emerging sports betting industry.

Kahlil Philander, the study's principal investigator and assistant professor in the School of Hospitality Business Management at WSU Everett, shared the study's results during the Washington State Gambling Commission's meeting on Nov. 16, 2021. Besides the $94 million in annual revenue, sports wagering at tribal casinos will lead to an estimated 273 direct jobs.

In March 2020, the state Legislature authorized on-premise sports wagering at tribal casinos, subject to the terms of tribal-state gaming compacts. Wagers must be placed in-person through a betting window, kiosk or onsite mobile app at the casino. Online betting from remote locations is not allowed.

The Snoqualmie Tribe began offering sports betting in September 2021. By 2023, 21 federally recognized tribes in Washington have received their licenses or have applied for one to offer sports betting at its casinos.

Not surprisingly, the Seahawks and Mariners were the most popular professional teams among the residents surveyed, and they also rooted for WSU and University of Washington athletic teams.

However, the state's regulations don't allow wagers on college or university teams located within Washington.

The study included a market analysis of remote online sports betting, which is available in other states.

If online sports betting from remote locations became legal in Washington in the future, the industry would more than triple in size, generating about $322 million in annual revenue, the study said.

The report used a five-year window for projections, anticipating that more tribal casinos would start offering sports betting and potential clients would become aware of the opportunity.

A grant from the gambling commission paid for the study, which includes best practices and policies from other states on topics like operator license fees, background checks, player education and responsible gambling programs.

Philander said the study provides a third-party analysis on the scope of sports betting in Washington. WSU doctoral student Lu Yuan and Eilers & Krejcik Gaming LLC of Irvine, California, also contributed to the report. ▮

Top Research Stories

Intense exercise while dieting may reduce cravings for fatty food

In a study that offers hope for human dieters, rats on a 30-day diet who exercised intensely resisted cues for favored, high-fat food pellets.

The experiment was designed to test resistance to the phenomenon known as "incubation of craving," meaning the longer a desired substance is denied, the harder it is to ignore signals for it. The findings suggest that exercise modulated how hard the rats were willing to work for cues associated with the pellets, reflecting how much they craved them.

While more research needs to be done, the study may indicate that exercise can shore up restraint when it comes to certain foods, said **Travis Brown**, corresponding author on the study published in the journal Obesity and a WSU physiology and neuroscience researcher.

In the experiment, Brown and colleagues from WSU and University of Wyoming put 28 rats through a training with a lever that when pressed, turned on a light and made a tone before dispensing a high-fat pellet. After the training period, they tested to see how many times the rats would press the lever just to get the light and tone cue.

The researchers then split the rats into two groups: one underwent a regime of high-intensity treadmill running; the other had no additional exercise outside of their regular activity. Both sets of rats were denied access to the high-fat pellets for 30 days. At the end of that period, the researchers gave the rats access to the levers that once dispensed the pellets again, but this time when the levers were pressed, they only gave the light and tone cue. The animals that did not get exercise pressed the levers significantly more than rats that had exercised, indicating that exercise lessened the craving for the pellets.

While this study is novel, Brown said it builds on the work of Jeff Grimm at Western Washington University who led the team that first defined the term "incubation of craving" and has studied other ways to subvert it. Brown also credited Marilyn Carroll-Santi's research at University of Minnesota showing that exercise can blunt cravings for cocaine.

It is still an unsettled research question as to whether food can be addictive in the same way as drugs. Not all foods appear to have an addictive effect. However, people do seem to respond to cues, such as fast-food ads, encouraging them to eat foods high in fat or sugar, and those cues may be harder to resist the longer they diet.

The ability to disregard these signals may be yet another way exercise improves health, Brown said. ▮

Photo by Happy Lark on iStock

University Achievements

WSU Extension's Annette Vary-Getty has collected data at a National Weather Service weather station on the Clark County Heritage Farm for four years, continuing a process that goes back well over a century.

Honoring 125 years of weather data collection

For more than 125 years, the weather monitoring station at **WSU's Clark County Extension** collects data that is then downloaded manually to record the temperature at observation, plus the highs and lows of each day from the previous week. The field is located at Clark County's 78th Street Heritage Farm. At the end of each month, the data, plus water measurements that are automatically collected, are provided to the National Oceanic Atmospheric Administration's National Weather Service. Temperature and precipitation observations have been taken at the farm's weather station since 1896, with WSU collecting the data since 1966.

In 2021, the National Weather Service, on the behalf of the World Meteorological Organization, presented the farm with a National Centennial Weather Station Award for the long contribution to record collecting. There are only 291 of these stations in the world, 11 in the United States.

The centennial award was created due to the importance of long-term meteorological observations as part of the cultural and scientific heritage of humanity. These measurements serve the needs of current and future generations for long-term high quality climate records and provide unique information about climate variability. Long term measurements of the weather provide the backbone for weather forecasting and climate science. Ensuring their long-term sustainability is important for understanding how these might change in the future.

The Heritage Farm has a deep history in Clark County, sitting just outside Vancouver city limits.

It started as a poor farm, where people lived and worked for sustenance, Perry said. In the 1940s, WSU took over the farm after it fell into disrepair. It was a research station for the university until 2008, when it was turned over to the county.

WSU Clark County Extension's offices have been on the farm since 2011, providing agricultural education, research, and technical assistance to the community. In addition, Extension has a 4-H Restorative Justice Garden, Master Gardener demonstration and educational sites, and a Master Gardener Foundation organic gardening site.

The county's parks department oversees the farm, but multiple partners use the land for education and research. More than a century of weather data benefiting the region is just one additional way this land continues to support the county. ▮

University Achievements

GCISL Corporate Scholars gain real-world career experience through interactions with Murano Senior Living residents and staff. (Photo courtesy of Sue McMurray, WSU Carson College of Business)

Granger Cobb Institute for Senior Living wins national award

The **Granger Cobb Institute for Senior Living** (GCISL) at WSU earned a Mather Institute Promising Practices Award recognizing its work on education, service, and research for the senior living industry.

