## Cover Stories

<table>
<thead>
<tr>
<th></th>
<th>Title</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Thermal sensors could save apples from sunburn, conserve water, energy</td>
<td><a href="https://news.cahnrs.wsu.edu/article/thermal-sensors-could-save-apples-from-sunburn-conserve-water-energy">https://news.cahnrs.wsu.edu/article/thermal-sensors-could-save-apples-from-sunburn-conserve-water-energy</a></td>
</tr>
<tr>
<td></td>
<td>agricultural research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>giant hornet</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Scientist to testify to U.S. legislators on salmon-killing tire</td>
<td><a href="https://news.cahnrs.wsu.edu/article/scientist-to-testify-to-u-s-legislators-on-salmon-killing-tire-chemical">https://news.cahnrs.wsu.edu/article/scientist-to-testify-to-u-s-legislators-on-salmon-killing-tire-chemical</a></td>
</tr>
<tr>
<td></td>
<td>chemical</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>New degree in place for wine students</td>
<td><a href="https://news.cahnrs.wsu.edu/article/new-degree-in-place-for-wine-students">https://news.cahnrs.wsu.edu/article/new-degree-in-place-for-wine-students</a></td>
</tr>
</tbody>
</table>

## Connect with CAHNRS

- **Online**: [cahnrs.wsu.edu](https://cahnrs.wsu.edu)
- **Facebook**: [facebook.com/CAHNRS](https://facebook.com/CAHNRS)
- **Instagram**: [instagram.com/wsucahnrs](https://instagram.com/wsucahnrs)
- **Twitter**: [twitter.com/wsucahnrs](https://twitter.com/wsucahnrs)
- **YouTube**: [youtube.com/user/WSUCAHNRS](https://youtube.com/user/WSUCAHNRS)

## DEAN’S OFFICE

- P.O. Box 646242
- 509-335-4561
cahnrs.deans@wsu.edu

## Contents

- Land-Grant ................................................... 1
- Diversity, Equity & Inclusion ....................... 2
- Academics.................................................... 4
- Research....................................................... 8
- Extension...................................................... 12
- Research & Extension Centers......................... 15
- Departments & Units................................ 17
Serve All People

The College of Agricultural, Human, and Natural Resource Sciences (CAHNRS) leads Washington State University’s land grant mission to serve all people through education, research, and service.

CAHNRS Cougs—our faculty, staff, students, and alumni—extend science and knowledge to serve Washington and the world. Our work creates healthy communities, families, and children, sustains the economy and the environment, and continually advances the science and practice of agriculture, helping feed a growing world populace.

For six generations, since our ancestor college started instruction on January 13, 1892, minds in CAHNRS have engaged in discovery that improves the food we grow, the clothing we wear, and the industries and resources we depend upon. We educate the next generation of leaders in dozens of fields, from food and animal sciences to economics, apparel and human development.

CAHNRS has the largest state presence of any college at WSU, with 12 schools and departments, three Extension Program Units, four Research and Extension Centers, and Extension offices serving 39 counties as well as the Confederated Tribes of the Colville Reservation.

Discovery at CAHNRS is funded by federal, state, industry, and community partners, as well as many passionate donors. In fiscal year 2020, CAHNRS secured more than $84 million in extramural funding, which accounted for more than 31 percent of all WSU extramural funding.

CAHNRS encompasses the state-wide impact of WSU Extension. For more than a century, Extension has fostered educational, personal, and professional development to families, farmers, and communities throughout the state—impacting the lives of Washingtonians in ways that no other organization can.

In the pages ahead, get to know CAHNRS and discover facts, achievements, and highlights of our college. Our long history of excellence continues in the present and will carry us into the future, because in CAHNRS, we can.
In 2021, CAHNRS launched a new state- and college-wide mission supported by our first Assistant Dean of Diversity, Equity, and Inclusive Excellence.

Luz María Gordillo works to encourage diversity, support inclusivity among faculty, staff, and students, and provide opportunities and assistance to underrepresented groups. Her goal is to increase, attract, and retain a diverse faculty, staff, and student body, and ensure that diversity, equity, and inclusion (DEI) are central parts of the cultural and social fabric of CAHNRS, and embedded in all policies and practices.

Studies show diversity and a favorable institutional climate promote faculty retention and productivity. A diverse faculty body has been shown to improve research quality and innovative pedagogical strategies; service providers are more effective when they reflect the communities they serve. Diverse research teams lead to better conclusions and creative outputs, and are better innovators and problem solvers.

**Defining DEI**

- **Diversity** means including and valuing everyone while promoting anti-racist initiatives
- **Equity** is fair treatment, access, opportunity, and advancement for all people, challenging hierarchies of power
- **Inclusion** is the act of creating environments in which any individual or group is welcomed, respected, supported, and valued to fully participate

Faculty, students, and staff can show and share their support for inclusion with CAHNRS backgrounds. Download virtual backgrounds for Pride Month and Hispanic Heritage Month, among others, from the CAHNRS Zoom backgrounds web page: cahnrs.wsu.edu/zoom-backgrounds
STUDENT ORGANIZATION HELPS MINORITY STUDENTS BECOME LEADERS IN AGRICULTURE

WSU students from diverse backgrounds are helping change the face of agriculture through involvement in Minorities in Agriculture, Natural Resources, and Related Sciences (MANRRS).

Entering its fourth year at WSU, the student organization launched two new scholarships in 2021 while helping members stay connected during the COVID-19 pandemic.

Meet the Assistant Dean

Luz María Gordillo has led a remarkably varied career. Originally from Mexico City, she is a first-generation college graduate who holds a doctorate in history from Michigan State University. Gordillo's first book, Engendering Transnational Ties: Mexican Women and the Other Side of Immigration, garnered the ALLA book award in 2011. Her current book manuscript Patients, Philanthropists, and Fieldworkers: The Hidden History of Women and Eugenics, examines gender, race, and public health. Her project brings science and the humanities together at an unexplored crossroad that has the potential to explore thought-provoking connections.

Gordillo has been at WSU Vancouver since 2005, where she has researched and taught 20th Century United States History: History of Sexuality and Medicine, as well as immigration and transnational studies and women’s studies. Gordillo has a strong interest in other scientific fields. She planned to study math and physics when she first went to college in the late 1980s. However, she was steered to more traditionally female arts and humanities coursework.

“I have loved working with artists and historians, but I want diversity, equity, and inclusivity embedded in sciences so that what happened to me, being pushed away from my original plans, doesn’t happen anymore. We have to include everyone.”

State-wide conversation

Gordillo is working to meet as many CAHNRS faculty, staff, and students from underrepresented groups, as possible. The college includes WSU Extension, so that means talking with people all across the state.

“I want to get to know those who are already there to hear what their needs, goals, and visions are,” she said. “I want to learn about where they are in their career and see how I can begin to provide support. It’s important to meet in person and learn about the communities that WSU Extension works with, as well as the graduate students engaged at CAHNRS R&E Centers.” Gordillo particularly looks forward to meeting with Extension faculty because “they are out there in the trenches, doing important work in local communities.”

“Many of our members are first-generation college students who are trying to learn what college is all about, find opportunities, and get to know what is out there for them,” said Stephanie Olivera, past chapter vice president and scholarship recipient.

“MANRRS provides opportunities to network, gain confidence, and build leadership experience,” said Aranza Arroyo-Mejia, an incoming junior and current chapter president. Chapter members connect with diverse fellow students and industry professionals in their field, and find support for success in studies and careers.
The College of Agricultural, Human, and Natural Resource Sciences is one of the most diverse colleges at Washington State University.

We encompass academic programs in Apparel, Merchandising, Design and Textiles, Human Development, Economic Sciences, Environmental Sciences, Food Science, Animal Sciences, and all aspects of the agricultural sciences, from Organic and Sustainable to Precision, Agricultural Education to Viticulture and Enology.

CAHNRS students can and do support and improve lives, businesses, families, and communities. Involved in more than 40 student clubs and organizations, our students complete more than 400 internships annually, and we provide almost $900,000 annually in scholarships. CAHNRS is a WSU leader in providing an outstanding classroom education as well as undergraduate research, career development, and stakeholder-related opportunities. We implement and stress the value of experiential learning, community, student success, educational access, and innovation.

The CAHNRS learning experience revolves around three main elements:

- A solid foundation of basic and discipline-based content
- Experiences and opportunities that bring learning to life
- Opportunities to engage with researchers, industry professionals, and former students

Our approach is designed to ensure that students acquire a full array of skills to launch successful careers and be job-ready, day one!

