



JOHNS HOPKINS TECHNOLOGY VENTURES

FISCAL YEAR 2024
ANNUAL REPORT

10
CELEBRATING INNOVATION
YEARS



JOHNS HOPKINS
TECHNOLOGY VENTURES

WELCOME

This year marks a milestone: one decade of work on behalf of faculty members and students. It is an opportunity to celebrate our progress, our wins and, most importantly, the incredible innovators and inventors at the nexus of the Johns Hopkins entrepreneurial ecosystem. Our celebration of 10 years has been a rewarding exercise in reflection, appreciation and planning.

We are **reflecting** on our progress: a tripling of annual licensing revenue, a quadrupling of venture investment and startup exits, and the creation of bustling spaces/programs for both faculty and student entrepreneurs. We appreciate the many stakeholders that make this possible, not limited to our unparalleled research faculty members and a dream team of Johns Hopkins Technology Ventures (JHTV) staff members. And we are **planning** for the decade ahead, focused on development of the policies, programs, places, people and partnerships that will unlock additional impact on humanity, our planet and Baltimore.

This work of academic translation and company building is not for the faint of heart. Those already doing it with us know the struggle and the immense rewards. If you are not yet doing this work, please lean in. There is nothing more satisfying than seeing entrepreneurship bear fruit, and we need a collective groundswell to make this happen at scale.

With all that Johns Hopkins researchers, students and alumni have to offer — and with institutional investments in data science/AI, life sciences infrastructure and much more — I cannot help but think that we have barely scratched the surface. In a way, it feels like we are just getting started. Onward!



Christy Wyskiel

Senior Adviser to the President of The Johns Hopkins University
for Innovation and Entrepreneurship
Executive Director, Johns Hopkins Technology Ventures

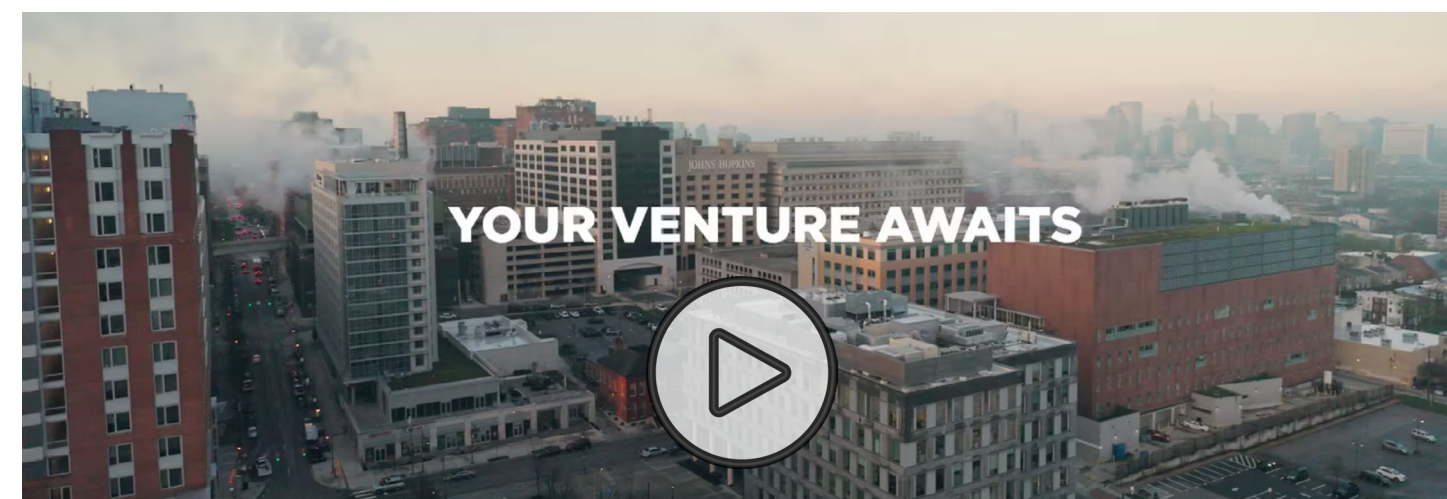
In Memoriam

This annual report is dedicated to two people whose deaths rocked the Baltimore innovation ecosystem this year: Pava Marie LaPere (A&S '19) and Mark Komisky (A&S '87). We are left with gaping holes in the fabric of our Johns Hopkins Technology Ventures/Baltimore ecosystem, but this community has shown its beauty in the way it has honored them and turned grief into action. To read about these cherished colleagues and the legacies we honor, visit [here](#) and [here](#).

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JHTV worked with a local filmmaker to capture the spirit of the entrepreneurial journey and the immense potential of Johns Hopkins innovation. *Cheers to 10 years and counting!*



Video by: **Morton Works**

10 YEARS OF INNOVATION

The following selection of innovations from the past decade illustrates the depth, breadth and impact of research from Johns Hopkins' many divisions and disciplines.