Launched in 2018, the GCISL focuses on education, research and service for the senior living industry. Collaboration with industry professionals helped the institute shape curriculum for several new programs, including a new major and minor in senior living, an online, on-demand certificate program, and Leaders LIVE! In 45, a weekly Zoom series that offers the insights of industry executives. Additionally, GCISL launched a new digital textbook for an introductory course in senior living for schools and organizations wishing to offer a course or launch a new program.

To fill the growing demand for a skilled senior-living workforce, the GCISL senior living management program equips students with real-world knowledge and industry-expert connections before they graduate. Unlike other programs that focus heavily on geriatrics, gerontology or policy, the WSU program is preparing students with community operations expertise, where industry need is the greatest.

The institute actively seeks collaboration opportunities with other academic programs to build similar models across the country and around the world, particularly other hospitality programs and business schools.

Being located within a hospitality school in an accredited college of business is one of the institute's biggest selling points and a valuable point of recognition for WSU.

The Mather Institute is an award-winning resource for research and information about wellness, aging and trends in senior living and successful industry innovations. ▮

WSU Libraries' Nash Collection wins national library award

WSU Libraries' Irwin Nash Images of Migrant Labor Digital Collection has received the American Library Association's Reference and User Services Association's 2022 John Sessions Memorial Award.

According to the award announcement, the libraries' Manuscripts, Archives, and Special Collections department is commended for its efforts to make the Nash Collection accessible to the community, and for involving that community in identifying people in the photographs to enrich the knowledge of current and future viewers and researchers.

The collection "depicts the rich social, cultural, political, and economic life of the Yakima Valley migrant labor community," the award announcement states. Of special relevance, the collection also depicts farmworker union meetings, rallies, and protests, including visits by United Farm Workers union co-founder Cesar Chavez, and Washington community organizers Guadalupe Gamboa and Tomás Villanueva.

The John Sessions Memorial Award, sponsored by the Department for Professional Employees, AFL-CIO, recognizes a library or library system that has made a significant effort to work with the labor community and by doing so has brought recognition to the history and contribution of the labor movement to the development of the United States. ▮

WSU-led program named key achievement of U.S.-India energy partnership

The **UI-ASSIST program** led by WSU was recognized as a key achievement of the U.S.-India Strategic Clean Energy Partnership when the two nations' energy ministers met previously.

UI-ASSIST, which stands for the U.S.-India CollAborative For Smart DiStribution System WIth Storage, is a consortium of 31 U.S. and Indian partners that aims to bridge the gap between smart grid, storage, and renewable energy research, and facilitate adoption by utilities around the world. The project started in 2017 and was completed at the end of 2023.

It is led by Noel Schulz, professor in WSU School of Electrical Engineering and Computer Science (EECS) in the Voiland College of Engineering and Architecture. Other involved WSU faculty include Christine Horne from the Department of Sociology as well as Anjan Bose and Assefaw Gebremedhin from EECS. ▮

University Achievements

WSU post-doctoral fellow Abhilash Chandel explains to an AgAID Institute team how the drone's sensing technology collects multispectral and thermal imagery data from a "smart farm" in Yakima County.

WSU is leading a national AI research institute for agriculture

With a $20 million federal grant, WSU has been leading a multi-institutional research institute to develop artificial intelligence (AI) solutions to tackle some of agriculture's biggest challenges related to labor, water, weather and climate change.

The new institute is one of 25 launched by the National Science Foundation and among the five funded by the U.S. Department of Agriculture-National Institute of Food and Agriculture. The institute launched in 2021. It's called the **AgAID Institute**, which is short for USDA-NIFA Institute for Agricultural AI for Transforming Workforce and Decision Support.

While traditional AI development involves scientists making tools and delivering them to end-users, the AgAID Institute involves a transdisciplinary coalition of people who will co-develop and apply the AI solutions for a variety of specialty crop agricultural applications, said Ananth Kalyanaraman, a WSU computer science professor and the lead principal investigator for the Institute. The Institute engages with the agricultural industry from farmers and workers to policy makers.

The AgAID Institute will be a multi-disciplinary, collaborative effort involving faculty and scientists with expertise on a diverse range of areas in computer science, agriculture and agricultural outreach.

In addition to WSU, the Institute members include Oregon State University; University of California, Merced; University of Virginia; Heritage University; Wenatchee Valley College; and Kansas State University. Private sector partners include IBM Research and the start-up innov8.ag.

The AgAID Institute is taking an "adopt-adapt-amplify" approach. This means first the Institute will design AI solutions in partnership with the people who use the tools, so they are practical and more likely to be adopted. The researchers will also work to make solutions that can adapt to changing environments and that amplify productivity by combining human skills and machine capabilities to be more effective than either would be alone.

Educating the workforce at all levels is central to the AgAID Institute not just to encourage AI adoption but as a matter of equity. The Institute plans multiple education programs from K-12 through higher education and worker training. The goal is to raise AI skill levels and open new career paths, which can improve pay and quality of life for agricultural workers. It can also attract more people to agriculture and computing professions.

The AgAID Institute is undertaking several challenging test cases involving specialty crops, many of which grow in the Western United States, such as apples, cherries, mint and almonds. These crops encompass several major challenges: they require intensive labor and irrigation. They are also vulnerable to weather events and climate change. Specialty crops account for 87% of the U.S. agricultural workforce, and about 40% of these crops are perennial, requiring long-term management and resource planning. ▮

Faculty Achievements and Recognition

Two WSU faculty named fellows in nursing's leading academies

Two WSU Vancouver College of Nursing faculty have been named fellows in the nursing profession's leading academies. Associate Professor Connie Nguyen-Truong has been named an Academy of Nursing Education Fellow (ANEF) by the National League for Nursing. Professor Catherine Van Son has been named a Fellow of the American Academy of Nursing (FAAN).

Nguyen-Truong

Connie Kim Yen Nguyen-Truong, Ph.D., RN
Nguyen-Truong is one of 19 nurse educators selected in 2021 for inclusion in the National League for Nursing's Academy of Nursing Education.

The National League for Nursing's selection process evaluates applicants' contributions to innovative teaching and/or learning strategies; nursing education research; faculty development activities; academic leadership; promotion of public policy initiatives that advance nursing education; and/or collaborative educational, practice, or community partnerships.

