



UNIVERSITY OF MARYLAND
STRATEGIC PARTNERSHIP
MPowering THE STATE

CMAV AND UMCEED ANNUAL REPORTS

University of Maryland Strategic Partnership

The University of Maryland Strategic Partnership Act of 2016 codified an alliance between the University of Maryland, Baltimore and the University of Maryland, College Park, known as *MPowering the State* or *MPower*. The law strengthened the partnership, outlined a series of charges to the universities, and created two new centers: the Center for Maryland Advanced Ventures (CMAV) and the University of Maryland Center for Economic and Entrepreneurship Development (UMCEED).

This document shares the Fiscal Year 2023 reports on the progress and activities of the two centers.

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For more information about the partnership and its activities, please visit the [MPower website](#); to view past fiscal year reports, please contact Adrienne Arthur, Executive Director and Assistant Vice Provost, aarthur@umaryland.edu.



CENTER FOR
MARYLAND
**ADVANCED
VENTURES**
FY2023 REPORT



Overview

The Center for Maryland Advanced Ventures (CMAV) facilitates technology transfer for UM Ventures and amplifies the impact of university-based research. Strategic initiatives help identify research projects with strong commercial potential while providing programming that supports the advancement of technology commercialization. The initiatives are designed to integrate and work collaboratively with existing offerings from UM Ventures, TEDCO, and the Maryland Department of Commerce.



James L. Hughes, MBA

CMAV is directed by Jim Hughes, senior vice president and chief enterprise and economic development officer at University of Maryland, Baltimore (UMB).

History

Located on the UMB campus, CMAV was created and funded through the University of Maryland Strategic Partnership Act of 2016 and launched on July 1, 2017. The legislation provides \$6.5 million annually to strengthen the commercialization of high-potential, university-based discoveries.

In Action

CMAV funds entrepreneurial staff, grants to startups and growing companies, program costs for promoting technology commercialization, matching support for faculty projects with high potential, student activities and experiences, outreach to the greater Baltimore scientific community, development of intellectual property, and assistance for small business formation. Throughout FY2023, the CMAV team focused on broadening outreach and developing additional programs that support emerging technologies and current areas of need. The following report illustrates the impact of CMAV funding, detailing annual and cumulative achievements of the programs supported by CMAV.

FY2023

PROGRAM ACTIVITIES



MARYLAND MOMENTUM FUND

FY2023 ACCOMPLISHMENTS

\$1.7M INVESTED

3 PORTFOLIO
COMPANY EXITS

4 INVESTMENTS IN
NEW COMPANIES

4 INVESTMENTS IN
EXISTING COMPANIES

A collaboration between UM Ventures and the University System of Maryland (USM), the Maryland Momentum Fund (MMF) is an early-stage investment fund that invests in Maryland-based, USM-affiliated startup companies.

The fund is supported by \$16 million from the University System of Maryland; additional investments from USM institutions bring the total size of the MMF to over \$21 million. Exits of three portfolio companies have generated a total of \$1.3 million in returns, which will be used to invest in a mix of new startups and existing companies.

CMAV funds a full-time Managing Director based at UMB and provides additional support and operational expenses. The MMF staff conduct outreach at all USM institutions, soliciting applications for funding and providing advice and support to entrepreneurs across USM.

LIFETIME PORTFOLIO ACCOMPLISHMENTS

\$11.7M
INVESTED

27 PORTFOLIO
COMPANIES

8 USM
INSTITUTIONS

\$125M
MATCHED

230+ UNIQUE
CO-INVESTORS

170+ NEW JOBS
CREATED

PRESIDENT'S ENTREPRENEURIAL FELLOWSHIP

To enhance entrepreneurial education, the President's Entrepreneurial Fellowship program provides UMB and University of Maryland, College Park (UMCP) Robert H. Smith School of Business MBA students the opportunity to learn first-hand the unique challenges of commercializing life science technologies. Mentored by UM Ventures staff, the Fellows work on interdisciplinary teams to commercialize UMB-owned technologies.