Serving the Land-Grant Mission

We honor our founding in 1890 as Washington’s Land-Grant University. Our students are mentored to acquire and apply knowledge, skills, and experiences that will serve them and their communities throughout their careers and lives. We strive to give them access to the highest quality education and experiences, so that all of our graduates can realize their highest potential and assume roles of leadership, responsibility, and service. We are proud of our heritage, but we also focus on the future.
FIRST-GENERATION SUCCESS

When Elizabeth Perez was in high school, she didn’t have much guidance when it came to higher education and working towards a career.

“My parents are immigrants, so their understanding of the U.S. college system was limited,” said Perez, whose parents hail from Cuba. “I knew I wanted to go to college, but I didn’t know the pathway, how to apply for scholarships, or about the resources available. It took a great advisor before I started getting helpful direction.”

Perez took those experiences to heart. Joining CAHNRS Academic Programs in 2021 as Director of Recruitment and Retention, she helps future students find their way, connecting representatives from high schools around the state with CAHNRS academic advisors and leading the CAHNRS Ambassadors student program.

“I’m passionate about helping students find the right program for them, along with the resources they need to succeed,” she says. “Representing students, and potential students, from underrepresented backgrounds is so important.”
Interdisciplinary Undergraduate Programs

In today’s increasingly competitive global economy, employers require a highly skilled and adaptable workforce. In the agricultural sciences, CAHNRS offers a diverse array of majors under two overarching degree programs that encompass and bridge multiple scientific disciplines.

- **Agriculture and Food Systems (AFS)** engages students in a wide range of studies connecting agriculture, education, and food production. AFS majors include: Agricultural and Food Business Economics; Agriculture and Food Security; Agricultural Education; Agricultural Technology and Production Management and; Organic and Sustainable Agriculture.

- The **Integrated Plant Sciences (IPS)** degree program provides students with an exciting depth and breadth of knowledge that crosses a variety of science disciplines. IPS majors include: Agricultural Biotechnology; Fruit and Vegetable Management; Field Crop Management; Landscape Nursery and Greenhouse Management; and Turfgrass Management. Our newest degree is the Bachelor of Science in Viticulture and Enology.

NEW VITICULTURE & ENOLOGY DEGREE

For the first time, students at WSU will be able to earn a bachelor’s degree in Viticulture and Enology. In 2020, the Northwest Commission on Colleges and Universities approved the new degree, which will combine resources offered at WSU’s Pullman and Tri-Cities campuses. Students may begin the program at either campus, but finish at Tri-Cities. This allows them to take advantage of the differing experiences offered at each campus as well as finish their degree in the heart of wine country, where opportunities to work with the industry are outstanding.

CAHNRS AMBASSADORS

CAHNRS Ambassadors is a student leadership organization that allows students to pursue higher education and serve as liaisons between the college and the greater community.

Ambassadors promote CAHNRS to prospective students through high school visits and on-campus tours. They participate in activities and events throughout CAHNRS and the broader WSU community, helping to educate the public about opportunities and careers in agriculture, family and consumer sciences, design science, natural resource sciences, and related disciplines. Developing their own leadership and networking skills and opportunities, they are the face of CAHNRS to the state and beyond.
Advanced Degrees Across Disciplines

Spanning five WSU colleges, six academic units, and WSU Extension, the **Prevention Science** doctoral program applies basic research on children, adults, families, and communities to promote physical, social, and psychological well-being.

Incorporating plant physiology, biochemistry, and molecular biology, students in the **Molecular Plant Sciences** doctoral program help develop life-saving medicines, keep our food safe and available, and develop agricultural systems that feed the world.

The **Master of Science in Agriculture** degree is an online program that offers versatile tracks that span animal sciences, agricultural sciences, food science, and economic sciences. Students in this program are often already in the workforce and are looking to increase their knowledge or advancement opportunities.

**AMDT FASHION SHOW GOES VIRTUAL**

The Apparel, Merchandising, Design and Textiles Fashion Show is a student organized event that has been a highlight of WSU’s Mom’s Weekend for 38 years. In 2021, the fashion show went virtual for the first time. The show, entitled “Zeitgeist,” explored contemporary themes of hope, justice, and equality as student models walked the runway wearing masks due to the COVID-19 pandemic. The work of ten senior designers was featured and awards for the best collections were presented following the event.

*Unbound*, fashion collection by Aliana Miller (center).

**UDALL SCHOLAR LOOKS TO ECONOMICS TO HELP HER TRIBAL COMMUNITY**

A member of the Confederated Tribes of the Colville Reservation, Jonnie Bray built a long career in the Native American legal system before coming to WSU in fall 2020. Having passed the tribal court bar in 1993, she served 26 years as a prosecutor, and then as public defender for the tribes. During this time, she increasingly envisioned systemic changes that would expand Native American tribes’ economic potential. This lead to her decision to pursue a bachelor’s degree at WSU.

Bray intends to become an economist focusing on key areas, including increased availability of middle-income housing, reduced brain-drain in Indian country, and more effective use of existing legislation. The prestigious Udall Undergraduate Scholarship awards are extremely competitive, and being selected is an outstanding achievement.

$900 / 400+

Thousand awarded in scholarships each year

Student internships completed annually

$900 / 400+

Thousand awarded in scholarships each year

Student internships completed annually
CAHNRS is a leading driver of research at WSU, contributing to more than 31 percent of the university’s extramural funding budget. CAHNRS research and Extension faculty brought in more than $84 million in FY2021 from competitive extramural funding sources including federal agencies, Washington state commodity commissions, and other non-federal agency grants.

We support a sustainable future through the powerful combination of both discovery and translational research designed to address the grand challenges of the 21st century—regionally and globally. We discover, develop, and transfer knowledge that: contributes to a safe and abundant food supply; promotes sustainability of agricultural and economic systems; supports energy innovations; encourages careful stewardship of natural resources and ecological systems; and enhances the well-being of individuals, families, and communities.

Research at CAHNRS is as diverse as the communities, families, businesses, agriculture systems, natural resources, and landscapes across the state of Washington. Our goal is to improve economic prosperity, environmental sustainability, community resilience, and quality of life for the people of Washington and beyond.

Kevin Murphy has a passion for crop breeding, especially focusing on nutritional value of the food produced. He’s working with the Elson S. Floyd College Medicine and other CAHNRS colleagues to breed the most nutritious varieties of barley, quinoa, and other crops that are tolerant to heat, drought, and diseases while improving yield, flavor, and end-use quality. Murphy also leads WSU’s Sustainable Seed Systems Lab.
More than 73% of CAHNRS extramural funding is from federal sources. Federal sources include USDA, Department of Energy, Department of Health and Human Services, National Science Foundation, Department of the Interior, EPA, NASA, National Institutes of Health, and flow-through sub-awards.

Non-federal sources include commodity commissions, the State of Washington, private foundations, businesses, local governments, foreign sponsors, and other state governments.

**CAHNRS GRANT AWARDS—FY21**

84,059,554

**Discovery Research**

Discovery research is fundamental to answering complex questions. More than 70 percent of the CAHNRS research portfolio, which is fueled by competitive extramural funding, supports discovery research.

**Premier research program areas**

- Animal genomics and reproductive biology
- Basic plant molecular biology, genomics, and plant breeding
- Biofuels and bioproducts
- Agricultural markets and trade
- Diverse food production systems including organic, conservation, and sustainable agriculture
- Food quality, safety, engineering
- Health and wellness
- Natural resources
- Water supply and quality

**Translational Research and Development**

Our translational research puts discoveries and development to work for the people, businesses, and industries of Washington, to further improve the region, the nation, and the world. At least 30 percent of the CAHNRS research portfolio supports translational research.

**IMPLICATIONS OF OBESITY**

Obesity, diet, and exercise for pregnant women can have major impacts on the health of their children developing in the womb. Min Du, professor in the WSU Department of Animal Sciences, studies the impact of maternal obesity, nutrition, and other physiological conditions on the early development of fetuses. Knowledge obtained through his lab’s research will eventually translate into clinical practice, curbing the vicious cycle between maternal and childhood obesity. His research also has applications in animal agriculture, where proper nutritional management of cows can improve the production efficiency and quality of animal products.
Core Research Facilities

Our capacity for research is strengthened by state-of-the-art facilities and an extensive network of research farms throughout the state.

With the aid of USDA-ARS, Murdock, and National Science Foundation grants, CAHNRS is investing in equipment to expand our capacity for phenomics, high-performance computing, and data handling and analysis. We will soon complete construction of a new research building to house molecular and computational biologists, along with state-of-the-art metabolomic and phenotyping equipment.