For more than a decade, **Personal Genome Diagnostics** has been developing liquid biopsy and tissue-based genomic products out of its Baltimore offices. Following a major acquisition by LabCorp in 2022, its next-generation sequencing is now incorporated into Labcorp's oncology diagnostics portfolio and driving better patient outcomes.

In 2024, the Food and Drug Administration (FDA) approved **Voranigo** (vorasidenib), a targeted cancer therapy that inhibits activity of the mutated gene IDH, slowing the growth of previously untreatable low grade glioma — the most common malignant primary brain tumor in adults. The gene's discovery in 2008 by Johns Hopkins and Duke University researchers enabled development of a targeted therapy.

Thrive Earlier Detection was formed to bring earlier multicancer detection into routine medical care via liquid biopsy. Its pioneering screening technology, including the pivotal CancerSEEK, got the attention of Exact Sciences Corporation, which acquired Thrive in 2020 for \$2.15 billion — the largest acquisition in Johns Hopkins' startup history.

The FDA approved **Opdualag** in 2022 for treatment of adult and pediatric patients with unresectable or metastatic melanoma. Opdualag is a first-in-class, fixed-dose dual immunotherapy combination of two immune checkpoints — LAG-3 and PD-1 — that represents a significant leap forward in improving antitumor response.

DELFI Diagnostics celebrated the launch of its first product, FirstLook Lung, in 2023. FirstLook Lung uses a breakthrough technology of whole-genome machine learning to analyze fragments of cell-free DNA that are markers of cancer in the blood. The company plans to use its fragmentomics platform to develop an array of disease-specific tests and other cancer treatment monitoring products.

Pylarify is a positron emission tomography (PET) imaging agent that precisely detects PSMA-positive cancers and guides treatment decisions, particularly for patients with suspected prostate cancer metastasis or recurrence. Brought to market by Lantheus, Pylarify was approved by the FDA in 2021 and has rapidly gained adoption, with sales of \$851 million in 2023.

A DECADE OF MOMENTUM

Since 2014

\$395M

AGGREGATE LICENSING REVENUE

At an average annual pace (\$39M) that has more than doubled

\$4.4B

VENTURE CAPITAL

Raised by startups, **400% uptick** in average annual fundraising

43

COMPANY EXITS

Compared to 11 exits (IPOs, M&A events) in prior history

\$236.6M

CORPORATE SPONSORED RESEARCH

From 60 industry partners

Founded in 2016, **Kubanda Cryotherapy** initially aimed to improve access to breast cancer diagnostics and treatments in low-income countries and evolved to offering minimally invasive tumor treatments for pets. The company's patented device freezes and eliminates cancerous masses during one outpatient session.

The OMIM Database is a catalog of human genetic traits and disorders, entitled Mendelian Inheritance in Man (MIM). It has become a critical research tool around the world, with over 1 million page views per week from 2.5 million unique researchers annually.

Circulomics is a genomics game changer that specializes in sample preparation by extracting high molecular weight DNA. It was acquired in 2021 by PacBio, a publicly traded company with "long read" DNA sequencing capabilities that allow scientists to read longer portions of DNA.

Founded in 2021, **CurieDx** makes a remote virtual diagnostic software tool that is among the first of its kind. The software provides an almost instant diagnosis for strep throat. CurieDx is developing six more diagnostic tools for common diseases.

ECOSYSTEM SUCCESSES

LEAD STORY

Blackbird Labs Launches with \$100M and Foundational Collaboration with Johns Hopkins University

In collaboration with Johns Hopkins and other local research institutions, Blackbird Labs is investing in early-stage academic technologies with the goal of launching Baltimore-based startups and solving unmet medical needs, with an initial focus on development of new medicines.

In its first year, Blackbird committed more than \$1.5 million in funding across four Johns Hopkins projects encompassing a wide array of technologies. The projects included development of innovative treatments for inflammatory bowel disease, a broad platform for improving gene therapies and software designed to locate and navigate clinical trials.

FUNDING NEWS

- » AsclepiX Therapeutics Raises \$10M to Advance Phase 1/2a Clinical Study of AXT107
- » EDAC Labs Raises \$3M to Scale Carbon-Removal Technology
- » Infinity Bio Opens Baltimore Lab after \$4.5M Raise
- » Rapafusyn Pharmaceuticals Raised \$28M Series A Funding

DIGITAL HEALTH

b.well Collaboration with Samsung Health to Make Personalized Healthcare a Reality

DELFI Diagnostics Recent Equity Investment to Accelerate Cancer Screening AI Platform

Scene Health and CareFirst Expanded their Partnership for Medicaid Recipients



PRODUCT UPDATES

Previsé's Flagship Product Esopredict™ Awarded NIH Direct to Phase II SBIR

NEW LAB SPACE

Johns Hopkins Green Tech Lab to Open Above R House Food Market



STARTUP NEWS

LEAD STORY

Clasp Therapeutics Launches with \$150M Investment in Precision Immuno-oncology

Clasp Therapeutics launched in March 2024, backed by \$150 million in venture financing. A biotechnology company pioneering precision immuno-oncology through next-generation T cell engagers (TCEs), Clasp seeks to address the unmet needs of patients with cancer who do not respond to existing treatments.