This year's cohort was comprised of nine students, representing the School of Medicine, School of Nursing, School of Law, and the Robert H. Smith School of Business.

The Fellows worked on two projects. One project focused on a market analysis of a surgical device for civilian and military trauma surgery. They also researched deals and investments in the niche trauma surgery market. The other project focused on drug repurposing, specifically repurposing approved drugs in diverse indications specifically for enhancing natural killer cell (NK cell) activity for use in cancer cellular immunotherapy. The students conducted wet lab experiments and used a machine learning approach for this project.

GRADUATE RESEARCH INNOVATION DISTRICT

FY2023 ACCOMPLISHMENTS

7 STUDENT TEAMS
FOR GRID PITCH

46 WORKSHOPS

966 PARTICIPANTS

The Grid, located in UMB's Health Sciences and Human Services Library (HS/HSL), has continued to expand its programming to provide entrepreneurial resources and education to students, faculty, staff, and the community.

The Grid Pitch showcase welcomed seven student teams. It was hosted in-person for the second year in a row, and more than 70 individuals from across UMB, Baltimore, and greater Maryland joined to celebrate student entrepreneurship. Thanks to the generous support of the UM Graduate School and the USM Launch Fund, the students were awarded a total of \$12,000 to advance their projects.



SMALL BUSINESS DEVELOPMENT CENTER

FY2023 ACCOMPLISHMENTS

501 CLIENTS
COUNSELED

2K JOBS CREATED
OR RETAINED

38 NEW
BUSINESSES
STARTED

\$12.15M LOANS AND CAPITAL INFUSION
INTO BALTIMORE CITY BUSINESSES

The Small Business Development Center, the Federal small business outreach entity, is supported with funding and space at UMB. The office provides direct assistance to local and University-affiliated entrepreneurs from a wide array of business sectors.

INTELLECTUAL PROPERTY LAW AND ENTREPRENEURSHIP CLINIC

FY2023 ACCOMPLISHMENTS

25 STUDENTS
ENGAGED

60 CLIENTS SERVED
PER SEMESTER

12 PATENT APPLICATIONS
SUBMITTED

19 TRADEMARK
APPLICATIONS
FILED

24 TRADEMARK
APPLICATIONS
ISSUED

10 NEW MARYLAND LIMITED
LIABILITY CORPORATIONS FORMED

The Francis King Carey School of Law Intellectual Property Law and Entrepreneurship Clinic (IPEC) provides second- and third-year law students with valuable work experience. Under the supervision of professors and with the support of two part-time clinical law instructors, students work with clients from UMB and the region to provide general counsel on basic business law, protect trade secrets, prepare nondisclosure agreements, and assist with company formation.

IPEC's new Business Law Track, established in 2021, gained traction with services provided to clients, including drafting non-disclosure agreements, LLC operating agreements, and creating privacy policy statements for electronic communications. They are very active providing research, guidance and actions pertaining to business law in the region.

BALTIMORE FUND

The Baltimore Fund encourages University-created or -sponsored technology companies to locate and expand in Baltimore City as specified in the legislation. CMAV funds the Director of the Baltimore Fund and all expenses of the program. In addition to managing the program, the Director facilitates engagement with Maryland's entrepreneurial ecosystem and its myriad support programs and resources including TEDCO, Baltimore Development Corporation, and the Maryland Department of Commerce. The Baltimore Fund is open to all Maryland public higher education institutions and is administered by UMB.

Since the Fund's creation:

- Baltimore Fund portfolio companies have raised over \$16 million in investment and have grants and sales income exceeding \$65 million.
- Awards have supported companies representing seven Maryland public higher education institutions and a wide array of technologies, including Morgan State University, UMCP, UMB and IMET to support their entrepreneurial activities in Baltimore City and increased outreach to diverse populations.