Research and Extension facilities and farms

Four R&E Centers and a network of research farms are located throughout the state. These farms include:

- Wilke Research & Extension Farm, Davenport
- Lind Dryland Research Station
- Othello Irrigated Agriculture Research Farm
- H.P. Singleton and Roza research farms, Prosser
- Pullman: Cattle Feeding Laboratory, Cook Long-Term Agroecology Research Farm, Eggert Family Organic Farm, Ensminger Beef Center, Knott Dairy, Palouse Conservation Field Station, Perennial Grass Breeding and Ecology Farm, Plant Pathology Farm, Spillman Agronomy Farm, Tukey Orchard
- Sunrise and Columbia View Orchards, Wenatchee
- WSU Long Beach R&E Unit cranberry research farm
- R.L. Goss Farm, WSU Puyallup
- Heritage Farm & Experimental Orchard, WSU Vancouver
- Honey Bee & Pollinator Research, Extension and Education Facility

CAHNRS-led subject matter centers

- Agricultural Weather Network
- Bioproducts, Sciences, & Engineering Laboratory
- Center for Precision Automated Agricultural Systems
- Center for Sustaining Agriculture & Natural Resources
- Center for Transformational Learning & Leadership
- Child & Family Research Unit (CAFRU)
- Clean Plant Center Northwest
- Division of Governmental Studies & Services
- Food and Environmental Quality Lab
- IMPACT Center
- Freight Policy Transportation Institute
- Ste. Michelle Wine Estates WSU Wine Science Center
- Metropolitan Center for Applied Research & Extension
- Washington Stormwater Center
- Washington Water Research Center
- Western Center for Metropolitan Extension & Research
- Western Center for Risk Management Education
- William D. Ruckelshaus Center

PROVIDING PRACTICAL, ECONOMIC HELP FOR ONION GROWERS

Bacterial diseases cause more than $60 million in losses annually to U.S. onion growers. To fight these diseases, the USDA and industry granted $8.1 million to the Stop the Rot project, headed by WSU plant pathologist Lindsey du Toit.

She leads 24 scientists in diverse disciplines across the U.S. to research the complete system of onion bacterial diseases. Together, they are developing practical, economically sound strategies for pathogen detection and management that will improve profitability and sustainability of onion production.
People and Partnerships

Our strength derives from world-class faculty, strong industry partnerships, and valued input from key advisors.

Faculty
The CAHNRS research environment is designed to recruit high-quality faculty and ensure their success. The Faculty Research Advisory Council, Plant Growth Facility Advisory Group, and Organic Committee engage faculty in the governance of existing facilities, soliciting input on new initiatives, and managing internal competitive grant programs such as Emerging Research Issues.

Industry partners
We engage the people, businesses, and industries that have a stake in research we conduct. We rely on our stakeholders for all aspects of research, including planning and assessment, advisory capacity, and financial support.

Advisory groups
Our external advisory groups ensure relevance and assist in implementation of external initiatives. They include:

- Cereal Variety Release Committee
- Tree Fruit Endowment Advisory Committee
- Wine Science Center Advisory Committee
- Variety of licensing advisory groups for cereals, tree fruit, and small fruit
- Clean Plant Center Northwest advisory groups
- Tree Fruit Royalty Use Advisory Committee
- Several departments have their own advisory groups

Commodity commissions
Our partnerships with agricultural commissions allow us to attract world-class leaders through recruitment of endowed chair positions and develop cutting edge research facilities. Commissions contributed more than $50 million to CAHNRS in the last five years through direct support of research and endowments, and support for infrastructure like the Washington Grains Plant Growth Facility.

RESEARCHING COSTLY PLANT PESTS
Root-knot nematodes cause billions of dollars in crop losses each year. The microscopic parasites infect plant roots and can cause damage that affects water and nutrient uptake. Cynthia Gleason studies the genetic components of nematodes to learn how they hurt plants on the molecular level. Gleason’s lab is in WSU’s new Plant Sciences Building, which opened in 2020.

UNDERSTANDING HOW PLANTS WORK
Helmut Kirchhoff wants to understand how plants optimize, protect, and maintain the structures needed for photosynthesis on the molecular, supramolecular, and membrane level. His findings could lead to insights on how plants survive in challenging and changing environments and can help to find new ways to solve global food and energy problems. He is part of an international research collaboration with Germany’s Cluster of Excellence on Plant Sciences.

Intellectual Property Portfolio

$5.7 Million in gross royalties for FY2021
88% Percent of total royalties collected by WSU

Top royalty producers
- Cougar Gold Cheese
- US Plant Patent for WA 38 and the Trademark COSMIC CRISP
- Microwave Sterilization and Pasteurization Technology
- 20+ Licensed Wheat Varieties
Support Local Communities

For more than 100 years, Washington State University Extension has helped improve the health, economy, and sustainability of the state of Washington.

WSU Extension experts supply individuals with research-based knowledge, allowing them to better succeed in their jobs, raise safe and healthy families, and build vibrant communities for the next generation of leaders.

WSU Extension includes three Program Units:

- **Agriculture and Natural Resources (ANR)** conducts locally relevant research in agricultural and natural resource sciences
- **Community and Economic Development (CED)** partners with local leaders to improve communities and grow their economies
- **Youth and Families (Y&F)** improves the capacity of young people to succeed, and strengthens families for healthy development

With 40 locations throughout the state, WSU Extension is the front door to the university. Recognized for accessible, experiential, and inclusive educational programs, Extension empowers individuals, organizations, and communities to solve challenges, and build a culture of lifelong learning.

Building on a strong cooperative history, WSU Extension continues to foster impact-driven partnerships with federal, state, tribal, and county governments, and private-sector entities. Extension actively addresses the complex, critical issues facing the state today.
The Extension Impact

Throughout its history, WSU Extension has been on the front lines helping to build and support the communities and families of Washington. Extension’s model of service and outreach has never been more evident than during this past year of the pandemic. Ahead, you will see the ways Extension programming fully realized the land-grant mission amid these challenging times through inter-unit collaboration and statewide engagement.

4-H

When the COVID-19 pandemic precipitated school closures, Washington State 4-H rapidly adjusted to this unprecedented event by leveraging its reach, resources, and partnerships to help those in need.

For instance, professionals at the Child and Family Research Unit (CAFRU) provided trauma training to 4-H staff on how to understand emotion regulation and the importance of self-regulation for learning. CAFRU and 4-H partnered together to provide 600 kits with supplies like fidget cubes and noise-cancelling headphones for rural Washington youth to help mitigate stress during remote learning, and 8,000 kits with 4-H school supplies and activity cards were sent to 4-H youth across the state. Leaders in 4-H held Facebook live sessions all year to continue programs online through social media.

Master Gardeners worked with 4-H to offer Junior Master Gardeners to Washington 4-H students so they could learn about agriculture, and 4-H and ANR worked together to create a program to examine native foods and food sovereignty with the Federally Recognized Tribes Extension Program. The Youth and Families program unit also partnered with 4-H to create a gardening and media camp for Kalispel Tribal youth.

Broadband Action Team (CED)

Broadband Action Teams (BATs) are critical networks that increase local engagement by helping to provide broadband access to underserved rural communities.

Throughout the COVID-19 pandemic, school and work closures forced rural families to look elsewhere for access to Internet. In April of 2020, the Drive-In WiFi partnership was launched, placing broadband access points at WSU’s county and tribal Extension centers throughout Washington’s 39 counties, as well as schools, libraries, and community centers across the state.

In addition to state and private partners, WSU worked with members of Washington’s congressional delegation, including Sens. Maria Cantwell and Patty Murray and Reps. Kim Schrier and Cathy McMorris-Rodgers, to demonstrate how the approach could potentially help underserved areas nationally.
Master Gardener Program (ANR)

The Master Gardener program originated in 1972 in Pierce and King counties. The program was developed to meet the community horticulture needs of growing urban areas of the state through the use of trained volunteers. Since then, the program has expanded into all 39 Washington counties, to many states in the U.S., and internationally into Canada, the U.K., and South Korea.

Master Gardeners have made significant impacts on improving water quality, decreasing pesticide use, increasing vegetable production, and expanding public interest and education in the healthy aspects of gardening.

Mental Health Promotion & Suicide Prevention (ANR)

WSU Extension is leading resiliency, mental health promotion, and suicide prevention efforts across the state and western region. This work is supported by federal and state partnerships, and funding includes both community programming and professional development for Extension personnel. Community programming reaches rural agricultural producers and workers to provide resources including hotlines and youth through local prevention coalition work and 4-H self-regulation toolkits. Capacity building efforts among existing Extension personnel include training Mental Health First Aid Instructors to serve as community resources and educating and supporting use of trauma-informed approaches in partnership with the Child and Family Research Unit within rural communities.
CAHNRS operates four main Research and Extension Centers (RECs) that develop sound science, instruction, and outreach to meet local and regional needs and make immediate and long-term economic impacts.