Clasp leverages research from Johns Hopkins investigators, including cancer geneticist Bert Vogelstein, M.D., and immuno-oncology pioneer Drew Pardoll, M.D., Ph.D. The researchers' expertise in human leukocyte antigen (HLA)-antibody interactions enables the engineering of advanced TCEs with newfound specificity, precisely targeting common oncogenic mutations. JHTV facilitated the commercialization of Clasp's innovative platform, which offers off-the-shelf, antibody-like medicines that can precisely target a wide range of challenging tumor types.

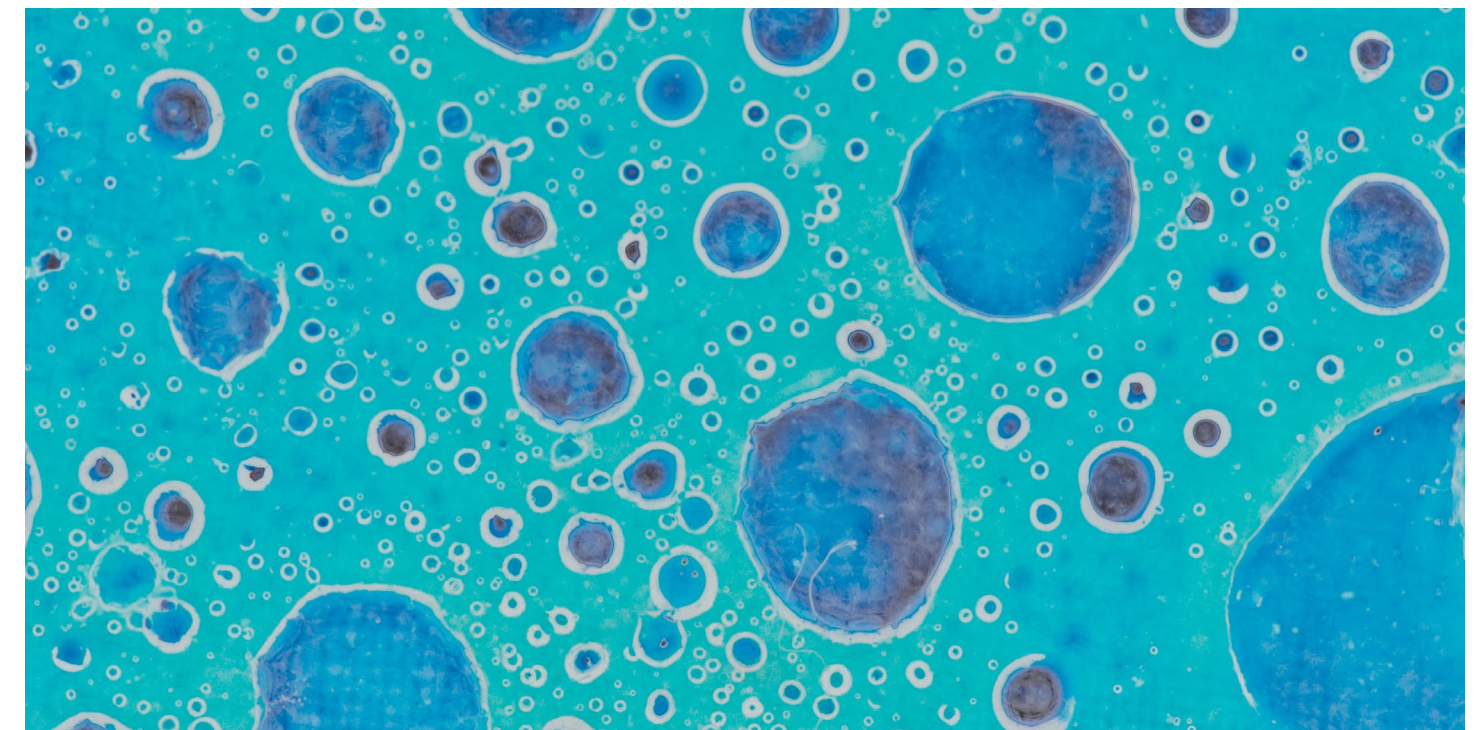
ACQUISITIONS

Escient Pharmaceuticals Acquired by Incyte



PRODUCT UPDATES

- » Ashvattha Therapeutics Announces Phase 2 Chronic Dosing Study
- » Glyscend Doses First Patient in a Phase 2 Obesity Trial of GLY-200
- » Proscia Digital Pathology Software was Awarded FDA 510(k) Clearance



COLLABORATIONS

TRILINK BIOTECHNOLOGIES

The Johns Hopkins University formed a collaboration with TriLink BioTechnologies, part of Maravai Sciences and a leader in mRNA manufacturing, to accelerate RNA therapeutic research. This partnership established a new center at the Whiting School of Engineering, using TriLink's advanced RNA synthesis technology. Recognized for its critical role in developing COVID-19 vaccines, RNA technology offers the potential to treat diseases such as Alzheimer's and Parkinson's disease and cancer, each considered untreatable with conventional drugs.