FY2023 activities included:

- Disbursed 12 grants with 9 new awards which included 5 directly to start up companies.
- Investments in UpSurge and Conscious Venture Labs innovation accelerator to a diverse and inclusive innovation community in Baltimore.
- Continued support of Lexington Market by providing a loan loss reserve to Baltimore Community Lending's targeted microloan program which benefited 13 small business vendors.
- Renewed and ongoing support for UMCP's I-Corps program in Baltimore City at Morgan, Coppin, and University of Baltimore with 49 participants this year.

LIFETIME ACCOMPLISHMENTS

68 ENTITIES ASSISTED

700+ JOBS CREATED OR RETAINED

16 NEW LEASE SUBSIDIES

19 COMPANY EXPANSION AND
RELOCATION GRANTS

FY2023

GRANT ACTIVITIES



GRANT APPLICATIONS

The legislation encourages application for external grants to support and enhance CMAV activities, including the growth of UMB's translational research and of Baltimore's innovation ecosystem.

In addition to the direct commercialization grants mentioned in other parts of this report, the following grants were submitted and directly enhance CMAV funding, programming, and activities.

FY2023 Grant Applications

- U.S. Economic Development Administration's (EDA) Tech Hubs in collaboration with GBC (*tech hub designation was awarded in FY2024; up to \$70 million of funding will be available for funded tech hubs*)
- NIH REACH Grant (*\$4 million, four-year grant; awarded in FY2024*)
- Maryland Department of Commerce Anchor Ventures Sponsorship (*\$10,000*)
- Maryland Department of Housing and Community Development SEED grants (*proposals total \$2.15 million; \$125,000 awarded in FY2023*)

MARYLAND DHCD SEED GRANTS

Previously UMB was awarded four SEED grants from the Maryland Department of Housing and Community Development (DHCD) to support 4MLK innovation spaces. These grants are still being managed and administered to support civic innovation spaces in 4MLK and on Maryland's Eastern Shore, as well as renovations of the M&T Bank Exchange. UMB actively collaborated with new partners in the UMB neighborhood to submit another three grant applications. These grants are currently under review and would enhance the services and storefronts in West Baltimore.

ANCHOR VENTURES

FY2023 ACCOMPLISHMENTS

3 PROGRAMMED EVENTS

300 EVENT REGISTRANTS

Anchor Ventures harnesses the collective expertise and influence of local universities, key stakeholders, entrepreneurs, and investors to foster collaboration between and the education of Baltimore's innovation ecosystem. Led by staff from UMB and Johns Hopkins University, Anchor Ventures provided three programmed events in FY2023, including the first in person event since COVID. Topics included "The Future of Neurotech", "Cancer Diagnostic Innovations" and "Is Telehealth the New Normal?".



We also obtained a grant from the Maryland Department of Commerce to support FY2024 programming activities.



In May 2022, Anchor Ventures held the first in-person event since COVID restrictions went into effect in 2020. The topic was focused on innovations in cancer diagnostics.

FY2023

TECHNOLOGY COMMERCIALIZATION



UM VENTURES

Since the inception of UM Ventures in 2012, technology transfer activities at both UMB and UMCP have increased.

In FY2023, UM Ventures recorded 234 new disclosures, executed 42 licenses, and created eight new startups. In addition, 260 patent applications were filed, and 48 patents were issued.

Through the concerted efforts of UM Ventures staff, strategic industry partnerships have been strengthened and the startup portfolio includes more high-profile startups.