Northwestern Washington Research and Extension Center (NWREC), Mount Vernon

Serving the unique agriculture of the north Puget Sound region, this center houses research programs for fruit and vegetable horticulture; blueberry, potato and vegetable seed pathology; soil health; water and nutrient management; weed science; cider production and education; organic production systems; and grain breeding.

Collaborative projects on rotational horticultural crops, alternative crops, soil-biodegradable mulches, disease and insect pest control measures for conventional and organic production systems, specialty fruits and vegetables and grains, and various ornamental crops are generating results applicable throughout the Pacific Northwest.

Cooperative research connects personnel in WSU’s Northwest Extension District with WSU locations across Washington, faculty at other universities, public agencies, organizations, and volunteer groups.

In August 2021, WSU’s NWREC dedicated the new Ruth Wylie Head House, a workspace and research hub for discoveries improving soil health and regional agriculture. WSU alumna Ruth Wylie (center) broke new ground in public service as Skagit County’s first woman commissioner and county treasurer. Her daughter Nancy Kercheval (center right) financially supported the new facility, built with support from Skagit County.
Irrigated Agriculture Research and Extension Center (IAREC), Prosser

From its original staff of two in 1919, Prosser IAREC has grown to include 17 WSU faculty who continue the legacy of pioneering, industry-relevant research, and outreach.

Prosser IAREC functions like an academic department, but one that includes faculty, staff, and students from diverse cultures, nationalities, and ethnicities working together to tackle complex agricultural challenges. Six CAHNRS departments have faculty or programs located at IAREC, including food science, entomology, horticulture, plant pathology, crop and soil sciences, and biological systems engineering. Three subject matter centers, AgWeatherNetwork, the Center for Precision Agricultural and Automated Systems, and the Clean Plant Center Northwest, call IAREC home.

Interdisciplinary research and global partnerships develop organically in this environment, as does inter-agency partnerships with USDA-ARS, WSDA, and WSU Extension. IAREC turned 100 in 2019 and is still going strong, making significant impacts to Washington state’s agricultural sustainability and global food security.

STUDENTS SERVING OUR STATE

Nearly 80 graduate students work at WSU’s R&E Centers, where they partner in research that benefits Northwest agriculture. Students hail from dozens of countries, bridging cultures and enriching our scientific knowledge and their local communities.

Puyallup Research and Extension Center

Puyallup REC is, second to Pullman, WSU’s oldest campus, and has a long history of developing agriculture in the Pacific Northwest. The center was established in 1894, and today houses multiple world-class research and Extension programs as well as much of the leadership for those programs. It is the birth place of the now internationally successful Master Gardener Program, and has long been deeply connected to research and education that supports the “Green Industry,” relevant to urbanizing communities.

The 160-acre main campus is comprised of labs and offices, state-of-the-art greenhouses, Avian Health and Food Safety Laboratory, Master Gardener demonstration gardens, the Washington Stormwater Center and Low Impact Development (LID) research installations, six acres of certified organic farmland, and several acres of agricultural and natural resource plots. There are an additional 112 acres of research plots along with beginning farmer incubator plots at the R.L. Goss Farm.

Tree Fruit Research and Extension Center (TFREC), Wenatchee

WSU’s Wenatchee-based scientists seek to develop new knowledge and technology that strengthens Washington’s tree fruit industry, promotes international competitiveness, provides safe and high-quality fresh fruit, and enhances the quality of the environment.

TFREC hosts WSU faculty and USDA-ARS scientists, as well as support staff and students, who conduct research and outreach on annual and perennial specialty crops, with a primary emphasis on apple, pear, and cherry. Disciplines represented include entomology, horticulture, plant physiology, plant pathology, and soil biology.

Principal infrastructure includes Sunrise and Columbia View orchards, F. L. Overley Laboratory, USDA Tree Fruit Research Laboratory building, entomology and soils-horticulture labs and greenhouses, USDA plant pathology lab, and a new cold storage and fruit handling facility.

Puyallup REC is, second to Pullman, WSU’s oldest campus, and has a long history of developing agriculture in the Pacific Northwest. The center was established in 1894, and today houses multiple world-class research and Extension programs as well as much of the leadership for those programs. It is the birth place of the now internationally successful Master Gardener Program, and has long been deeply connected to research and education that supports the “Green Industry,” relevant to urbanizing communities.

The 160-acre main campus is comprised of labs and offices, state-of-the-art greenhouses, Avian Health and Food Safety Laboratory, Master Gardener demonstration gardens, the Washington Stormwater Center and Low Impact Development (LID) research installations, six acres of certified organic farmland, and several acres of agricultural and natural resource plots. There are an additional 112 acres of research plots along with beginning farmer incubator plots at the R.L. Goss Farm.

Tree Fruit Research and Extension Center (TFREC), Wenatchee

WSU’s Wenatchee-based scientists seek to develop new knowledge and technology that strengthens Washington’s tree fruit industry, promotes international competitiveness, provides safe and high-quality fresh fruit, and enhances the quality of the environment.

TFREC hosts WSU faculty and USDA-ARS scientists, as well as support staff and students, who conduct research and outreach on annual and perennial specialty crops, with a primary emphasis on apple, pear, and cherry. Disciplines represented include entomology, horticulture, plant physiology, plant pathology, and soil biology.

Principal infrastructure includes Sunrise and Columbia View orchards, F. L. Overley Laboratory, USDA Tree Fruit Research Laboratory building, entomology and soils-horticulture labs and greenhouses, USDA plant pathology lab, and a new cold storage and fruit handling facility.
Achieve Excellence

The 2021 CAHNRS Achievement Profile shares a portrait of the research, scholarship, people, and impacts of our college’s 12 schools and departments, and three WSU Extension program units.

In the pages ahead, we offer highlights of academics; impacts; staff, faculty, and student numbers; funding; intellectual property; service and outreach; and facilities.

These profiles underline the successes and strengths of our departments and program units in providing knowledge and service to Washington state and the world. From exploring fundamental agricultural science and spreading practical knowledge of conservation and nutrition to ensuring a safe food supply and enhancing the economy of our nation, CAHNRS and WSU Extension are elevating our communities and our disciplines.

Opened in 2020, the new Honey Bee & Pollinator Research, Extension, and Education Facility supports beekeeping and agricultural industries in Washington and around the world. Created through support from the Hiatt family, Ken and Sue Christianson, and Eric and Sue Olson, the Washington State Beekeepers Association, and other partners, the facility allows WSU to conduct research at the commercial scale of beekeeping, enabling larger field studies on a wide variety of topics.
The mission of the Animal Sciences (AS) department is to advance knowledge through research and innovation across a range of academic disciplines; extend knowledge through high quality educational programs to emerging scholars, fellow scientists, and stakeholders; and to apply animal science knowledge to improve the quality of life for people and animals.

ACADEMICS

- UNDERGRADUATE
  - Animal Sciences, Technology and Production
  - Animal Sciences, Science/Pre-Professional

- GRADUATE
  Master of Science and Doctor of Philosophy in:
  - Genetics/Genomics
  - Growth & Development
  - Nutrition/Environment
  - Reproductive Biology

HIGHLIGHTS

- Added two new faculty: Dr. Nathan Law (Reproduction and Stem Cells) and Dr. Marcos Marcondes (Ruminant Nutrition–Dairy)
- Upgraded internet capacity at our livestock units (Beef and Dairy) for enhanced research, teaching, and Extension opportunities
- Improved the accessibility of our USDA-inspected Meats Lab as a result of one-time CARES funds
- Dr. Z. Jiang awarded a Fulbright Research Fellowship for travel and work in Australia

SCHOLARSHIP

Animal Sciences awards multiple scholarships to our undergraduate and graduate students. These scholarships are awarded following application and based on need, merit, discipline, and program emphasis.

SERVICE & OUTREACH

Outreach was impacted by COVID-19 mitigation strategies but Animal Sciences faculty continued to serve our land-grant mission under these unique circumstances.

FACILITIES

- Animal Feed Preparation Lab
- Cattle Feeding Lab
- Cougar Quality Meats
- Ensminger Beef Center
- Farm Services
- Knott Dairy Center
- Aquaculture facility

PEOPLE

- 16 STAFF
- 9 TENURE TRACK FACULTY
- 2 CAREER TRACK FACULTY
- 1 ENDOWED POSITION
- 550 UNDERGRADUATE STUDENTS
- 4 MASTERS STUDENTS
- 11 DOCTORAL STUDENTS

RESEARCH

Research conducted by the faculty, staff, and students (graduate and undergraduate) in AS ranges from that which is immediately applicable to farmers and ranchers to fundamental discovery science that has implications in human and animal health and well-being. The grant portfolio is diverse and includes industry funding, USDA, NIH, NSF, state agencies and private funding targeting applied, translational and fundamental research.

