2024
Impact Report

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OHSU Innovates is a collaborative network of departments united by one primary objective: to assist scientists in realizing the full potential of their discoveries. While many innovative ideas and breakthroughs emerge from universities, the process of validating, testing, and bringing these concepts to market for patient benefit can be long and challenging.

This is where OHSU Innovates steps in, offering support for new technologies, startup companies, and collaborations. Our team leverages years of experience to help OHSU clinicians and researchers get their ideas from bench to bedside.

This report showcases some of the extraordinary discoveries being made at OHSU, which OHSU Innovates has had the honor of supporting. We hope these stories encourage you to become a part of the vibrant innovation community at OHSU.

Innovation is a key component of OHSU's mission of improving the lives of people in Oregon and beyond. We are dedicated to advancing promising discoveries out of our labs toward clinical development, which benefits everyone. We also collaborate with industry leaders to validate and test new healthcare technologies. The road from a promising discovery to a new product or service is a long one, but OHSU is dedicated to providing services that help early-stage ideas reach their full potential.

2024 was another strong year for innovation at OHSU. As part of our effort to take innovations to market, we had 94 new technologies disclosed and five new companies spun out of the university last year. These innovations came from across the university and took on many forms, such as therapeutics, diagnostic methods, educational materials, software, and more.

OHSU Innovates, now in its third year, is here to help scientists advance these new innovations. OHSU Innovates is a collective group of units that work together to streamline support for innovators and entrepreneurs. Our services include evaluation and patenting of technologies, collaboration management, startup support, entrepreneurial education, and technology funding. We launched new programs and services this year to continue building support for OHSU innovators.

One of those programs is the Drug and Device Advisory Committee, which provides no-cost consultation and advice to research teams, especially helping to move a new drug or device towards commercialization.

A second program is the OHSU Innovates Speaker series, which goes beyond traditional innovation discussions and explores how diversity in thought, background, and experience leads to more robust and creative solutions.

I'd like to congratulate all faculty, staff, and students who are following the innovation pathway to advance their research discoveries towards dissemination and commercialization. Moreover, I'd also like to thank the professionals in all units making up OHSU Innovates, as your support is essential for discovery advancement.

Peter Barr-Gillespie, Ph.D.

Executive Vice President & Chief Research Officer
OHSU Research & Innovation

Revolutionizing eye care

The OHSU Casey Eye Institute unites world-class clinical care with leading-edge research to bring innovative new strategies in eye care to patients. The institute's faculty are responsible for many advances in ophthalmology, some of which have revolutionized the diagnosis and treatment of eye conditions.

Using artificial intelligence to prevent blindness in children

Retinopathy of prematurity, or ROP, is a leading cause of blindness in children across the world. It is characterized by abnormal growth of blood vessels near the retina, which is the visual processing center of the eye, and often occurs in prematurely born babies. Research at OHSU, originally started by Michael Chiang, MD (now director of the National Eye Institute) and now led by J. Peter Campbell, M.D., Ph.D., and colleagues, is working to develop a better way to detect ROP using artificial intelligence, or AI. A recent publication found that the AI method developed at OHSU detected severe cases of ROP with 100% accuracy.[1] This method could allow for faster and more efficient screening of the millions of babies born prematurely each year.

In 2022, Campbell and colleagues spun this work out of OHSU to form the startup Siloam Vision. The company is working to advance an integrated AI imaging solution along with a cloud-based service to improve early detection of ROP. In late 2023, Siloam Vision entered a partnership with the nonprofit Orbis International to use the company's cloud-based telemedicine platform to expand access to eye care and prevent blindness in premature infants living in hard-to-reach communities.[2] The ROP project also continues to spur new innovative technologies at OHSU. OHSU researcher Yifan Jian, Ph.D., was awarded a Biomedical Innovation Program grant in 2023 to develop two new pediatric retinal cameras designed for improved screenings of ROP in infants, which have now also been licensed to Siloam Vision for commercialization.