She has two decades of nursing experience and has been a nurse educator for 15 years. Her research and teaching focus on cultural immersion experiences and enhancing communications between nursing faculty and students and representatives of minority communities, including Micronesian Islanders, Vietnamese, Chinese, Korean and Laotian partners. She has developed innovative, culturally safe, linguistically appropriate engagement and educational curriculums and models.

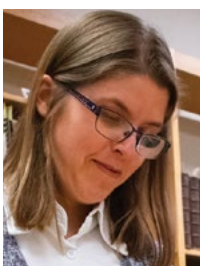
Van Son

Catherine Van Son, Ph.D., RN
Van Son is one of 225 nurse leaders to be inducted as a Fellow of the American Academy of Nursing. The Academy's Fellows embody its values of equity, diversity and inclusivity, inquiry, integrity, and courage, which enable nurse leaders to achieve new heights of impact that advance health policy across the globe.

Van Son has specialized in improving care for older adults her entire nursing career.

Her clinical experience spans over 30 years and includes the continuum of community-based care: long-term care, assisted living, PACE model care settings, home health, hospice, and congregational health. Her research reflects her long interest in gerontological nursing.

Librarian Talea Anderson selected as Mellon Fellow



Anderson

Talea Anderson, scholarly communication librarian in WSU Libraries, has been selected as an Andrew W. Mellon Fellow for Diversity, Inclusion, and Cultural Heritage through the Rare Book School (RBS) at the University of Virginia.

The three-year fellowship covers tuition and travel to take RBS courses, attend a cultural heritage field school, organize a symposium, and engage with rising leaders in archives, libraries, and museums. The fellowship provides professional development opportunities for early- to mid-career professionals working in a special collections library, archive, or other cultural heritage institution located in the United States.

The history of accessibility and disability in archives and special collections is largely untold. Anderson's study of braille starting in 2020 sparked her interest in the history of tactile writing. She hopes to take advantage of the Mellon Fellowship's multicultural focus and invaluable connections to other fellows, as well as learning methods of book archaeology to better understand the readers who may have been otherwise invisible in the historical record.

Faculty Achievements and Recognition

Award honors Peabody's groundbreaking historical work

Peabody

The French Colonial Historical Society has established a new prize in honor of **Sue Peabody**, Meyer Distinguished Professor of History at WSU Vancouver. The Sue Peabody Award will be granted to a scholar with a doctoral degree and a full-time position at a scholarly institution outside Europe or North America to support attendance at the FCHS annual meeting.

To date, two recipients have been awarded the Peabody Prize. Monique Milia Marie-Luce from the Université des Antilles in Martinique received the 2022 Peabody Prize. The 2023 Peabody Prize was awarded to Sylvain Mbohou from the Université de Dschang-Cameroun.

The award is intended to further Sue Peabody's work promoting diversity and internationalization in the Society and in the field. They praised Peabody for her eminent stature in the international field of French colonial history and the high esteem in which she is held in that field and beyond.

Peabody is considered a major scholar of race and the law in the Atlantic world, and her books have helped transform the field of French colonial history. Her first book is "'There Are No Slaves in France': The Political Culture of Race and Slavery in the Ancien Régime" (1997), and her most recent, "Madeleine's Children: Family, Freedom, Secrets, and Lies in France's Indian Ocean Colonies" (2017) won three book prizes and has been translated into French.

The letter notes in particular that Peabody is recognized for helping to support and promote the work of emerging scholars, including those from Africa, Southeast Asia, the Caribbean and the Indian Ocean.

Di Wu recognized by two professional societies for research contributions

Wu

Di Wu, associate professor in the Gene and Linda Voiland School of Chemical Engineering and Bioengineering and founding director of the Alexandra Navrotsky Institute for Experimental Thermodynamics, is being recognized by two professional societies in different fields for his early career accomplishments.

Wu has been named among the most influential chemical engineering and applied chemistry researchers, according to a leading journal in the field, Industrial & Engineering Chemistry Research (I&EC Research), which is published by the American Chemical Society. Meanwhile, he is also featured in the "Futures" issue of AIChE Journal, the flagship journal of the American Institute of Chemical Engineers (AIChE).

The I&EC Research award recognizes early career researchers based on the quality and impact of their research. The AIChE honor highlights the research of emerging scholars in chemical engineering.

Wu, who has been with WSU since 2016, conducts research in the experimental thermodynamics of materials employed in energy storage, heterogeneous catalysis, carbon capture and sequestration, and nanogeoscience. He also specializes in calorimetry technology development for in situ measurements.

As part of being selected as a 2021 Influential Researcher, Wu's work is featured in a special issue of the journal. His paper entitled "Formation Energetics and Guest—Host Interactions of Molybdenum Carbide Confined in Zeolite Y" describes the thermodynamics of refractory carbides of inexpensive major industrial metals, such as molybdenum (Mo) and tungsten (W), encapsulated in a family of materials with subnano-scale pores –– zeolites. Once properly supported by zeolites, these carbides can serve as possible substitutes for expensive and rare metals like platinum in catalysts that are used in many industrial processes. His research highlighted in the "Futures" issue of AIChE Journal is on "Thermodynamics of Molybdenum Trioxide Encapsulated in Zeolite Y."

Five WSU faculty named AAAS Fellows

Professors Santanu Bose, Tom Kawula, Bernd Markus Lange, Jill McCluskey, and Katrina Mealey have all been elected as Fellows of the American Association for the Advancement of Science (AAAS), a lifetime honor recognizing the distinguished contributions of scientists, engineers, and innovators.

They are part of 564 new Fellows honored in 2022 by the scientific society which publishes the Science family of journals.

The new AAAS Fellows from WSU are:

Bose

Kawula

Lange

McClusky

Mealey

Santanu Bose
Professor, Veterinary Microbiology and Pathology
College of Veterinary Medicine—Bose was recognized for his contributions to the field of respiratory virus innate immunity and inflammation, particularly for understanding the mechanisms regulating production of proinflammatory and antiviral factors to treat inflammatory lung diseases.