Led by Jeff Coller, Ph.D., who worked closely with Johns Hopkins Institute for NanoBioTechnology directors Hai-Quan Mao, Ph.D., and Sashank Reddy, M.D., Ph.D., the center will drive innovation and unite Johns Hopkins researchers of RNA biology, genetic medicine and biotechnology, fostering innovation and reducing research barriers. TriLink will provide funding, technical expertise and its CleanScript technology, enabling seamless transition from research-grade to clinical-grade mRNA.

AMAZON

Johns Hopkins' AI2AI partnership with Amazon is entering its third year of a five-year initiative. Announced in 2022 and housed in the Whiting School of Engineering, the initiative focuses on machine learning, computer vision, natural language understanding and speech processing. To date, the initiative has awarded 15 faculty research awards and 10 Ph.D. fellowships.

CANON MEDICAL SYSTEMS

Canon renewed its collaboration with Johns Hopkins for another five years to advance high resolution MRI/computerized tomography (CT) technology, building on a history that has yielded 31 projects involving 15 faculty members since 2017. The collaboration makes research funding and cutting-edge clinical diagnostic instruments available to Johns Hopkins researchers. For example, the collaboration enabled a multicenter clinical study that investigates the effectiveness of ultrahigh resolution CT to detect coronary heart disease. Other research projects combine expertise from our School of Engineering and School of Medicine, and uses AI and data science to minimize denoising and spectral distortion in advanced CT. To further the collaboration, Canon plans to install new scanners at Johns Hopkins during the next two years, including a new MRI and photon-counting CT scanner.

DANAHER CORPORATION

Danaher has joined forces with Bloomberg Distinguished Professor Jessica Gill, Ph.D., M.S.N., and Richard Rothman, M.D., Ph.D., to develop advanced blood-based diagnostics for mild traumatic brain injury (TBI). The collaboration aims to leverage novel biomarker panels for early, precise TBI diagnosis with the potential to revolutionize treatment and benefit the nearly 56 million patients globally who have mild TBI.

RESEARCH AREAS & FACULTY HIGHLIGHTS

CARDIOMETABOLIC DISEASE

Johns Hopkins cardiometabolic research spans four centers and institutes that conduct research, prevention and treatment for obesity, diabetes, chronic kidney disease, cardio-kidney-metabolic disease and heart health/hypertension. Johns Hopkins research in this area has particular depth in lipid metabolism, targeted immunotherapies, energy balance and nutrient sensing.



Dax Fu, Ph.D.

Type 1 and type 2 diabetes research leader who is developing antigen-specific and islet-targeted immunotherapies to achieve permanent protection against, or reversal of, T1D. His research has been funded by the Brookhaven National Laboratory, NIH, the Van Andel Institute and companies including Amgen and Pfizer.

DATA SCIENCE & AI

Johns Hopkins has made a transformational investment in the power and promise of data science and AI, and it is building the nation's foremost destination regarding emerging applications, opportunities and challenges presented by data science, machine learning and AI. Faculty are engaging with industry on applications for drug discovery, precision medicine and climate resilience, among other areas.



Jeffrey Gray, Ph.D.

Leader in antibody engineering and protein structure prediction, including in the use of deep learning and AI. Gray's research has been funded by ACS, the Beckman Foundation, DARPA, NIH, NSF, Rosetta Commons and companies including AstraZeneca, GSK Vaccines, Moderna and UCB.

ORGANOIDS

During the past decade, advances in human stem cell biology, tissue engineering and microtechnology have led to development of microphysiological systems and organoids, which are platform technologies used to recapitulate key organ features and to study human tissues under complex conditions. Faculty members in this field are engaging with industry to work toward a paradigm shift in high-throughput drug and toxicology testing.



Annie Kathuria, Ph.D.

Leader in organoid tissue engineer breakthroughs, is exploring the molecular foundations of several neurological disorders including autism, schizophrenia and Alzheimer's disease. Kathuria's research has been funded by the Brain and Behavior Research Foundation, Element Biosciences, the Maryland Stem Cell Research Fund and the NIH.