COMMERCIALIZATION ACTIVITIES | 6-YEAR TRENDS

From FY2012 through FY2023, the number of licenses and startups and the amount of revenue has been steadily increasing.*

12% INCREASE IN LICENSES

18% INCREASE IN STARTUPS

62% INCREASE IN REVENUES



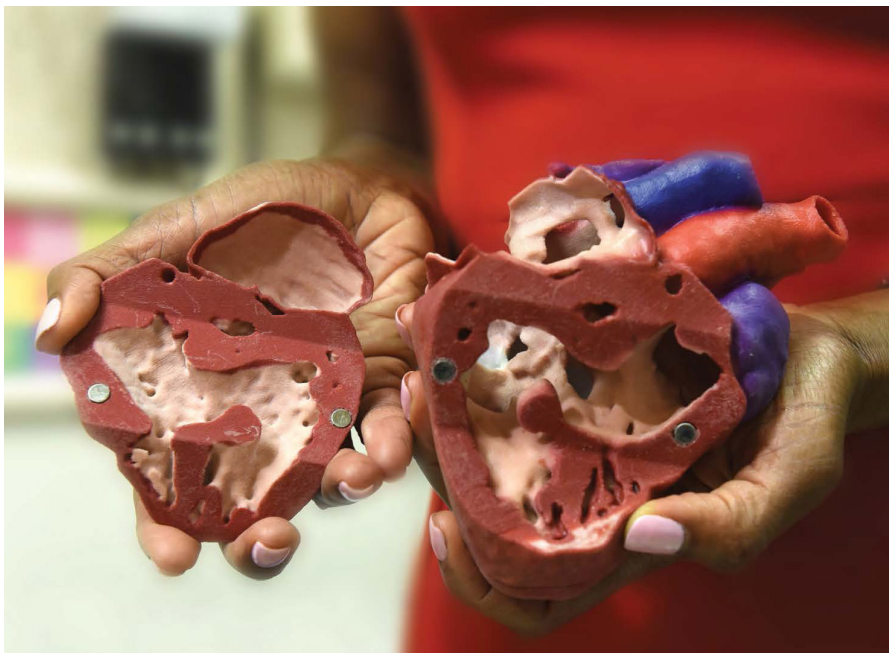
IRAZÚ

IRAZÚ Bio is bridging the divide between academic research and drug development. With a hands-on approach, IRAZÚ identifies, de-risks, and develops the best intellectual property-protected academic research to create innovative life science companies. IRAZÚ's first spin out company, IRAZÚ Oncology, is advancing a vaccine candidate for colorectal cancer. Their novel platform builds on a technology initially developed at the Center for Vaccine Development and Global Health at the University of Maryland School of Medicine. IRAZÚ was founded and is led by Marco Chacón, PhD.

**Based on six-year averages from FY2012 - FY2023.*

MEDICAL DEVICE DEVELOPMENT LAB

UMB's Office of Technology Transfer (OTT) team works with leading UMB surgeons to expand the development of novel medical devices and grow UMB's medical device portfolio. Collaboration with the UMSOM supported development of a medical device innovation and rapid prototyping lab. The space is located within the UMSOM to facilitate easy access for surgeons working in the hospital. UMB's OTT team and the Fischell Institute provide direct support enabling CAD drawings, 3D printing, rapid prototyping, and streamlined patent filing.



Since the lab's creation:

- Eleven device projects have been created by UMSOM faculty.
- Three startups have been formed around projects: Lionheart, Protaryx, and Econnect-1.

FY2023 activities included:

- A new full-time staff person was hired in collaboration with the Fischell Institute to augment medical device development.
- Funding seven projects as a result of the Medical Device Sprint Competition.
- Started four additional new projects.
- Contributed to two patent applications and one MII grant

LIFETIME ACCOMPLISHMENTS

19 PROJECTS
CONDUCTED

6 PATENT APPLICATIONS
FILED

3 STARTUPS
CREATED

VENTURES WET LAB



A 650 sq. ft. wet laboratory features molecular and cell biology capabilities as well as specialized equipment for technology validation and testing. Located in the UM BioPark, the lab was opened in FY2020 and is staffed by UMB's Office of Technology Transfer (OTT). In FY2023, three commercial entities based on UMB IP actively utilized the lab.