J. PETER CAMPBELL, M.D., PH.D.
Edwin and Josephine Knowles Endowed Professor
Associate Professor of Ophthalmology, School of Medicine

YIFAN JIAN, PH.D.
Associate Professor of Ophthalmology, School of Medicine
Associate Professor, Biomedical Engineering, School of Medicine

David Huang recognized nationally for transformative ophthalmic innovations

The last year was a remarkable one for OHSU physician and researcher David Huang, M.D., Ph.D. As a M.D./Ph.D. student at Massachusetts Institute of Technology and Harvard University, Huang co-invented the imaging technique called optical coherence tomography, or OCT. OCT is now used daily by physicians across the world and enables identification of vision-threatening disease early, often before patients experience symptoms.

The impact of this innovation has been profound, and Huang and his OCT co-inventors were recognized in 2023 with the Lasker-Debakey Clinical Medical Research Award[1], which is sometimes referred to as "America's Nobel." Huang and his co-inventors were also honored in 2023 with the U.S. Medal of Technology and Innovation by President Biden at a White House ceremony.[2] In 2024 Huang was also awarded the Oregon History Maker award recognizing his contributions to the field of ophthalmology.[3]

David Huang, M.D., Ph.D., accepts the National Medal of Technology and Innovation from President Joe Biden

(Ryan K. Morris and the National Science and Technology Medals Foundation).

Huang continues to be a prolific innovator at OHSU. In 2023 he received a MJ Murdock Charitable Trust Commercialization grant. This grant award will help Huang and colleagues advance a new medical device for the treatment of conjunctivochalasis. Conjunctivochalasis affects millions of people and occurs when the conjunctiva, the moist tissue layer that protects the whites of your eye, loosens and folds. This can cause symptoms such as dry eye, eye discomfort, and blurry vision. Development of this therapeutic device has led to the formation of a new startup company, Unfold Therapeutics, for which Huang is a co-founder and chief executive officer.

> The support of Casey Eye Institute has allowed my research group, the Center for Ophthalmic Optics & Lasers[4] to grow from 5 to 40 over the past 14 years and develop several extensions of OCT, including OCT angiography, that are now widely used in ophthalmology. I am also grateful for OHSU Innovates for the commercialization of several of our OCT technologies as well as my two startup companies: GoCheck Kids and Unfold Therapeutics.

DAVID HUANG, M.D., PH.D.
Professor of Ophthalmology, School of Medicine
Professor of Biomedical Engineering, School of Medicine
Wold Family Chair in Ophthalmic Imaging
Associate Director & Director of Research, Casey Eye Institute, School of Medicine

Improving behavioral health

The National Institutes of Health, or NIH, estimates that more than one in five Americans currently have a mental illness. OHSU researchers and providers are developing new tools to offer patients better support and treatments. This includes proactive approaches to promote positive mental health environments as well as new ways of diagnosing mental health disorders.

Evidence-based educational training to improve mental health at work

During the COVID-19 pandemic there was a spike in worker burnout and stress, unveiling a need for better strategies to promote positive mental health in the workplace. Leslie Hammer, Ph.D., was poised to answer this demand. Hammer's research career has been dedicated to understanding what factors influence workplace mental health. Through this research she has extensive experience designing, implementing and evaluating worksite training programs aimed at improving employee mental health.

Findings from this scientific research led to the development of a web-based educational module, which provides managers and supervisors with training to support the mental health of their workers. This training, called the Workplace Mental Health Training for Managers, was officially launched in 2023.[1]

More than one year later, the training is making an impact. At OHSU 200 managers have gone through the training and the training has also been licensed to more than 15 outside organizations.

One organization now poised to use this training is the National Environmental Satellite, Data, and Information Service (NESDIS). "Our supervisors appreciate the focus on 'supportive behaviors' and mental distress recognition, enhanced by an evidence-based behavior tracking tool" says Christian B. Rathke DMSc, PA-C, DFAAPA, director of the total worker health program for NESDIS. "Chosen for its effectiveness, scalability, and seamless integration into our learning system, this program meets our managers' needs and strengthens our commitment to a supportive workplace."