FUNDING & AWARDS



Provost Ray Jayawardhana, Nick Papadopoulos, Christy Wyskiel, President Ronald Daniels, Christopher Douville, Chettan Bettegowda, Bert Vogelstein, and Denis Wirtz

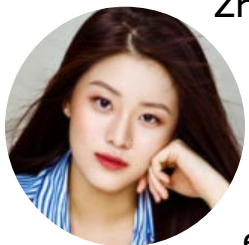
PRESIDENT'S INNOVATION AWARD

Christopher Douville, Ph.D., an assistant professor of oncology at the Johns Hopkins University School of Medicine, was named the inaugural recipient of the Johns Hopkins President's Innovation Award in recognition of his scholarly pursuits.

The \$250,000 President's Innovation Award will be given annually to an early-career to mid-career faculty member who is focused on solving problems in society and translating research beyond academia. The award, which builds on the range of commercialization support and resources that JHTV provides, was presented during an event celebrating JHTV's 10th anniversary. Douville was selected from 28 nominees from across the university.

Douville's work is in the field of computational biology — he uses algorithms to understand cancer genetics and to detect cancer early via liquid biopsy. In research published earlier this year in *Science Translational Medicine*, Douville and collaborators found that people with cancer have different amounts of a type of repetitive DNA than those without cancer. Blood tests can reliably detect these anomalous early cancer warning signs before symptoms appear.

PITCH IT ON!



Zhuolun Wang, a Ph.D. candidate at The Johns Hopkins University, won \$15,000 in JHTV's annual Pitch It On! competition for her innovative chronic pain management system.

Pitch It On! is a virtual competition featuring female inventorship at Johns Hopkins that reflects JHTV's efforts to close the entrepreneurship gap in which women are much less likely to be patent holders and startup founders. A generous donation from the female members of JHTV's IDEA Board funded this year's award.

Wang's CALMS technology, which combines clustered regularly interspaced short palindromic repeats (CRISPR) gene editing and AAV delivery, aims to provide long-lasting pain relief without the side effects of opioids. Through her startup, SereNeuro Therapeutics, Wang hopes to commercialize studies from her Ph.D. thesis project into curative therapies for chronic pain.

LOUIS B. THALHEIMER FUND FOR TRANSLATIONAL RESEARCH

The Thalheimer Fund, established with a generous donation from businessman and philanthropist Louis Thalheimer, provides seed funding for crucial proof-of-concept and validation studies at Johns Hopkins. This year, three faculty members were awarded a total of \$240,000.



Reza Kalhor, Ph.D.

Research

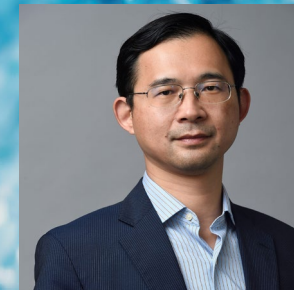
A High-Throughput Cell Line Development Platform to Assess Cell Line Performance in Realistic Biomanufacturing Conditions



Betsy Luczak, Ph.D.

Research

A Novel Drug Discovery Platform to Identify Small Molecules to Treat Atrial Fibrillation



Chao Wang, Ph.D.

Technology

Electrochemical Extraction of Lithium from Seawater

MARYLAND INNOVATION INITIATIVE (MII)

An additional 17 Johns Hopkins faculty members received a total of \$2 million from the state of Maryland's MII.

PAVA CENTER

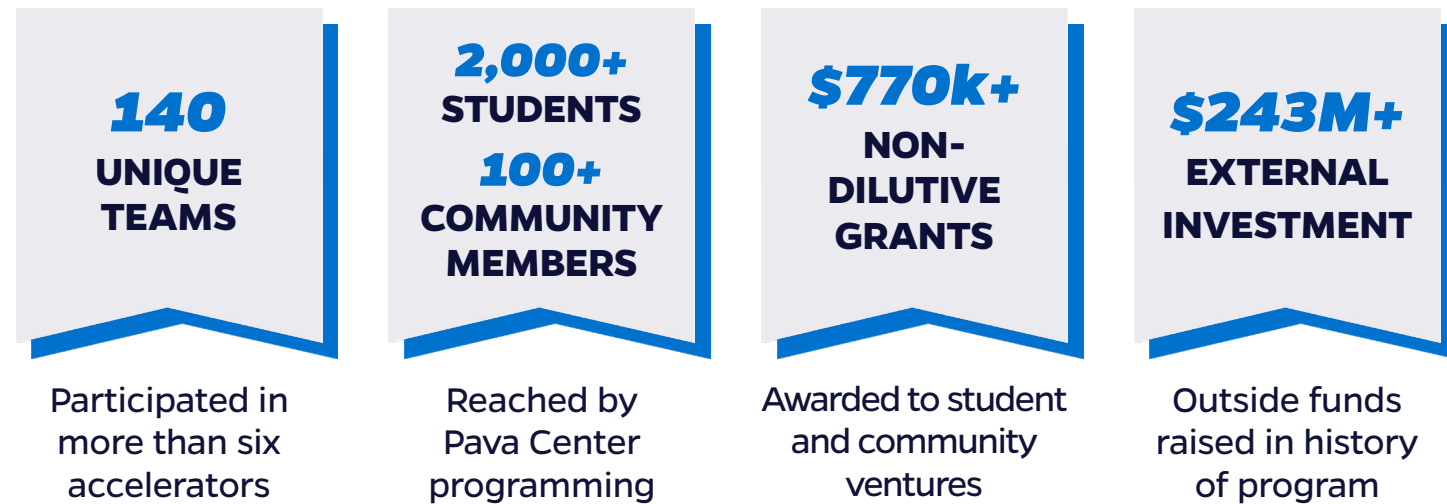
A fiscal year 2024 highlight was the launch of the **Pava Marie LaPere Center for Entrepreneurship**, dedicated in memory of a formative member of the student entrepreneurship program previously called FastForward U.