LIFE SCIENCES IP FUND

The Life Sciences IP Fund (LSIPF), created in February 2018, provides proof-of-concept and external validation funding to accelerate commercialization of technologies at UMB. Supported projects receive project management support along with funding for technology validation and further development. Five projects have resulted in the creation of new UMB startups: Isoprene Pharmaceuticals, Protaryx, GEn1E Lifesciences, E-connect, and RenuBioMed. Protaryx and GEn1E have successfully closed initial financing rounds, and in mid-2021, Isoprene received a \$2 million SBIR Direct-to-Phase II grant from the National Cancer Institute. More than half of LSIPF projects have been medical device technologies, many of which have been prototyped by a newly embedded on-site engineer who is jointly supported through UMB's Office of Technology Transfer and UMCP's Fishcell Institute.

LIFETIME ACCOMPLISHMENTS

\$19M CATALYZED (3RD PARTY)
CAPITAL

19:1 RETURN ON
INVESTMENT

34 EARLY-STAGE
TECHNOLOGIES ASSISTED

5 STARTUPS
FORMED

INSTITUTE FOR CLINICAL & TRANSLATIONAL RESEARCH

Institute for Clinical & Translational Research (ICTR), UMB's first Universitywide interdisciplinary hub for clinical translational research and training, operates as part of a consortium with JHU. UMB's OTT team works closely with the UMSOM on ICTR and provides a joint program manager to facilitate identifying promising new technologies. In addition to annual funding, in FY2023, CMAV supported patient-oriented research and Phase II clinical trials through ICTR.

A total of 15 projects were funded in FY2023 through the following funding programs:

Accelerated Translation Incubator Pilot (ATIP) Grant Program

ATIP supports innovative, translational research projects

- 16 applications were received and 9 were funded for a total of \$400,000
- Collaborations across the Schools of Medicine, Pharmacy, and Dentistry, and with UMCP and UMBC

Community Engaged Research (CEnR) Grant Program

CEnR specifically supports projects addressing health problems through community-engaged implementation.

- 4 applications were received and 2 were funded for a total of \$78,350
- Collaborations across the Schools of Medicine, Nursing, and Social Work and with UMBC and non-USM institutions.

Nephrotic Syndrome Research Program (NSRP) Grant

NSRP was a one-time opportunity to support innovative, translational research applications that address issues of prime concern directly relevant to Nephrotic Syndrome.