Tom Kawula
Professor and Director, Paul G. Allen School for Global Health, Director of Graduate Education, College of Veterinary Medicine— Kawula was selected for his work in microbiology, particularly in molecular pathogenesis of zoonotic bacterial diseases and training of the next generation of infectious diseases scientists.

Bernd Markus Lange
Professor, Institute of Biological Chemistry
College of Agricultural, Human, and Natural Resource Sciences— Lange was honored as a Fellow for his research in the field of plant terpenoid biochemistry, with particular emphasis on metabolic control in specialized secretory structures and cell types.

Jill McCluskey
Regents Professor and Director, School of Economic Sciences, College of Agricultural, Human, and Natural Resource Sciences— McCluskey was recognized for her contributions to research and leadership in the areas of food labeling, food quality, and product reputation.

Katrina Mealey
Regents Professor, Director, Program in Individualized Medicine, Veterinary Clinical Sciences College of Veterinary Medicine— Mealey was elected a Fellow for her contributions to veterinary pharmacogenetics, particularly for developing methods to identify animals susceptible to adverse drug events thereby preventing fatal adverse drug reactions.

Faculty Achievements and Recognition

WSU faculty named to Washington State Academy of Sciences

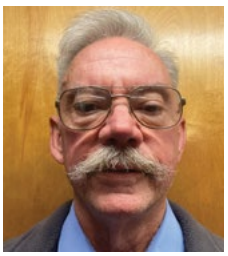
The Washington State Academy of Sciences announced six faculty from WSU will be new members. Membership in WSAS recognizes their scientific and technical contributions to the state of Washington and the nation.

John Roll, professor and vice dean of research for WSU Elson S. Floyd College of Medicine, will be moving from the president-elect position to take the helm as the president of the WSAS governing board. Julie Kmec, WSU professor of sociology, will also take a seat on the board.

The new WSU members of the Academy are:

Bollens

Field



McNamara

Prasad

Venkatasubramanian

Stephen Bollens
Professor in the School of the Environment and School of Biological Sciences, Director of the Meyer's Point Environmental Field Station—For research on salt and freshwater aquatic systems that is both timely and important to understanding the impact of global climate change and rising sea levels on estuarine systems and biodiversity in the Pacific Northwest. For a proven willingness to engage and serve institutions and the public.

David Field
Professor in the School of Mechanical and Materials Engineering, Director, Institute of Materials Research, WSU—For developing and commercializing the automated Electron Backscatter Diffraction techniques and their application and mentoring a large group of graduate and undergraduate students in mechanical and materials engineering.

John McNamara
Professor Emeritus in Animal Sciences—For research in nutritional physiology of farm animals which opened new areas of research and changed on-farm management to improve sustainability. For work on companion animal biology that helped start new programs across the country, and work with the Washington Science Teachers Association to help prepare teachers in integrated STEM teaching.

Bhagwat Prasad
Associate Professor in the College of Pharmacy and Pharmaceutical Sciences, Director of Industry Engagement—For expertise in drug metabolism and pharmacokinetic modeling that is valuable to FDA and pharmaceutical companies, since proteomics-informed in silico modeling helps to avoid drug failures. For his work as an associate professor of pharmaceutical sciences at WSU where he trains and mentors researchers in these approaches.

Vaithianathan Venkatasubramanian
Boeing Distinguished Professor in Electrical Engineering, Director of the Energy Systems Innovation Center—For contributions to the development of novel modeling, stability analysis, and control solutions based on wide-area measurements for electric power interconnections around the world including in the U.S., Europe, and India, and for service to power industry and regulatory agencies on improving the understanding of complex stability phenomena in power grids.

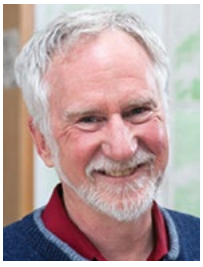
Two WSU faculty named to National Academy of Sciences

Biochemistry professor John Browse and anthropology professor Tim Kohler were elected to the National Academy of Sciences in recognition of their achievements in original research.

Browse and Kohler are among just 150 new members announced in 2022. First established by U.S. Congress and President Abraham Lincoln in 1863, the National Academy of Sciences is a nonprofit society of scholars charged with providing independent, objective advice about science and technology to the nation.

Browse

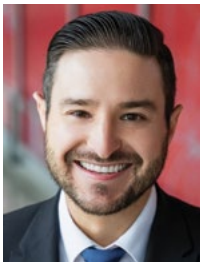
John Browse
Charlotte Martin Distinguished Professor in Agricultural Research
Regents Professor Emeritus of biochemistry and molecular plant sciences, Institute of Biological Chemistry
Browse is a pioneer and leader in plant biology. His research focuses on investigating the biosynthesis of membrane and seed-storage lipids in plants, using Arabidopsis, or thale cress, a model organism often used to understand plant biology. His work has improved understanding of plant defenses and helped bioengineer plants with higher amounts of useful chemicals, such as increased levels of heart-healthy monounsaturated fatty acids. He is also well known for identifying and cloning the desaturase gene in Arabidopsis, responsible for the synthesis of polyunsaturated fatty acids in plants.



Kohler

Tim Kohler
Regents Professor Emeritus of Archaeology and Evolutionary Anthropology
External Professor, Santa Fe Institute
Kohler studies the social dynamics of prehistoric cultures, specializing in the U.S. Southwest. His research explores the relationships among demography, violence, wealth inequality, social evolution, and climate variability. While his work has improved methods of understanding the past, his findings have echoes into the present — which was recently recognized when the United Nations named Kohler as a lead author on a recent Intergovernmental Panel on Climate Change report. Kohler's current projects include the SKOPE project to make interpreted paleoenvironmental data widely accessible, and another National Science Foundation-funded project to generate and analyze measures of wealth inequality in societies around the world over the last 10,000 years.

Entrepreneurship professor receives Emerging Scholar Award



Kier

Alex Kier, associate professor of entrepreneurship at WSU Vancouver, was honored with the 2021 Emerging Scholar Award by the Entrepreneurship Division of the Academy of Management. The award recognizes excellence in the field of entrepreneurship research.

Award winners demonstrate an emerging record of scholarship that has the potential to make innovative and impactful contributions to the body of entrepreneurship research.