FUNDING

2021 includes Dr. Hayashi’s NIH grant though she transferred to SMB.
Apparel, Merchandising, Design and Textiles (AMDT) seeks, assimilates, and disseminates knowledge through research-based problem-solving strategies addressing issues of sustainability in design, distribution, and consumption of textiles and apparel. We solve challenges for the global textile and fashion industry, using science and technology with an understanding of the needs of the people who use those products. We foster diverse educational opportunities and develop socially, economically, and environmentally responsible leaders.

HIGHLIGHTS
- Technology company PTC donated $1.25 million worth of its FlexPLM software suite to the AMDT department, which will allow students to build career skills by mastering the same technology used by iconic brands and retailers
- AMDT hosted annual virtual fashion show
- AMDT created an online certificate program
- Considerable progress is being made in the arena of environmentally friendly cotton/cellulose waste recycling, led by faculty member Hang Liu

SCHOLARSHIP
Faculty and graduate students produced more than 60 peer-reviewed journal articles, books/book chapters, conference proceedings, and juried design exhibits. AMDT faculty serve as associate editors or editorial board members of many prestigious journals.

SERVICE & OUTREACH
AMDT faculty are actively involved in their professional society where they serve as editor, editorial board member, or reviewer for refereed publications, and are involved in outreach at local schools.

INTELLECTUAL PROPERTY & COMMERCIALIZATION
Hang Liu has been involved in intellectual property/commercialization of environmentally friendly cellulose waste recycling; recycling cotton waste to manufacture regenerated fibers; and system and method for cellulose waste dissolution and fiber spinning.

IMPACTS
Faculty produce high quality research addressing the critical issues facing industry or society, such as waste reduction, sustainable textiles, and apparel. Our students are learning how to select and analyze textiles for sustainability based on science, advancing functionality of Personal Protective Equipment, designing sustainable textile-apparel-retail supply chain, and enhancing food system sustainability through social media uses by small scale food and farm businesses.

FACILITIES
Our facilities are mainly teaching and learning areas for students on the Pullman campus, including Textile labs (needing significant investment), design studios (need equipment updating), visual labs (needing equipment), and a computer lab.

RESEARCH
AMDT research focuses on sustainability, designing for functionality, and reducing waste—including sustainable supply chain management and marketing in the textile-apparel-retail industry; sustainable and functional textile material and product development for human well-being; functional apparel design; social interactions among consumers and their responses to visual culture in social media as related to marketing, management, and omni-channel retailing.
BIOLOGICAL SYSTEMS ENGINEERING

Biological Systems Engineering (BSE) conducts research and outreach activities in agricultural environment engineering, food engineering, bio-energy and bio-product engineering, and agricultural automation engineering. We generate knowledge and develop technologies for environmental stewardship, renewable energy, productive and sustainable agriculture, and safe and nutritious foods.

ACADEMICS

■ GRADUATE
  Master of Art/Science and Doctor of Philosophy in:
  • Biological & Agricultural Engineering

HIGHLIGHTS

■ BSE faculty will play a critical role in the new $20 million national AI research institute for agriculture grant
■ Juming Tang was elected to the National Academy of Engineering
■ BSE faculty developed a full-scale 12-armed robot for the fruit industry and supported FAD filing of four processes based on WSU MATS Technology for NASA
■ BSE’s anaerobic digestion and alternative jet fuel programs have gained national recognition
■ BSE improved computer modeling systems that are used globally for assessing economic and environmental impacts of agriculture

SCHOLARSHIP

BSE faculty and graduate students published 170 peer reviewed papers. Our faculty members serve as scientific editors of leading journals. Average h factor of BSE faculty is 46. Average number of citations in 2020 was 1180. Several books were edited.

SERVICE & OUTREACH

Faculty are engaged in service to professional societies and scientific organizations. They provide short courses and serve on proposal review panels for NSF, USDA, and DOE.

INTELLECTUAL PROPERTY & COMMERCIALIZATION

BSE faculty received four U.S. and International patents in 2019 and five in 2020. WSU signed a license agreement with 915 Labs for global commercialization of the Microwave Assisted Pasteurization System (MAPS).

IMPACTS

Our faculty provide ideas and solutions in areas related to environmental impact assessment, productivity and sustainability for food-water systems, food processing technologies, renewable energy and bioproducts, and automation of high value agricultural production systems. The first Microwave Assisted Thermal Sterilization (MATS) was launched in India for commercial production of shelf-stable meals.

FACILITIES

Major facilities include: Water Quality and Waste Analysis Laboratory; GIS and Agricultural Systems Modeling Laboratory; a food processing pilot plant; Analytical Chemistry Center; Center for Precision and Automated Agricultural Systems (IAREC); and AgWeatherNet and Bioproducts Science Engineering Laboratory (WSU Tri-Cities).

RESEARCH

BSE develops innovative technologies and long-term solutions for food and agriculture, renewable energy, and water systems intended to help solve state and global problems.
CROP & SOIL SCIENCES

The Department of Crop and Soil Sciences (CSS) serves Washington State University’s land-grant mission by offering nationally competitive undergraduate and graduate education programs, conducting discovery and translational plant and soil research, and extending the science of our disciplines to serve the public.

ACADEMICS

UNDERGRADUATE

- Agriculture & Food Systems (3 majors)
- Integrated Plant Sciences (3 majors)

GRADUATE

Master of Science

- Agriculture
- Soil Science
- Crop Science

Doctor of Philosophy

- Crop Science
- Soil Science
- Molecular Plant Sciences

HIGHLIGHTS

- Dr. Haly Neely received a New Innovator in Food & Agriculture Research Award from the Foundation for Food & Agriculture Research
- Dr. Deirdre Griffin-LaHue developed a new course in regenerative agriculture
- Drs. Karen Sanguinet and Haiying Tao were each awarded large federal grants
- The Endowed Chair in Soil Health for Potato Cropping Systems was established and state funding was secured for the Soil Health Initiative

SCHOLARSHIP

Faculty and graduate students consistently publish 90–100 peer-reviewed articles each year; many in prestigious journals. Twelve faculty members are Fellows in their respective scientific societies. Two faculty members are Fellows of the American Association for the Advancement of Science, which is the world’s largest multidisciplinary scientific society. The Fellow Award is typically the highest honor granted to a member of a scientific society.

SERVICE & OUTREACH

Faculty actively engage in outreach, for example, leading the Extension Dryland Cropping Systems Team, Cereal Variety Testing Program, Farmers Network, and the Washington Oilseeds Cropping Systems Initiative. Faculty also serve in professional society leadership positions, on scientific society editorial boards, review manuscripts submitted to scientific journals, and serve on grant panels.

INTELLECTUAL PROPERTY & COMMERCIALIZATION

Faculty patent two to three new cereal varieties each year. Active commercialization of these varieties generates over $1 million in royalty income every year. Faculty are actively identifying new genes controlling plant traits, developing new sources of crop herbicide resistance, and implementing dynamic decision tools to improve management at the farm level.

IMPACTS

Cereal varieties developed by CSS faculty are grown on 50% of the wheat acres planted each year in Washington.

FACILITIES

CSS manages five dryland research farms, a grass breeding and ecology center, core facilities including advanced instrument service centers, and a full complement of field equipment.

RESEARCH

Our diverse and accomplished faculty are committed to using cutting-edge techniques to discover and translate principles of crop and soil sciences and the human dimensions influencing the application of these principles to integrated agricultural systems.

FUNDING
The Department of Entomology contributes new knowledge in basic and applied insect science, provide a rigorous curriculum that encourages curious and creative thinking in our graduates, and to inform the public about issues related to insects and other arthropods. Our faculty, staff, and students can be found state-wide working collaboratively with growers, state and federal agencies, and stakeholders of all ages.