As an undergrad and then local alum, LaPere directly mentored dozens of teams and helped shape some of FastForward U's signature programs, influencing more than a thousand student ventures and counting. She represented the trajectory that FastForward U aimed to enable: that Johns Hopkins students create high-impact startups while on campus, then remain in Baltimore to grow them and give back to future generations of campus and local entrepreneurs.

Last year, the Pava Center worked with 140 teams across six accelerator programs, including teams from all nine schools and teams from the community that participate in the Social Innovation Lab accelerator.

Philanthropic gifts enabled many of the center's activities this year. These include gifts made as part of our Founders' Pledge program, in which alumni founders such as Jess Gartner (Education, '11) generously commit a share of proceeds upon company exit.

PAVA CENTER STATS

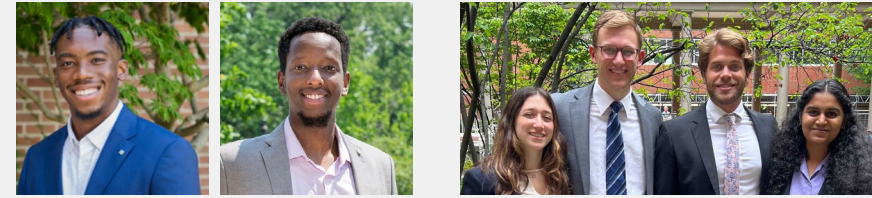


FASTFORWARD U & PAVA CENTER TIMELINE



STUDENT, COMMUNITY, & ALUMNI SPOTLIGHTS

President's Venture Fellowship Awardees



Drul

Somnair

Innovation & Entrepreneurship Challenge

10 teams were awarded a total of \$130k.