Kier's research focuses on the psychology of entrepreneurship covering topics such as entrepreneurial imagination, the effects of cannabis on new business ideas, and how government grants affect future private investment and growth of new businesses.

His work has been published in top management and entrepreneurship journals such as the Academy of Management Journal, Entrepreneurship Theory and Practice, Journal of Business Venturing, and Strategic Entrepreneurship Journal; and featured in the popular press such as Forbes and U.S. News & World Report, as well as on the University of Colorado's Creative Distillation podcast.

Faculty Achievements and Recognition

Department of Art professor research receives national and international recognition

Meredith

Hallie Meredith, assistant professor of art history at WSU, has been selected as a 2021-2022 Kress Foundation Residential Fellowship for the Summer Teachers Institute in Technical Art History.

The Kress Foundation supports the training and practice in the field of art conservation through its fellowship and grant programs. The Summer Teachers Institute in Technical Art History is an intensive week-long professional development program intended to offer a broad introduction to technical art history for art history faculty at colleges and universities throughout North America. The Summers Teachers Institute in Technical Art History is jointly lead by the Conservation Center at the Institute of Fine Arts at New York University and the Yale University Art Gallery.

Meredith also has been selected as the recipient of an award from the United Nations International Council for the International Year of Glass 2022. The 2022 UN International Year of Glass highlighted the scientific, economic, and cultural roles and celebrates several anniversaries. Glass supports many vital technologies, facilitates sustainability and a green world and enriches our lives, yet often goes unnoticed. This award was for Meredith's community engagement event titled, "Glass Comes Alive in Pullman." The event took place on August 30, 2023. Nearly 1,000 people attended in-person and remotely. This interdisciplinary event also received generous internal support from several WSU units.

Physicist honored for microscope invention, impact on society

McCluskey

A recognized authority on compound semiconductors and the recipient of two U.S. patents, **Matthew McCluskey**, Westinghouse Distinguished professor in the College of Arts and Sciences Department of Physics and Astronomy, has been named a Senior Member of the National Academy of Inventors.

NAI Senior Members are active faculty, scientists, and administrators from NAI member institutions who have created innovation-producing technologies that have brought, or aspire to bring, real impact on the welfare of society. They also have growing success in patents, licensing, and commercialization, while educating and mentoring the next generation of inventors.

High-end confocal microscopes are used to ensure there are no material inconsistences or defects in electronic, optoelectronic, and structural devices, as well as coatings, tubing, devices, disks, and specialty mirrors. McCluskey, an experimental physicist, developed an improved method of inspecting surfaces for miniscule defects. Called confocal optical profile microscopy (COP), his innovative approach uses a CCD array rather than the pinhole and single-element detector of standard confocal microscopes. COP captures the entire beam profile of emitted light, resulting in more accurate and complete data at a fraction of the cost.

Refinement of the COP technique led to two patents, with McCluskey the sole inventor on both, and to the creation of Klar Scientific, a WSU spin-out company co-founded by McCluskey that has exclusive license to the intellectual property.

Four WSU faculty recognized on the 2021 Highly Cited Researchers list

The 2021 list recognizing the top 1% most cited researchers in the world includes four WSU faculty. Business professor Dogan Gursoy joins the Highly Cited Researchers list from Clarivate for the first time, appearing alongside veteran members medical professor Kris Kowdley and engineering faculty Dan "Annie" Du and Yuehe Lin.

The annual list identifies researchers who demonstrated significant influence in their fields through the publication of multiple highly cited papers during the last decade. Their names are drawn from the publications that rank in the top 1% by citations for field and publication year in the Web of Science citation index.

Du

Gursoy

Kowdley

Lin

Dan "Annie" Du, Research professor in the School of Mechanical and Materials Engineering, Voiland College of Engineering—Du is an innovator in the fields of biomaterials and bioengineering. Her work focuses on using nanomaterials for biosensing and drug delivery as well as immunosensors and microchips for biomarker detection. She is currently leading a project to develop a quick test to detect wildfire smoke exposure. Her past work includes an early detection method for Alzheimer's disease and functional gold and platinum nanoparticles for cancer therapy. She has published 300 research papers which have been cited more than 33,000 times, according to Google Scholar.

Dogan Gursoy, Taco Bell Distinguished Professor in Hospitality Business Management, Carson College of Business—Gursoy is a leading hospitality and tourism researcher covering topics such as sustainability, services management, tourist behavior, and hospitality and tourism marketing. Recent studies include artificial intelligence acceptance within the hospitality industry and customers' willingness to return to hotels and restaurants during the COVID-19 pandemic. He is the editor-in-chief of the Journal of Hospitality Marketing & Management (SSCI IF = 12.5). He developed and designed the "Hotel Simulation," a virtual management training game in which participant teams run 500-room hotels in a competitive marketplace. Gursoy has published over 200 research publications in refereed journals and 12 books. The scientific impact of his publications is evident in the cumulative h-factor of 88 and over 36,000 citations. He is recognized and consistently ranked as one of the most prolific hospitality and tourism researchers worldwide. He is also ranked as the number 80 researcher in the United States in Business and Management category and the number 141 researcher worldwide in the same category. He is the recipient of the 2021 ICHRIE Lifetime Research Achievement Award and the 2019 University of Delaware's Michael D. Olsen Research Achievement Award. These awards recognize individuals who have made significant contributions to outstanding scholarship in hospitality and tourism.

Kris Kowdley, Professor, Elson S. Floyd College of Medicine—Kowdley is an internationally recognized liver disease expert and researcher. He has led several major international clinical trials of new treatments for hepatitis C, hereditary hemochromatosis, primary biliary cholangitis, primary sclerosing cholangitis, and nonalcoholic steatohepatitis. His translational and laboratory research focuses on the role of iron as a co-factor in many liver diseases, ranging from hepatitis C, hemochromatosis to nonalcoholic steatohepatitis. He has developed murine models for nonalcoholic steatohepatitis. Kowdley is an author on more than 1,000 articles, book chapters, reviews, and commentaries, and his scholarly work has been cited nearly 50,000 times, according to Google Scholar.