**ACADEMICS**

- **UNDERGRADUATE**
  - Agricultural & Food Systems
  - Integrated Plant Sciences
  - Entomology Minor

- **GRADUATE**
  - Master of Science
    - Entomology
    - Agriculture
  - Doctor of Philosophy
    - Entomology

**HIGHLIGHTS**

- Donor contributions over $1.5M in 2020 to Entomology programs (WSU Bees, WSU M.T. James Entomology Museum)
- First sterile insect release in Washington state for codling moth control
- Leaders and collaborators in the Little Cherry Disease Task Force
- New funding from the WA State Legislature to support pesticide education programs and pollinator research and extension
- Research article by Zhu, Gutierrez Illan, Looney & Crowder published in PNAS on the Asian Giant Hornet had a potential audience reach of 3.5 billion in 2020—https://news.wsu.edu/2021/01/28/top-wsu-research-stories-2020/

**FACILITIES**

WSU Entomologists are found state-wide. Our faculty, staff, and students work at all four WSU Research and Extension Centers and the Tri-Cities campus as well as on farms with grower cooperators.

Pullman is home to the M.T. James Entomological Collection and Museum and in 2019 a new Honey Bee and Pollinator Research, Extension, and Education Facility in Othello was acquired. That facility houses a growing program in honey bee breeding and hive health as well as native bee pollination and conservation studies.

**ACADEMIC YEAR STUDENT CREDIT HOURS**

**PEOPLE**

- **STAFF** 18
- **TENURE TRACK FACULTY** 12
- **CAREER TRACK FACULTY** 7
- **ENDOWED POSITIONS** 3
- **MASTERS STUDENTS** 12
- **DOCTORAL STUDENTS** 15

**RESEARCH**

Entomology faculty have internationally recognized and emerging research excellence in: tree fruit pest management and biological control; integrated pest management in diverse cropping systems such as hops, mint, vegetable seed crops, small fruits, and potatoes; pollination ecology and conservation; honey bee breeding and health; insect physiology, pesticide resistance management; arthropod-borne disease vectors; and organic and sustainable agro-ecological systems.

**FUNDING**

2021 funding to date, 8/2/2021.
The WSU Extension Agriculture and Natural Resources (ANR) Program Unit engages people, organizations, and communities to advance knowledge, economic well-being, and quality of life by fostering inquiry, learning, and the application of research.

**PEOPLE**

- **25** STAFF
- **24** TENURE TRACK FACULTY
- **8** CAREER TRACK FACULTY
- **5** EMERITUS FACULTY
- **39** AFFILIATE FACULTY

**HIGHLIGHTS**

- The work of our faculty spans a broad range of expertise that includes agronomic and horticultural crops; animal agriculture; water resources; environmental stewardship; forestry; rangeland management; farm management; marketing; apiculture; integrated pest management; pesticide safety; and urban horticulture
- Our personnel lead interdisciplinary efforts in local food systems, regional food policy, and risk management, providing increased economic opportunities for farmers and consumers

**SCHOLARSHIP**

Faculty recorded the following achievements:

- Published 34 peer-reviewed journal articles and have 16 peer-reviewed publications under review
- Completed 32 WSU Extension publications with 10 more under review
- Contributed 96 other creative Extension scholarship products (digital, book chapters, training manuals)
- Gave five international presentations, 27 national presentations, and 74 regional/state presentations

**SERVICE & OUTREACH**

Faculty are engaged in service to professional organizations and national, state, and local agencies and organizations. They have served on proposal and scholarly review panels, committees, and boards. In 2020, ANR faculty mentored two graduate students and served on 24 graduate student committees. ANR faculty and staff were awarded seven state and national awards from professional societies.

**RESEARCH**

ANR Program Unit members are successful in leveraging both industry and community support for competitive grants nationally through USDA and locally for commodity support. The diversity of fund generation reflects the diversity of disciplines and communities that ANR faculty engage with.
The WSU Extension Community and Economic Development (CED) Program Unit faculty and staff partner with local leaders to improve their communities and grow their economies. CED is comprised of three units: the Division of Governmental Studies and Services (DGSS); the Metropolitan Center for Applied Research and Extension; and The William D. Ruckelshaus Center.

HIGHLIGHTS

- CED activities focus on promoting local business expansion and retention; increasing transfer funds within a local economy (such as tourism dollars and retirement dollars); economic analysis; and increasing exports and local entrepreneur development. In addition, efforts include programs that result in local leadership development and effective community non-profits. In undertaking this work, CED has a number of special emphases which include:
  - Advancing workforce development through training and collaborative certificate programs such as Fire Training and Remote Worker Training
  - The deployment of broadband and use of information technology in rural areas
  - Enhancing WSU Extension’s engagement with Tribal communities and leaders
  - Composite and wood product development through the Composite Materials & Engineering Center

SERVICE & OUTREACH

Faculty are engaged with international, national, state, and local service for professional organizations, agencies, commissions, taskforces, and boards serving in a variety of roles.

IMPACTS

WiFi Access—Sparked by lessons learned during Extension’s 2014 Oso mudslide recovery work, the Drive-In Wi-Fi Hotspots Project initiated with the Washington State Broadband Office, Microsoft Corporation, Avista, Washington State Library, and other partners placed wireless broadband access points at WSU’s county and tribal Extension centers, as well as schools, libraries, and community centers across the state.

Age-Friendly Housing—A multi-agency project led by CED’s Metropolitan Center and Division of Governmental Studies and Services assessed the Puget Sound area’s projected needs for senior housing. The “Moving Toward Age-Friendly Housing in King County” report found that the number of older adult-led households is on track to outpace the supply of accessible and affordable housing in King County. Half of senior households who rent are already cost-burdened, as are 40% of those with a mortgage. Recommended strategies ranged from updating land use policies to allow cottage clusters and accessory dwelling units to increasing funding for home delivery services. They also recommended building senior housing units near established services to provide for daily needs, socialization, and transportation.
The WSU Extension Youth and Families Program Unit educates and empowers individuals and families in diverse and inclusive communities to achieve physical, social, emotional, and economic health and well-being.

**HIGHLIGHTS**
- The Youth and Families Program Unit programs, projects, and personnel successfully pivoted to meet the emerging state and community needs in response to COVID-19 by:
  - Creatively adapting and delivering programming to meet COVID-19 restrictions
  - Developing and delivering food safety content via podcasts, online videos, and web content
  - Evaluating adapted program content by comparing online versus face-to-face outcomes

**SCHOLARSHIP**
Personnel in the unit published 18 peer-reviewed articles and four Extension publications. Research within the unit is applied and centers around topics of effectiveness and implementation of community-based programming (e.g., youth/family development, nutrition education) and impact on outcomes (e.g., childhood obesity, coping with stress), and processes and systems that support community-based programming (e.g., volunteer development).

**SERVICE & OUTREACH**
By nature of the Extension work we do, it is often blurred with outreach. From a service perspective, faculty and staff engage in service to professional organizations as well as national, state, and local agencies and organizations. This includes service on proposal and scholarly review panels, committees, and boards.

**IMPACTS**
WSU Extension delivers Supplemental Nutrition Assistance Program Education (SNAP-Ed) and Expanded Food and Nutrition Education Program (EFNEP). SNAP-Ed teaches youth, adults, and community members about good nutrition, how to stretch the food dollar, and to be physically active. In 2020, SNAP-Ed reached over 371,222 individuals in 39 counties and one tribal reservation. WSU also provides training and technical assistance to SNAP-Ed providers. EFNEP improves the diets and food-related behaviors of low-income families through peer-nutrition education. In 2020, EFNEP reached 373 adults and 1,389 youth, affecting over 1,365 family members indirectly.

WSU Extension delivers evidence-based and culturally adapted parenting programs to youth and families across the state. Outcomes of these programs demonstrate increased family relationships and reduced youth substance use. In 2020, WSU developed a Community of Practice and virtual toolkit to support facilitators and virtual program implementation.

WSU Extension Diabetes Prevention Programs are working toward CDC Full Recognition for virtual delivery. This supplements CDC recognized in-person programming.
The Department of Horticulture provides state-critical and globally impactful research, teaching, and extension. Through our highly engaged and productive faculty, staff, and students we will continue to demonstrate excellence in discoveries that improve and protect tree fruits, vegetables, viticulture and enology, small fruits, and cool-season legumes.

**ACADEMICS**

**UNDERGRADUATE**
- Agricultural Biotechnology
- Agricultural Food Systems
- Fruit & Vegetable Management
- Integrated Plant Sciences
- Landscape, Nursery, & Greenhouse Management
- Viticulture & Enology

**GRADUATE**
- Master of Science
  - Agriculture
  - Horticulture
- Doctor of Philosophy
  - Horticulture
  - Molecular Plant Sciences

**HIGHLIGHTS**
- Hort Club advisor Jamie Holden raised $23,000 for scholarships during COVID-19
- Lee Kalcsits named WSU's Endowed Chair for Tree Fruit Environmental Physiology and Management
- Jacob Blauer joins faculty as post-harvest potato physiologist
- Mark Pavek elected President of the Potato Association of America
- Linda Chalker-Scott won a 2020 Award of Excellence for her book, *Gardening with Native Plants*

**SCHOLARSHIP**
Faculty published 90 peer-reviewed articles and received $4.2M in grants.

**SERVICE & OUTREACH**
- **3,976 HOURS**  |  **46 PEOPLE**
Our faculty are leaders in Extension, outreach, and service. They provide annual training for commercial growers of tree fruit, wine and juice grapes, small fruit, and vegetables, and provide ongoing professional development training to Master Gardeners, educators, and credentialed professionals. They also provide practical information to the general public as part of the land-grant university mission. They serve on professional societies, grant review panels, and organize workshops.