Spark Fall Judge's Prize Winners

Biolinco, Stem Equity Project, TiBi, and Whisper

Spark Spring Judge's Prize Winners

Droply, Fiesta, Oratio, and RectaNav

Fuel Fall Grand Prize Winner

Orbit



Fuel Spring Grand Prize Winner

Squid3 Space

Social Innovation Lab Cohort Prize Winner

Salama Wellness

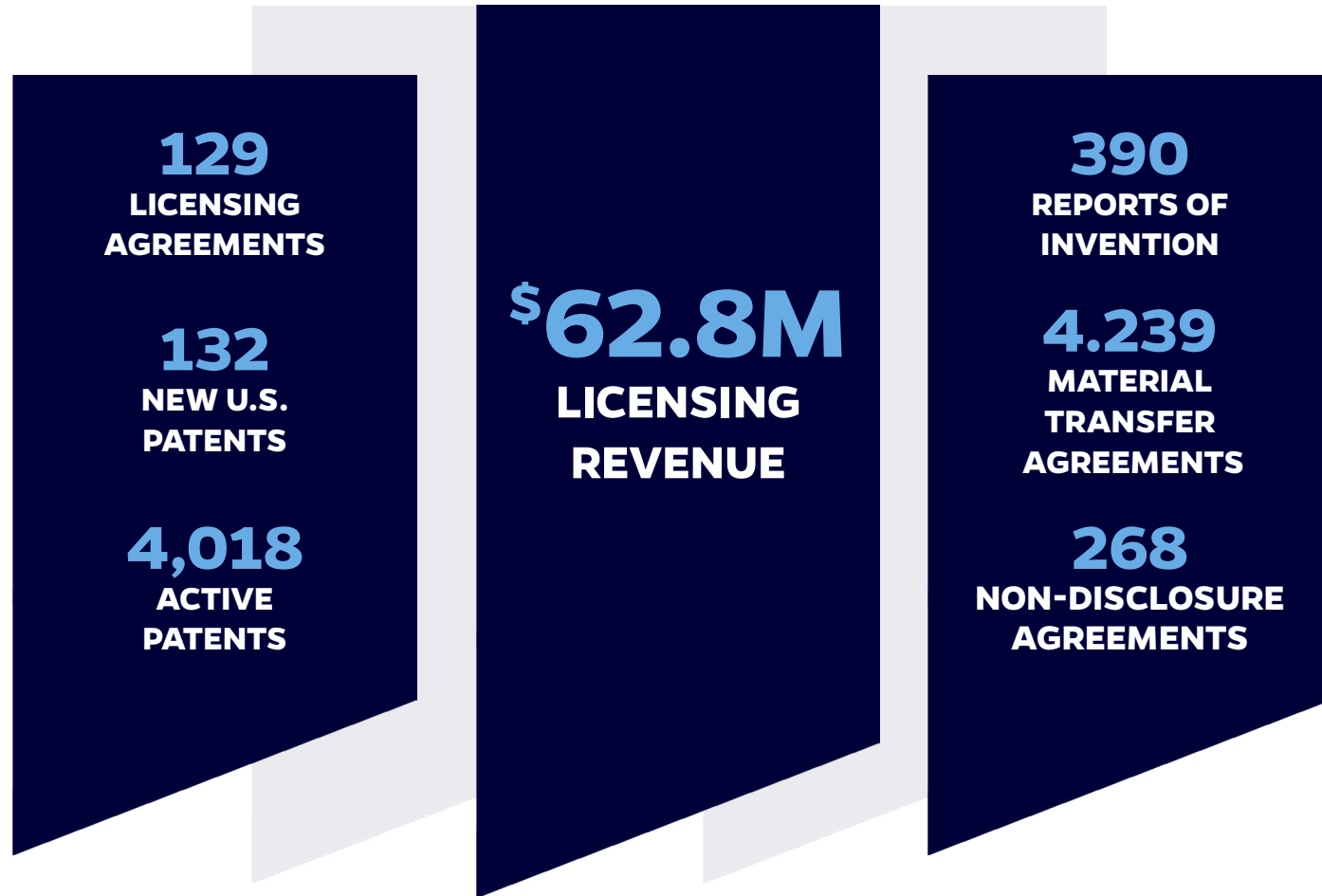


Alumni News

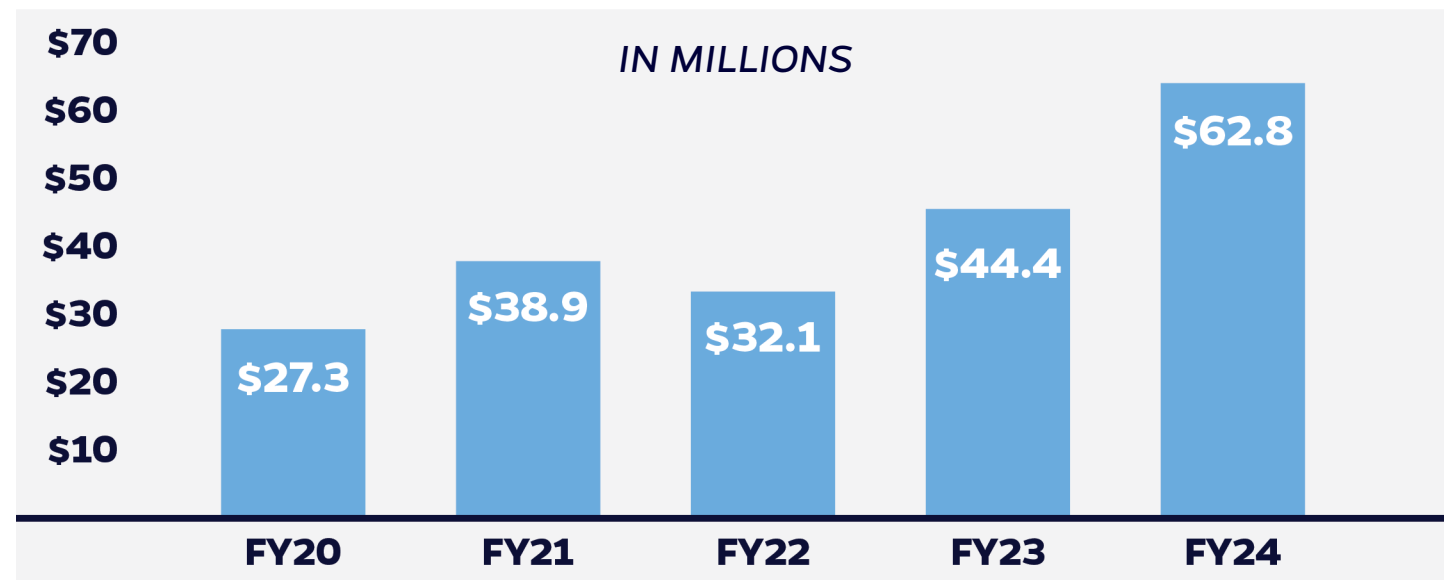
- » Hubly Surgical Closes Oversubscribed \$3M Seed Funding Round
- » Marigold Health Secures \$11M in Series A Funding to Expand Peer Support