Yuehe Lin, Professor in School of Mechanical and Materials Engineering, Voiland College of Engineering—Lin is a leader in the fields of bioengineering and energy. His work includes the development of nanomaterials and nanobioelectronic devices for disease diagnosis and drug delivery and catalysts for energy storage and conversion. Recent notable studies include the development of a low-cost glyphosate sensor, and a breakthrough in water-splitting. He has produced 600 publications which have been cited more than 85,000 times, according to Google Scholar. Lin is a fellow of the National Academy of Inventors, the American Association for the Advancement of Science, American Institute of Medical and Biological Engineering, Electrochemical Society, and Royal Society of Chemistry as well as an elected member of the Washington State Academy of Sciences.

Faculty Achievements and Recognition

Mona Ghandi receives World Architecture Award

Ghandi

Mona Ghandi, associate professor of architecture in the School of Design and Construction, and her team in the Morphogenesis Lab have received a World Architecture Award from World Architecture Community for a project that uses artificial intelligence and wearable technology to create adaptive spaces that respond to people's emotions.

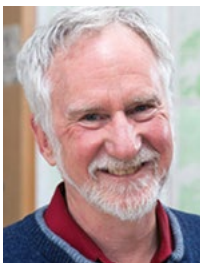
The award highlights and recognizes projects that have the potential to inspire questions about contemporary architectural discourse.

The award was for Ghandi's lab work, "Wisteria: Architecture as an Embodiment of Human Emotion." Wisteria is an adaptive installation that performs real-time responses to people's emotions, based on biological and neurological data. In the project, people enter a space filled with a forest of cylindrical fabric shrouds that suspend from the ceiling. Upon sensing the presence of an occupant, using a programmable material (shape-memory-alloy), the shrouds begin to fluctuate, expanding and contracting the volume of the space in rhythm and sequence. In this project, the user's biological data was translated into emotion categories and the installation was calibrated to actively respond to this data to create an ambiance that would improve the users' emotions. The shrouds are arranged to create a distinct spatial progression and bring forth a heightened perception of scale and awareness of oneself within the space. The project integrates artificial intelligence (AI), wearable technology, sensory environments, and adaptive architecture, allowing visitors to change the color and form of the installation using their brains and emotions.

With its use of affective computing or "emotion AI," the project could someday lead to medical applications helping people who have difficulty communicating their emotions, such as those with autism, PTSD, or mental disabilities.

With WSU since 2016, Ghandi's interdisciplinary research is linking architecture, computer science, neuroscience, and psychology. It focuses on the Emotive and Performative Intelligent Architecture which examines the role of Artificial Intelligence, machine learning, robotics, sensory environments, and adaptive architecture to enhance social, environmental, and personal well-being. Her research aims to create cyber-physical adaptive spaces that can respond to the user's physiological and psychological needs based on biological and neurological data in real-time. Her focus is on smart systems that create adaptive and user-oriented spaces using affective computing. Through artificial intelligence, she seeks to create spaces that can learn from the user's behavioral patterns in real-time, enhance environmental quality, reduce user's anxiety and depression, and promote more flexible, human-centered designs. Ghandi has applied this approach in correlation with biofeedback data, aspiring to make buildings more attuned to the psychology of their occupants addressing crucial topics like well-being, social justice, and environmental sustainability.

Archaeologist plays major role in UN climate report



Kohler

Tim Kohler, a WSU emeritus professor of archaeology and evolutionary anthropology, is the first archaeologist to contribute as author to one of the United Nations' Intergovernmental Panel on Climate Change's (IPCC) reports. He is also the only lead author from Washington state on the 157-page chapter 14 of the IPCC's report on North America.

The latest IPCC report forecasts bad news for a host of issues from rising food insecurity to increasing social inequality in North America unless steps are taken now to reduce global carbon emissions. Overall, the report predicts major losses to North American biodiversity, hundreds of billions of dollars in economic losses in the U.S., and spikes in heat-related human mortality and crime during the hot summer months. The IPCC climate assessment included contributions by 195 UN member countries on how global warming is influencing nature, agriculture, and human health

Much of Kohler's research focuses on how humans have adapted to a changing climate in North America throughout history. He explained that people were able to flourish across the continent at the end of the last ice age almost 12,000 years ago because the world entered a period of climatic conditions conducive for agriculture called the Holocene.

Konstantin Matveev named ASME fellow

Matveev

Konstantin Matveev, a professor in the School of Mechanical and Materials Engineering, has been named a fellow of the American Society of Mechanical Engineers (ASME).

About 2% of ASME's 130,000 members are fellows, which recognizes their exceptional engineering achievements and contributions to the engineering profession.

With WSU since 2006, Matveev conducts research in the areas of high-performance marine vehicles, advanced energy systems, and unmanned mobile systems.

He has designed high-performance marine vehicles with air-lubricated hulls, hydrofoils, and amphibious platforms. He has even looked to highly efficient seafaring creatures such as dolphins to create better designs for ocean-going ships that aim to improve energy efficiency and reduce harmful emissions.

In the area of energy systems, Matveev conducts research on liquid hydrogen and cryogenic systems. He also has worked to develop unmanned mobile systems for drones, boats, and underwater vehicles.

He has received funding support from numerous agencies, including the Defense Advanced Research Projects Agency, the National Science Foundation (NSF), the Department of Energy, Office of Naval Research, National Aeronautics and Space Administration, and Washington's Joint Center for Aerospace Technology Innovation.

Matveev holds a Ph.D. in mechanical engineering from the California Institute of Technology and a bachelor's and master's degree in applied physics from the Moscow Institute of Physics and Technology in Russia.

History professor honored as Fellow of International Royal Historical Society

Hatter

WSU associate professor of history **Lawrence B.A. Hatter** is among 99 people from across the globe recently elected a Fellow of the prestigious Royal Historical Society (RHS). The 153-year-old organization based in the U.K. recognized Hatter for his contribution to the discipline of history.

The RHS represents the interests of historical researchers in universities, libraries, archives, museums, heritage and broadcasting, as well as those engaged in public, community and family history research. It promotes historical scholarship by supporting research and publication and advocates for best practices in history teaching at universities and schools. It also provides a forum for historians to meet and exchange ideas.