**INTELLECTUAL PROPERTY & COMMERCIALIZATION**
Newly bred horticultural crop varieties are constantly released as WSU intellectual property. We have been awarded national and international patents in regulating the ripening and senescence of fruit to avoid food wastage, and have developed intellectual property for artificial pollination and to prevent cracking in sweet cherry.

**IMPACTS**
Former graduate students are successful teachers, scientists at diverse institutions, and industry leaders around the world. Graduates from our majors contribute to the global excellence of Washington produce. A new method for grafting watermelon, developed by our faculty, is being tested by companies that produce grafted watermelon transplants.

**FACILITIES**
Our faculty are based at the Pullman and Tri-Cities campuses and all four R&E Centers. Each location has significant acreage devoted to horticultural crop science and specialized labs. Facilities in Pullman include well-equipped labs, plant production areas, the Tukey Research Orchard, and the new Horticulture Center with four acres for intensely managed fruit crops.

**RESEARCH**
Faculty conduct basic and applied research in diverse areas including breeding, physiology, production systems, genomics, systems biology, bioinformatics, and signaling. We are developing new varieties of apples, blueberries, cherries, pears, potatoes, raspberries, and strawberries; cutting-edge crop training and management systems for sustainable production; genome sequencing to identify crop traits; and novel analysis tools and specialty crop database resources.

**FUNDING**
The Department of Human Development (HD) engages in high quality research, scholarship, and instruction that translates to evidence-based programs, practices, and policies that elevate the well-being of individuals, families, and communities in Washington and beyond.

ACADEMICS

- **UNDERGRADUATE**
  - Human Development
  - Family & Consumer Science Education
  - Lifespan Development
  - Early Childhood Education
  - Child/Youth Development
  - Gerontology
  - Family Services
  - Prevention Science

- **GRADUATE**
  - Master of Science
  - Doctor of Philosophy
  - Prevention Science

HIGHLIGHTS

- We revamped our undergraduate offerings to better meet the evolving needs of students and communities—all HD students now complete an internship as a culmination of their studies.
- Major grants awarded in 2020 include NSF funding to study the development of self-regulation in early childhood, and evaluation of a post-secondary support program for youth in foster care.

SCHOLARSHIP

HD faculty produced nearly 60 peer-reviewed manuscripts in 2020. Areas of focus included basic and applied research that addresses issues related to well-being across the lifespan.

SERVICE & OUTREACH

Multiple HD faculty have full or partial Extension appointments, and service learning is a key component of several undergraduate HD courses. Several faculty in the department work closely with agencies throughout the state to promote health and well-being. Our unit includes the WSU Children’s Center and the Center for Transformational Learning and Leadership (CTLL).

IMPACTS

Through our teaching, research, and Extension programs, we promote the healthy development of children, adults, and their families in the state of Washington and beyond. Our research and dissemination in prevention programming has had a positive impact on thousands of Washington residents. Our high-impact experiential teaching and learning opportunities continue to transform the WSU community.

PEOPLE

- **37** STAFF
- **19** TENURE TRACK FACULTY
- **9** CAREER TRACK FACULTY
- **578** UNDERGRADUATE STUDENTS
- **9** MASTERS STUDENTS
- **24** DOCTORAL STUDENTS

RESEARCH

Our research funding spans from basic to translational, and includes projects focused on program efficacy and evaluation. Our funding has increased steadily over the past five years, to nearly $5 million in 2020. Current projects include major grants from the National Institutes of Health; U.S. Department of Health & Human Services’ Substance Abuse and Mental Health Services Administration, and Administration for Children and Families; Children’s Bureau; foundations; and Washington state agencies.

FUNDING
The Institute of Biological Chemistry (IBC) was established at Washington State University in 1980 to pursue fundamental research in the molecular biology and biochemistry of plants. Work at the IBC focuses on basic plant science with an emphasis on plant derived products synthesis, determinants of plant architecture, bioenergetics, and plant-microbe interacts. The research outcomes have potential applications in agricultural biotechnology, bioenergy, and medicine.

**ACADEMICS**

- **UNDERGRADUATE**
  More than 20 undergraduates complete a total of 250–300 hours of directed research and laboratory experience each year

- **GRADUATE**
  Master of Science/Art
  Doctor of Philosophy
  - Chemistry
  - Molecular Bioscience
  - Molecular Plant Sciences

**HIGHLIGHTS**

- Eminent faculty and research programs
- Breakthrough discoveries in novel plant products, plant defense, energy and nutrient acquisition
- Outstanding record in extramural funding
- Intellectual property portfolio underpins translational research and spinoff companies

**SCHOLARSHIP**

Each year, IBC researchers publish more than 60 primary research papers, invited commentaries and reviews, and chapters in textbooks and specialty research publications. Faculty are editors for several scientific journals and review departments and programs at institutions in the U.S. and overseas. Present and former faculty have been honored by being elected to the U.S. or other national academies of science.

**SERVICE & OUTREACH**

IBC faculty and students are strongly engaged in outreach efforts. Focus initiatives include ones designed to attract Native American and other minority high-school students into undergraduate college programs.

In conjunction with NASA, space biology research is being brought to local middle and high school classrooms. Additionally, space research films, podcasts, and news articles have been published over the past several years.

**INTELLECTUAL PROPERTY & COMMERCIALIZATION**

IBC faculty have been issued more than 20 patents and engage in research and consulting agreements with biotechnology companies. Many graduates join biotechnology companies as research scientists.

**IMPACTS**

IBC discoveries continue to lead to improved growth and health of crops and advances in food, materials, and biofuels, improving rural economics and the quality of life for the people of Washington and elsewhere. IBC research is often highlighted in newspapers, magazines, and on radio and TV.

**FACILITIES**

- Greenhouse & Growth Chambers Facility
- Phenomics Service Center
- M. J. Murdock Metabolomics Laboratory
- Tissue Imaging & Proteomics Laboratory

**RESEARCH**

Extramural funding averaging $5.6 million per year supports researchers conducting both discovery science and translational biotechnology.

**FUNDING**

2021 Funding totals $5,370,184.00, which $2,104,365.00 comes from AIS and $3,065,819.00 comes from Workday = $5,370,184.00
The Department of Plant Pathology directs instruction, extension, and research toward all aspects of plant diseases, including biology, causes, protection, and control, as they affect commercial crop and landscape plants in Washington. The mission is accomplished through quality graduate education, conducting applied and basic research for the state and the scientific community at large, and disseminating information through extension.

ACADEMICS

UNDERGRADUATE
- Integrated Plant Sciences
- Ag & Food Systems

GRADUATE
Master of Science
- Plant Pathology
Doctor of Philosophy
- Molecular Plant Sciences
- Plant Pathology

HIGHLIGHTS
- Two tenure-track faculty members were hired into positions new to the department as a result of stakeholder support. Dr. Chakradhar Mattupalli is an Assistant Professor at NWREC and leads the Berry and Potato Pathology Program. Dr. Youfu “Frank” Zhao is a Professor and Endowed Chair in Tree Fruit Bacterial Diseases at IAREC.

SCHOLARSHIP
During 2020, 46 peer-reviewed and 23 extension publications were produced by department faculty. Three students completed PhDs and two others completed Masters. Lindsey du Toit served as the president of the American Phytopathological Society, the largest professional organization of plant pathologists. Tim Murray became the Rosalie and Harold Rea Brown Distinguished Endowed Chair following a $3 million endowment.

SERVICE & OUTREACH
1,200 HOURS | 22 PEOPLE
Service to our stakeholders occurs through formal and informal extension activities. Two Plant Pest Diagnostic Clinics (in Pullman and Puyallup) provide services for homeowners and commercial agriculture. The Clean Dahlia Center provides diagnoses of plant disease problems of dahlia, while the Clean Plant Center provides virus-free planting stock to fruit tree, grapevine, and hop industries. The Shaw Mycological Herbarium distributes samples worldwide.