BY THE NUMBERS

TECHNOLOGY TRANSFER



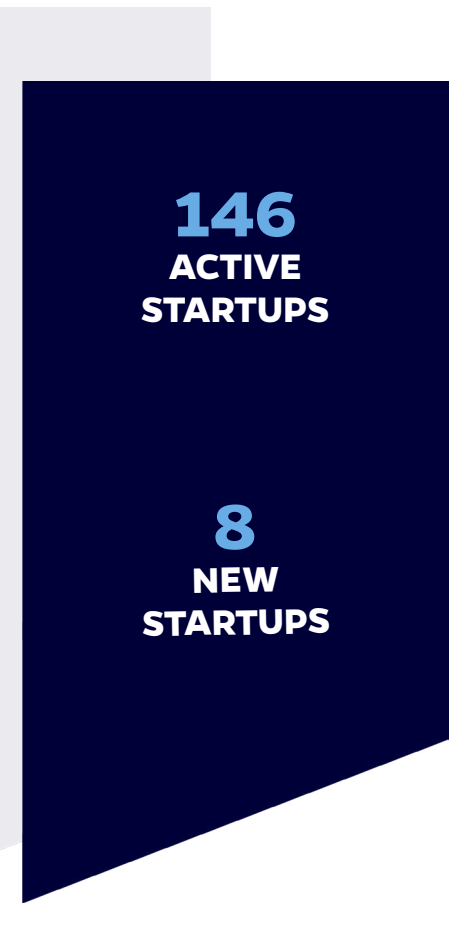
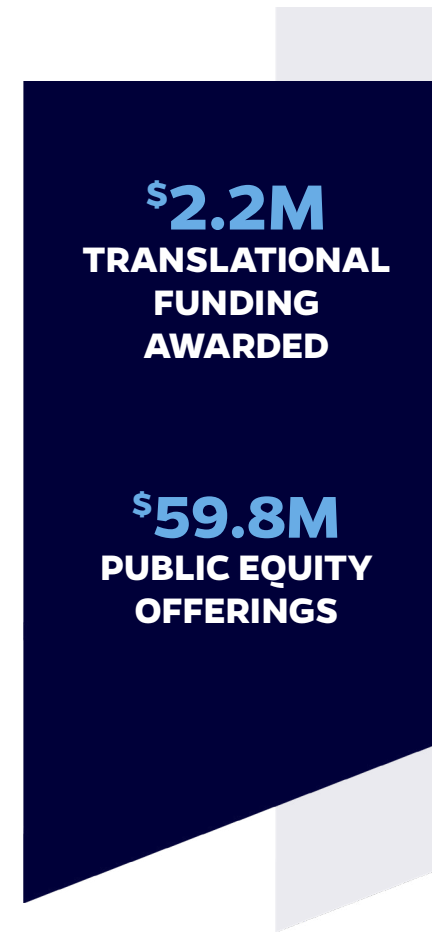
LICENSING REVENUE TREND FY20-24



CORPORATE PARTNERSHIPS



UNIVERSITY STARTUPS



PORTFOLIO SNAPSHOT



EVENTS & VIBRANCY

JHTV INNOVATION HUBS

Last year, JHTV had many opportunities to host the innovation ecosystem. At our 1812 Ashland Ave. hub, we continued to cohost the Anchor Ventures panel series with the University of Maryland, Baltimore. We also held UpSurge Baltimore's Equitech Tuesday at the Pava Center, gathering more than 100 people from Baltimore's innovation community.



5-5-5 SERIES

This initiative was implemented last year to bring together five innovators, five investors and five entrepreneurs to spark valuable conversations. The series has provided a space for informal discussion about innovations, the markets and opportunities.

CELEBRATION OF INNOVATION

JHTV celebrated the prolific research community, which has made discoveries that have changed the world and the Baltimore skyline. We gathered Johns Hopkins and Baltimore ecosystem leaders and faculty innovators to recognize the accomplishments of the past decade while looking ahead to an exciting future.



COLUMBIA UNIVERSITY PITCH DAY

Columbia University invited JHTV to co-host its annual Startup Pitch Day, an event that welcomes a new university each year to showcase startups from its research labs. Faculty members and a student from 14 Johns Hopkins labs pitched their innovations in New York City to more than 175 investors.

PAVA CENTER DEDICATION

Over 250 people gathered to celebrate five years of empowering and equipping Johns Hopkins students, alumni and community change makers, while formally dedicating the Pava Marie LaPere Center for Entrepreneurship.



ACKNOWLEDGMENTS

JHTV is grateful for the support of many generous stakeholders, including its donors, corporate sponsors, mentors, and strategic advisers.

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