Hatter is a transnational historian of 18th– and early-19th-century America. Originally from the U.K., he earned his doctoral degree in early American history at the University of Virginia and joined WSU faculty in 2012. He regularly teaches a range of courses focused on early U.S. history.

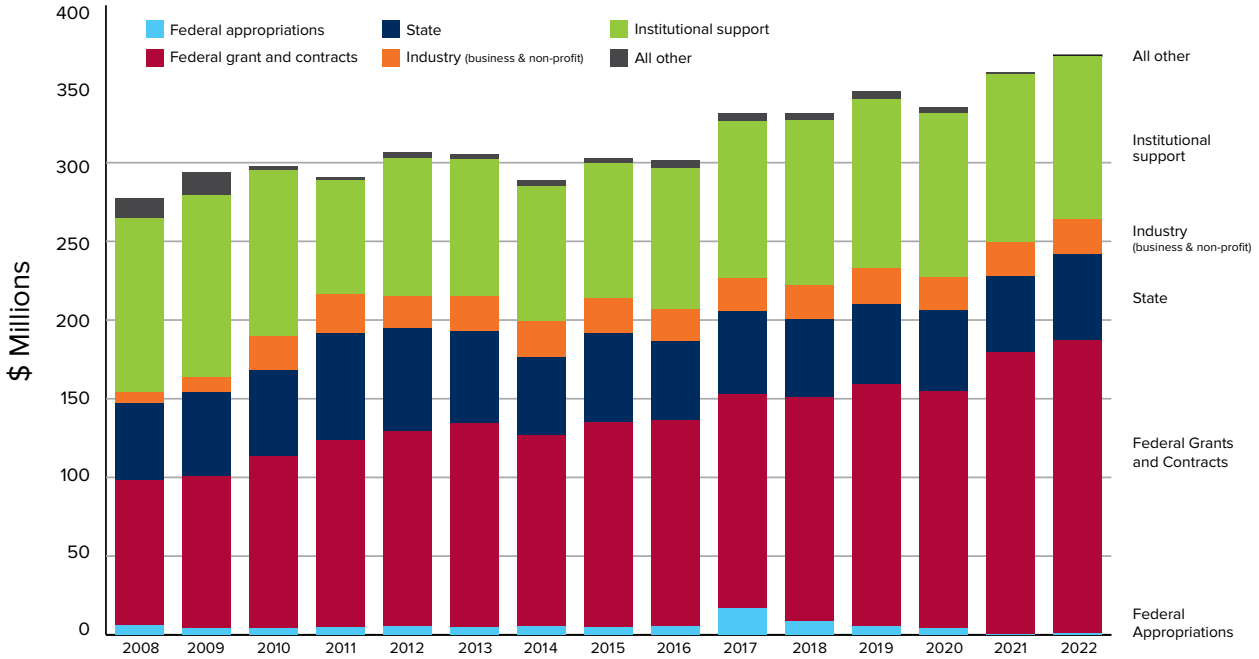
He has authored numerous scholarly publications, and his first book, Citizens of Convenience: The Imperial Origins of American Nationhood on the U.S.–Canadian Border (Charlottesville & London, 2017) won the 2016 Walker Cowan Memorial Prize for an "outstanding work of scholarship in eighteenth-century studies" and was named a 2017 Choice Outstanding Academic Title by the American Library Association.

Facts & Figures

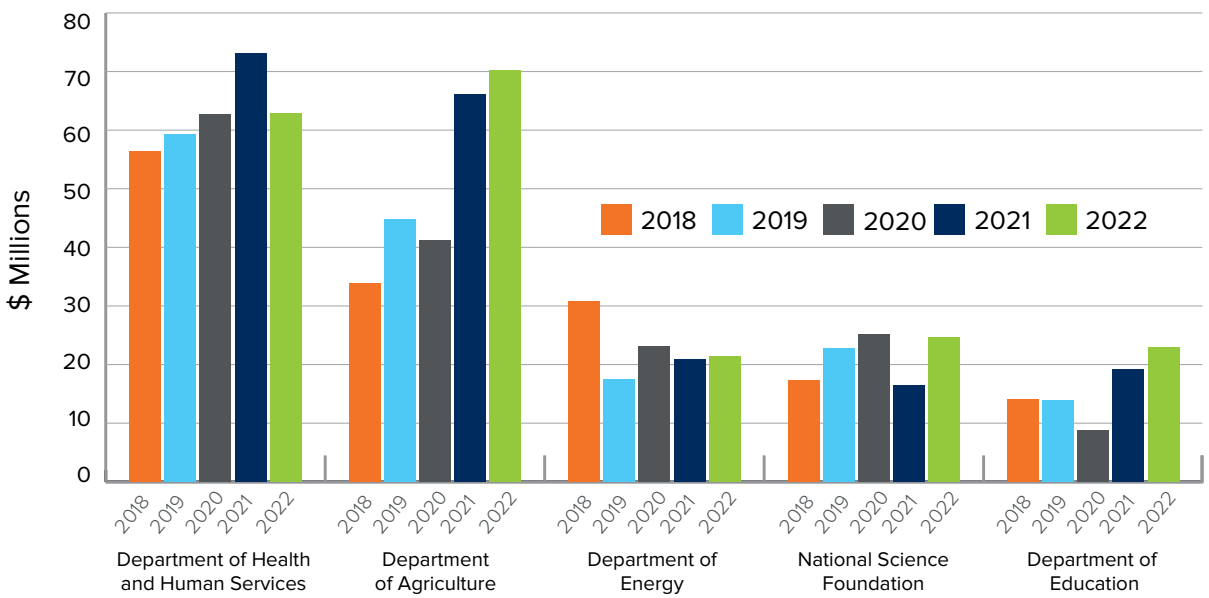
Total Research and Development Expenditures