- 6 applications were received and 4 were funded for a total of \$360,000

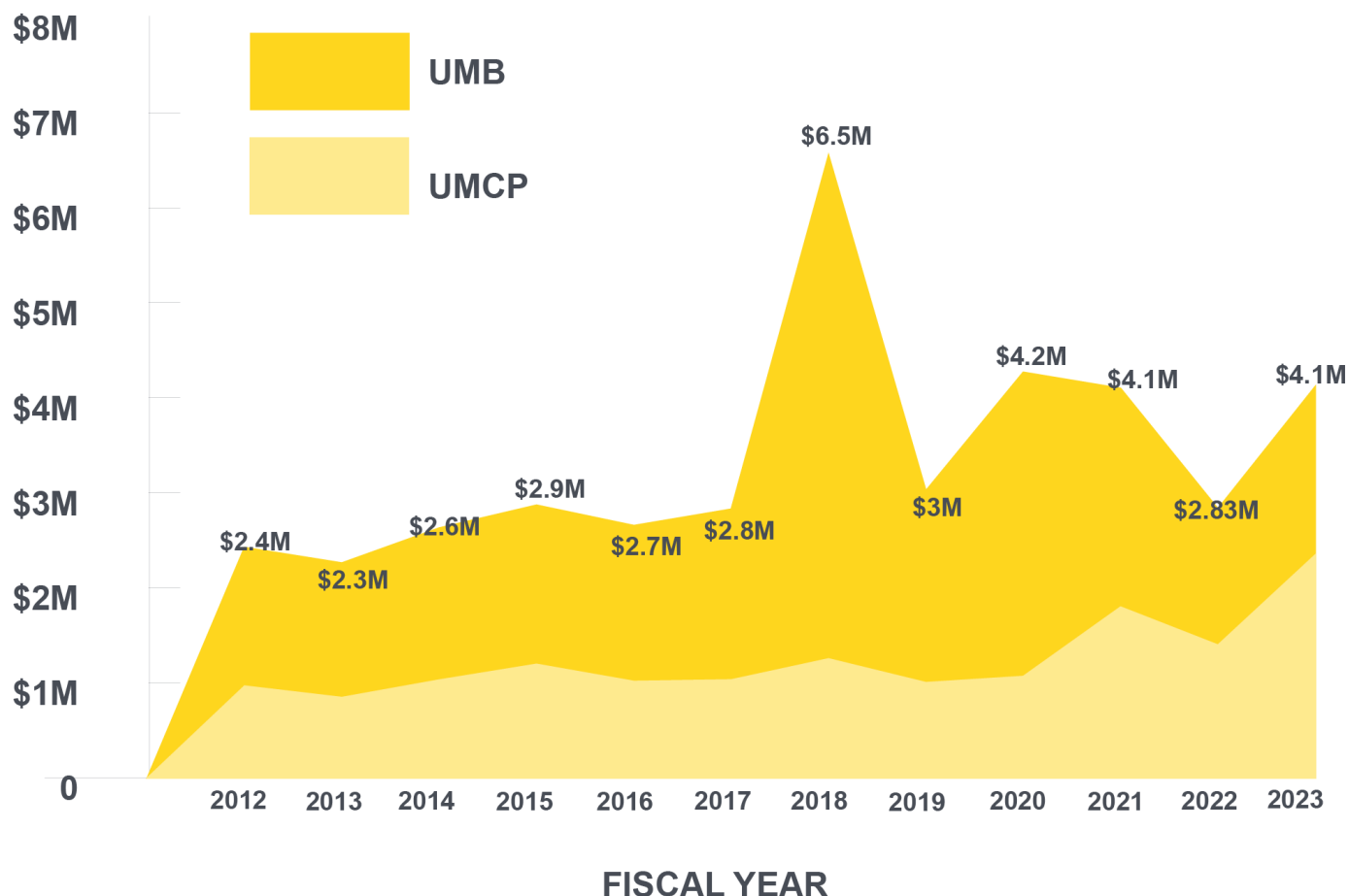
LIFETIME ACCOMPLISHMENTS

20% PROJECTS HAVE RESULTED
IN IP DISCLOSURES

VALUE OF LICENSED TECHNOLOGIES

It is difficult and highly speculative to value technologies when they are first licensed; however, technology transfer revenues to UM Ventures have averaged \$4.1 million over the past five years.

REVENUE RECEIVED



UMB Investment Portfolio

External investment is a good indicator of the value of our technologies and the strength of our companies. To date, UMB has invested \$1.4 million in the most promising UMB startups, and those companies have received \$88 million in follow-on capital investments, which is an 18:1 external match ratio to our initial investment.

\$88M FOLLOW-ON CAPITAL INVESTMENT

18:1 EXTERNAL MATCH RATIO

FY2023

ACCOMPLISHMENTS AND RECOMMENDATIONS






FY2023 SUMMARY

1. Commercialization activities of invention disclosures have continuously increased as evidenced by the increasing number of startups, licenses and revenues over the past 10 years.
 2. Continued to expand programming and outreach to interested USM faculty, staff, and students on technology transfer opportunities and to develop entrepreneurial skills.
 3. Provided direct support to entities affiliated with UMB, UMCP, UMBC, UMES, UMGC, Towson, Coppin and University of Baltimore.
 4. Extended support of UMCP I-Corps programming at Morgan State, University of Baltimore, and Coppin State, which has successfully brought additional resources to Baltimore City and expanded the entrepreneurial capabilities of these institutions while reaching a more diverse population.
 5. Provided input and support to multiple federal grant opportunities that would bring additional resources and funding towards CMAV commercialization activities
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RECOMMENDATIONS FOR FY2024