INTELLECTUAL PROPERTY & COMMERCIALIZATION
Several faculty have been involved in commercialization efforts focusing on diagnostic reagents for plant pathogens. Most recently, Dr. Maren Friesen is part of an IP filing for an electrochemical sensor for soil health that has the potential to give growers real-time information on their soil microbial function.

IMPACTS
Two faculty-published papers appeared in very high impact journals (IF>10). Faculty with applied research programs worked with multiple commodity groups to identify effective new methods for disease management that reduced pre- and post-harvest losses and improved profitability for stakeholders.

FACILITIES
Plant Pathology Farm and Shaw Mycological Herbarium, Pullman; Plant Pest Diagnostic Clinics in Pullman and Puyallup; Molecular Biosciences lab, Puyallup; Clean Plant Center Northwest, Prosser.

RESEARCH
We conduct fundamental and translational research on a wide range of regional and global plant disease problems, and extend that research to growers. Current examples include fungicide-resistance in pathogens that cause disease on raspberries, blueberries, cereals, peas, and other pulse crops; identification of genes in wheat to improve disease resistance to fungal diseases; and identification of genes in nematodes that enables them to cause disease in potatoes.

FUNDING
Extramural funding only—does not include endowment funds.
The School of Economic Sciences (SES) is a unified general economics and agricultural economics program. Our mission is to advance economic knowledge through creative research and scholarship; to extend economic knowledge through educational programs where our graduates assume roles of leadership, responsibility, and service to society; and to apply economic knowledge through local and global engagement that will improve quality of life and enhance the economy of the state, nation, and the world.

ACADEMICS

- **UNDERGRADUATE**
  - Economic Sciences

- **GRADUATE**
  Master of Science and Doctor of Philosophy in:
  - Applied Economics
  - Economics

HIGHLIGHTS

- SES produces about 20% of CAHNRS’ PhDs and 10% of WSU’s PhDs—many are placed at top research universities upon graduation
- SES has a large undergraduate program, a strong Masters program, and has added a new professional degree, the Master of Applied Economics
- SES faculty obtain grants that are evidence of research relevance
- SES faculty include Fellows in AAAS, Agriculture & Applied Economics Association, Western Agriculture Economics Association, and NBER

SCHOLARSHIP

SES faculty have published several textbooks and appeared in top journals, including *American Economics Review*, *Management Science*, *Econometrica*, and *Science*.

SERVICE & OUTREACH

SES outreach includes Extension Economists who specialize in grain marketing and agricultural finance, specialty crop marketing, crop enterprise budgets, health economics, livestock economics, community and regional economics, and environmental and resource economics.

The IMPACT Center, located in SES, seeks to address economic, social, political, and technical problems that affect the competitiveness of Washington’s agriculture and related sectors.

PEOPLE

- 25 TENURE TRACK FACULTY
- 8 CAREER TRACK FACULTY
- 3 ENDOWED POSITIONS
- 2 REGENTS PROFESSORS
- 250 UNDERGRADUATE STUDENTS
- 23 MASTERS STUDENTS
- 64 DOCTORAL STUDENTS
- 4 STAFF

RESEARCH

SES researchers work to find answers to problems in areas including global climate change, wildfire management, transportation, healthy living choices, sustainability and environmental quality, efficient water management, energy, and agriculture. Faculty work closely with various industries and clientele groups in the state, providing economic research products and educational programs focused on improving economic knowledge and management and enhancing societal outcomes.

FUNDING

Totals from the WSU Office of Research; Award figures based on Credit Department Credit.
The School of the Environment (SOE) supports the mission of Washington State University as a major land-grant research institution. Our teaching, research, and outreach advance understanding of the Earth’s complex physical, ecological, and biological systems and their human dimensions, including impacts of land use and climate change. We advance scientific and social innovation needed to conserve the Earth-system platform, and to promote productive and sustainable communities.

ACADEMICS

- **UNDERGRADUATE**
  - Earth Science
  - Environmental & Ecosystem Sciences
  - Forest Ecology & Management
  - Wildlife Ecology & Conservation Sciences (Pre-Vet Option)

- **GRADUATE**
  Master of Science and Doctor of Philosophy in:
  - Environmental & Natural Resource Sciences
  - Geology

HIGHLIGHTS

- Hiring new faculty on the Pullman campus who work across our Forest Ecology and Management and Earth Sciences programs
- Media coverage by the *New York Times* (among other outlets) of faculty and their research programs in grizzly-bear, large carnivore, and salmon ecology
- We support hundreds of our undergraduate students and all of our graduate students with scholarships and fellowships from a variety of sources

SERVICE & OUTREACH

Cultivating Success and Farmer Incubator partnership—Over the past decade, semester-long courses have been offered in 24 different Washington counties, online, and in four different languages. Over 5,000 students have come through this program.

Coming Together for Racial Understanding—As part of a program led by Dr. Marcy Ostrom, trained facilitators led Extension-wide Study Circle dialogues on race and racism in the summer of 2020.

FACILITIES

- Aquatic Ecology Lab
- Collaborative Modeling Lab
- Ecology Lab
- Environmental Hydrodynamics Lab
- The GeoAnalytical Lab
- Radiogenic Isotope and Geochronology Laboratory
- The Steffen Center and WSU Arboretum
- Watershed Biogeochemistry Lab
- Wildlife Habitat Lab
- Wild Ungulate Facility
- WSU Bear Research, Education, and Conservation Center

PEOPLE

- **STAFF**
- **TENURE TRACK FACULTY**
- **CAREER TRACK FACULTY**
- **UNDERGRADUATE STUDENTS**
- **MASTERS STUDENTS**
- **DOCTORAL STUDENTS**

RESEARCH

SOE features a broad range of high-impact research that falls roughly into three areas:

1) Application of resilience thinking and hydro-ecological approaches to management of watersheds and aquatic ecosystems;

2) Forest and wildlife ecology research to inform management for sustainability; and

3) Earth system processes as basis for sustainability.

FUNDING

2020 data is approximate.
The School of Food Science (SFS) seeks to improve food safety locally, nationally, and globally by developing healthy and sustainable value-added foods, advancing fundamental approaches to enhance food quality, and developing innovative food processing technologies. We help provide food security, ensuring that the U.S. is self-sufficient in food production—emphasizing the need to ensure all have enough healthy food. We assist the food industry to be economically sound, sustainable, and competitive.

**ACADEMICS**

- **UNDERGRADUATE**
  - Food Science
    - General option
    - Fermentation Science
  - Certificates: Food Science or Food Safety

- **GRADUATE**
  - Master of Science
    - Food Science
    - Ag Food Science & Management
  - Doctor of Philosophy
    - Food Science

**HIGHLIGHTS**

- Dr. Carolyn Ross was awarded the Sahlin Faculty Excellence Award for Instruction
- Jasmine Ricke, MS graduate student, received the Excellence Award in Teaching Assistant from the WSU Graduate and Professional Student Association

**SERVICE & OUTREACH**

In 2020, four in-person workshops were held with a total attendance of 109 industry professionals. Thirteen remote workshops were also held with a total attendance of 615 industry professionals.

**FACILITIES**

Ferdinand's Creamery is the beacon of the School of Food Science. There, our students and staff produce the famous Cougar Gold cheese, plus many other cheese variations, and award-winning ice creams. The renowned Cougar Gold cheese and brand is a significant income generator for SFS and CAHNRS.

SFS has pilot plants and small-scale facilities for the production of fermented products and laboratories for food chemistry, microbiology, and engineering.

**ACADEMIC YEAR STUDENT CREDIT HOURS**

<table>
<thead>
<tr>
<th>Year</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>800</td>
<td>400</td>
</tr>
<tr>
<td>2017</td>
<td>800</td>
<td>400</td>
</tr>
<tr>
<td>2018</td>
<td>800</td>
<td>400</td>
</tr>
<tr>
<td>2019</td>
<td>800</td>
<td>400</td>
</tr>
<tr>
<td>2020</td>
<td>800</td>
<td>400</td>
</tr>
<tr>
<td>2021</td>
<td>800</td>
<td>400</td>
</tr>
</tbody>
</table>

**PEOPLE**

- **STAFF**
- **TENURE TRACK FACULTY**
- **CAREER TRACK FACULTY**
- **UNDERGRADUATE STUDENTS**
- **MASTERS STUDENTS**
- **DOCTORAL STUDENTS**

**RESEARCH**

With a network of regional, national, and global collaborators, our faculty are internationally recognized experts in food science, technology, and food safety. We conduct fundamental and applied research in chemistry, microbiology, applied nutrition, processing, and sensory science.

**FUNDING**

![Funding Graph]