LESLIE HAMMER, PH.D.
Professor, Oregon Institute of Occupational Health Sciences
Director, Oregon Healthy Workforce Center, Oregon Institute of Occupational Health Sciences
Associate Director of Applied Research, Oregon Institute of Occupational Health Sciences

Working to improve attention deficit disorder diagnosis

An attention-deficit/hyperactivity disorder, or ADHD, evaluation is often done when a parent, teacher or pediatrician notices symptoms that interfere with a child's ability to function at home or at school. While there's no cure for ADHD, early diagnosis can improve quality of life by enhancing child development through behavior therapy and medication. However, in the U.S., children sit on a waitlist for an ADHD evaluation anywhere from 6 months to 2 years.

In response, Joel Nigg, Ph.D., Michael Mooney, Ph.D. and colleagues sought to harness the power of artificial intelligence, or AI, to develop a rapid, accurate diagnostic tool for ADHD. A recent publication found that this AI-powered diagnostic could accurately predict ADHD, and importantly, required less clinical datapoints than traditional methods.[1] This tool could allow physicians to gather a smaller amount of patient information to make an ADHD diagnosis, saving time and resources. In 2024, Nigg, Mooney and their OHSU colleague Bonnie Nagel, Ph.D., were awarded a $16 million research grant from the National Institute of Mental Health to continue to develop AI-assisted diagnostics and tools for mental health conditions in children.[2] The researchers hope that these new diagnostic strategies can help physicians accurately diagnose adolescent mental health conditions faster and ultimately get patients the help they need sooner.

(Getty Images)

JOEL NIGG, PH.D.
Professor of Psychiatry, Division of Clinical Psychology, School of Medicine
Co-Director, Center for Mental Health Innovation, School of Medicine

MICHAEL MOONEY, PH.D.
Associate Professor of Medical Informatics and Clinical Epidemiology, School of Medicine
Associate Professor of Psychiatry, School of Medicine

BONNIE NAGEL, PH.D.
Professor of Psychiatry, Division of Clinical Psychology, School of Medicine
Co-Director, Center for Mental Health Innovation, School of Medicine

Developing new therapeutics for infectious disease

The COVID-19 pandemic highlighted the extreme need for continued research into developing new vaccines and therapeutics for infectious diseases. OHSU researchers are working to understand the basic biology of many of these diseases and performing translational research to test new treatment strategies.

Engineering long-lasting vaccines

Teams of scientists at the OHSU Vaccine and Gene Therapy Institute, or VGTI, are working to rapidly advance infectious disease research. The goal is to quickly advance findings at the molecular and cellular level into translational studies in animal models to fast-track development of new treatments. This model is epitomized in the breakthrough project to use human cytomegalovirus, or CMV, to develop better human vaccines.

The human body naturally generates a strong and prolonged response to the CMV virus. Scientists at the VGTI are exploiting this biology, to genetically engineer inactive forms of CMV for vaccines. These CMV-based vaccines have been shown to induce prolonged immune responses and have the potential to offer long-term protection against viral pathogens.

The laboratory of Jonah Sacha, Ph.D., is working on the development of a universal flu vaccine.
(OHSU/Christine Torres Hicks).

The CMV vaccine project was licensed to Vir Biotechnology and in 2023 the company initiated a Phase I clinical trial to test a new HIV vaccine developed using the CMV platform.[1] A 2024 research study using the CMV platform also revealed its potential for the development of a new kind of flu vaccine.[2] Research led by Jonah Sacha, Ph.D., and colleagues demonstrated a CMV vaccine could potentially be used to create a universal flu vaccine, which could be given once and provide years of protection against a variety of influenza strains.
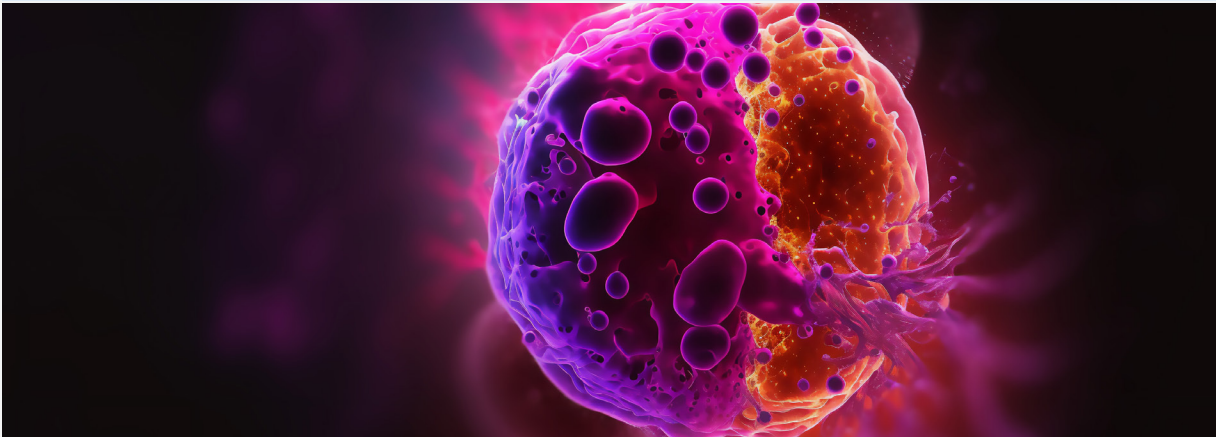