$368.3 million total for FY2022

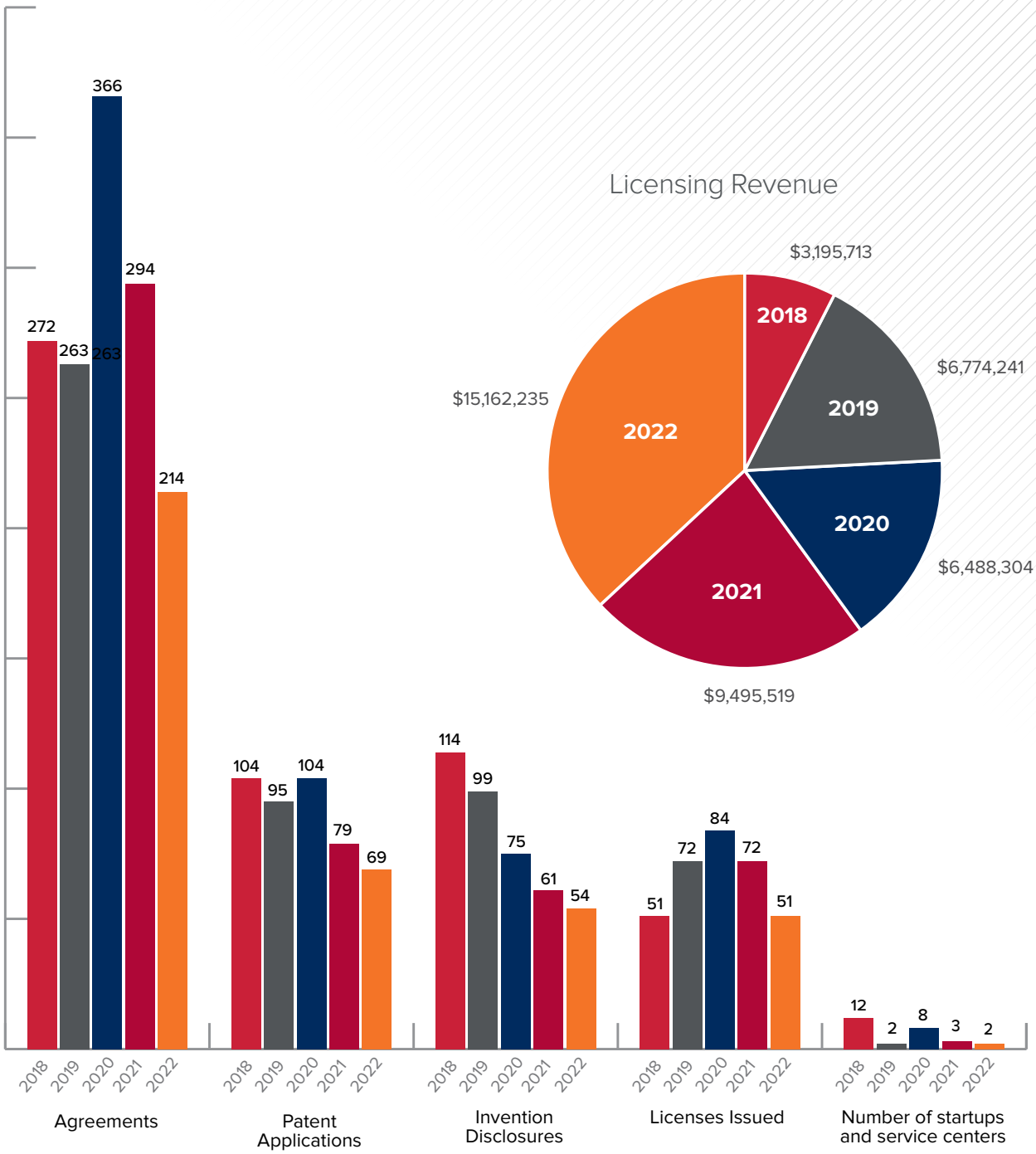
Please note: *Figures in this graph differ from the NSF HERD Report to reflect recent corrections with data calculations through FY2021 within WSU. The data calculated by WSU for FY2022 is what was submitted years.*



Trends in Federal Awards



Commercialization Advancement FY18-FY22

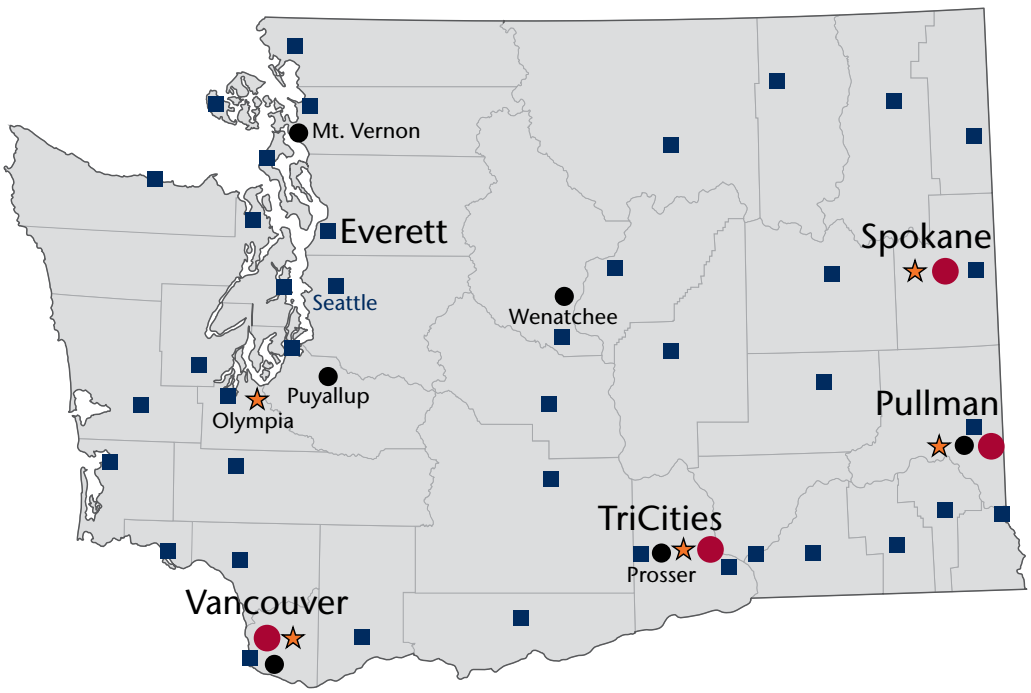


Licensing Revenue

Facts & Figures

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.

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

research.wsu.edu

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