JONAH SACHA, PH.D.
Professor, VGTI-Vaccine and Gene Therapy Institute
Professor, Oregon National Primate Research Center

Fighting malaria

While the incidence of malaria is low in the U.S., globally the disease still affects hundreds of millions of people each year. These infections cause more than 600,000 deaths annually, predominantly in children under the age of 5. OHSU researcher Michael Riscoe, Ph.D., has spent his career developing new solutions for the treatment and prevention of malaria and other parasitic diseases.

Research from his laboratory uncovered a new series of chemical compounds, termed Endochin-Like Quinolones, or ELQs. ELQs disrupt activity in the mitochondria of several disease-causing parasites, including Plasmodium falciparum, which causes the most severe form of malaria. The discovery of ELQs has led to several industry collaborations to further develop these compounds for clinical and veterinary use. Medicines for Malaria Venture is performing preclinical evaluation of an ELQ compound as a prophylactic treatment for malaria, with first-in-human clinical trials expected to start in 2025. SRI, a nonprofit research institute, also collaborated with OHSU to develop a "long-acting injectable" formulation of an ELQ for use in preventing seasonal malaria for up to 3 to 6 months per dose.[1] Riscoe was recognized by OHSU Innovates with the 2024 Career Innovation Award for the success of the ELQ program and his proven track record as an impactful innovator and mentor.[2]

> Given malaria's devastating impact on human civilization, I decided early on in my career to dedicate myself to making a difference by focusing on discovering new and safe drugs to prevent and treat malaria in the most vulnerable populations, children and pregnant women. And I consider myself fortunate to have attracted many like-minded scientists and clinical scientists at OHSU to join in this effort and it has made all the difference in our success!

MICHAEL RISCOE, PH.D.
Professor of Molecular Microbiology and Immunology, School of Medicine
Research Career Scientist, Portland VA Medical Center

Improving cancer detection and prevention

The OHSU Knight Cancer Institute is a recognized leader in oncology, providing breakthrough care and conducting leading-edge science and clinical trials. Collaborations across OHSU bring a variety of expertise to OHSU's oncology research programs spawning the development of innovative new strategies for the detection, treatment and prevention of cancer.

Building hope for a cancer vaccine

Even after patients have finished cancer treatment, there is a risk that a few cancer cells are left behind. Over time, these cancer cells can grow and divide, resulting in a recurrence of a cancer. Recent research from the Vaccine and Gene Therapy Institute is exploring whether a vaccine platform being used to develop HIV and tuberculosis vaccines could also be used to develop a vaccine that prevents cancer from coming back.

Research led by Klaus Früh, Ph.D., and colleagues, examined whether genetically engineered cytomegalovirus, or CMV, can be used to activate T-cells to recognize and attack cancer cells. T-cells are part of the body's immune system that are constantly on patrol for new infections. However, T-cells normally ignore the body's own cells, even cancerous ones. A publication from the lab found that CMV could be used to program T-cells to recognize cell-surface proteins on cancer cells and attack them.[1]

This research opens the door for a possible CMV-based vaccine for cancer, in which T-cells are trained to recognize and attack cancer cells before they've had a chance to grow and spread. This strategy could be especially beneficial for people who have recovered from cancer but are at risk for recurrence.

Klaus Früh, Ph.D. and colleagues are investigating the potential of cytomegalovirus-based vaccines.

(OHSU/Christine Torres Hicks).

KLAUS FRÜH, PH.D.
Professor, VGTI-Vaccine and Gene Therapy Institute

Detecting cancer earlier

In 2009 the laboratory of <u>Melissa Wong, Ph.D.</u>, uncovered a new cell type that may be leveraged to detect tumor burden, including serving as an early sign of metastasis, the process by which cancer cells spread to new organs in the body. The hybrid cells, characterized by Wong and colleagues, are a hybrid of a cancer cell and an immune cell called a macrophage. Macrophages travel throughout the body to patrol for invading organisms. These unique hybrid cells maintained the mobility of a macrophage while also still behaving like a cancer cell. Wong's research has focused on better understanding these cells as early signs of metastasis with the goal of developing new strategies to catch cancer before it has a chance to spread.

Wong teamed up with researchers <u>Yu-Jui Chiu, Ph.D.</u>, and <u>Jose Luis Montoya Mira, Ph.D.</u>, of the OHSU Knight Cancer Institute's Cancer Early Detection Advanced Research Center to engineer a new way to isolate these hybrid cells. The team developed a microfluidic device in which a blood sample is placed into a very small channel with an underlying electrical current. As cells pass through the channel the current helps to quickly sort pre-cancerous hybrid cells from other cell types. The hope is that this device could be used to develop a simple blood-based test to detect metastatic cancer earlier.

YU-JUI CHIU, PH.D.
Associate Scientist, CEDAR, OHSU Knight Cancer Institute, School of Medicine

MELISSA WONG, PH.D.
Professor of Cell, Developmental and Cancer Biology, School of Medicine
Co-leader, Cancer Biology Program, OHSU Knight Cancer Institute, School of Medicine

JOSE LUIS MONTOYA MIRA, PH.D.
Research Engineer 3, CEDAR, OHSU Knight Cancer Institute, School of Medicine
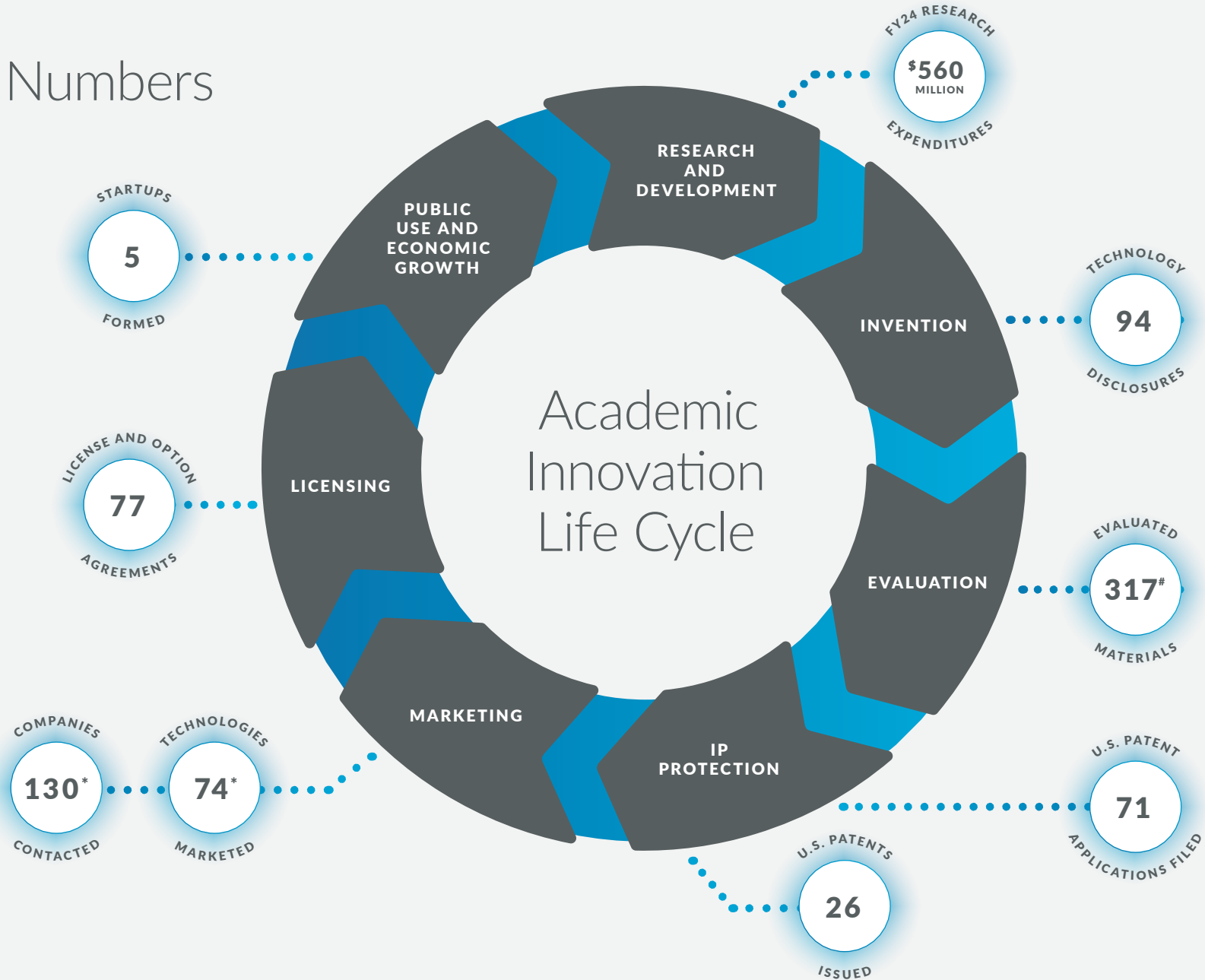(OHSU/Christine Torres Hicks).

> The synergy between biology and engineering, combining a unique tumor cell with cutting-edge engineering has promise to revolutionize cancer care by enabling earlier cancer detection, and monitoring for recurring disease, thus ultimately improving treatment strategies.
>
> — MONTOYA MIRA

By the Numbers
FY24

Academic Innovation Life Cycle

- RESEARCH AND DEVELOPMENT
- INVENTION
- EVALUATION
- IP PROTECTION
- MARKETING
- LICENSING
- PUBLIC USE AND ECONOMIC GROWTH

FY24 RESEARCH — **$560 MILLION** — EXPENDITURES

TECHNOLOGY — **94** — DISCLOSURES

EVALUATED — **317**# — MATERIALS

U.S. PATENT — **71** — APPLICATIONS FILED

U.S. PATENTS — **26** — ISSUED

COMPANIES — **130*** — CONTACTED

TECHNOLOGIES — **74*** — MARKETED

LICENSE AND OPTION — **77** — AGREEMENTS

STARTUPS — **5** — FORMED

Includes invention disclosure and presidsclosures.

* Reported marketing metrics reflect those collected by OHSU Technology Transfer and represent only a subset of OHSU Innovates outreach activities.

TECHNOLOGY DISCLOSURES

94

- **34%** Therapeutics / vaccines
- **15%** Research tools
- **9%** Diagnostics
- **16%** Software
- **7%** Medical Devices
- **19%** Other

NEW OPTION / LICENSE AGREEMENTS

77

- Biological materials **67%**
- Patent **17%**
- Copyright **12%**
- Other **4%**

MATERIAL TRANSFER
421

INDUSTRY-SPONSORED RESEARCH
53

NON-DISCLOSURE/CONFIDENTIALITY
134

Agreements

OTHER RESEARCH*
159*

* Includes research collaboration agreements, other commercialization agreements, sponsored-research amendments, no-cost extensions and miscellaneous agreements

OHSU Innovates

🔗 www.ohsu.edu/innovates

✉ innovates@ohsu.edu

OHSU Innovates is a collaborative multi-department network supporting innovation and entrepreneurship at OHSU, within the regional community and beyond. Thank you to each contributing department and others who have supported our efforts.

OHSU

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