1. Strengthen connections with local angel networks and national venture capital companies.
 2. Continue to expand outreach to and inclusion of underserved populations in activities.
 3. Create additional opportunities and programs to educate interested USM faculty, staff, and students on technology transfer commercialization and entrepreneurial skills.
 4. Create additional collaborative programming with other USM institutions and pursue new external funding opportunities.
 5. Leverage federal grants into additional commercialization activities.
 6. Plan and develop programming for CMAV-supported space in 4MLK, the BioPark's new development project.
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UNIVERSITY OF MARYLAND CENTER FOR ECONOMIC AND ENTREPRENEURSHIP DEVELOPMENT

FY2023 REPORT



FY23 report on University of Maryland Center for Economic and Entrepreneurship Development (UMCEED) progress at University of Maryland, College Park (UMD)

UMCEED shall advance the education of students by developing degree and credential programs in the following fields of study:

- a. Virtual and augmented reality*
- b. Neurosciences*
- c. Biomedical devices*
- d. Data analytics*
- e. Cybersecurity*
- f. Quantum Technologies, Advanced Data Computing, and Information Technologies (added via SB943 in spring 2021)*

Introduction

In higher education, it takes several years to launch new or expand existing academic programs. In addition to developing the curriculum and obtaining the required approvals, instructors must be hired, laboratories and classrooms must be equipped, and students must be recruited to the new programs and make progress to degree. It is also important to note that academic programs are very distinct from entrepreneurship and economic development activities related to IP and startup companies. In FY23, UMCEED funds have been used to support economic development through faculty recruitment, degree programs, and other infrastructure to further the campus mission of economic development in the sectors identified in the bill. Significant progress has been made in recent years toward our UMCEED goals, and we are pleased to provide this FY23 report.

Progress on degree production in current UMCEED-related programs and certificates

- **Immersive Media Design Major**

In Fall 2021 the University launched the new major in Immersive Media Design, through a collaboration between the Colleges of Arts and Humanities (ARHU) and Computer, Mathematical and Natural Sciences (CMNS). This major represents a substantive collaboration between STEM fields and the Arts, and will prepare students to be leaders in the production of Augmented Reality, Virtual Reality, and related Immersive Media Design disciplines. Students will collaborate over the course of several semesters to jointly study and address some of today's most pressing questions about the role of technology as a creative medium. First degrees from this program are expected in May 2024, assuming that some students would be able to transfer into the program from other disciplines. The program increased from a handful of majors when launched in Fall 2021 to 42 in the Fall 2022 and 75 for the Fall 2023.

- **College of Information Studies programs**

There has been an extraordinary amount of growth in the Information Studies College (INFO) over the past few years, spurred by the tremendous success of new undergraduate majors and specializations. INFO continues to grow its programs and graduates, with additional faculty hires using UMCEED funding. The undergraduate major in Information Science, launched in 2016, now has nearly 1740 majors (as of Fall 2023) on the College Park campus as well as a very successful transfer program at the Universities at Shady Grove, with 109 additional majors. In FY23 there were over 560 bachelor's degree recipients, and 220 recipients of master's degrees, and about 33% of the master's degrees were in Human-Computer Interaction.

With prior funding from Governor Hogan's Workforce Development Initiative (WDI), INFO also launched a new specialization in Cybersecurity, and two academic minors in Information Risk Management and Privacy and in Technology Innovation Leadership. While these will not produce new degree recipients, they will broaden the expertise of students majoring in this area. INFO has also recently added a new joint bachelor's/master's option between its BS in Information Sciences and the Master of Information Management.

- **Computer and Data Science**

With the implementation of a limited enrollment program in computer science, the number of majors has stabilized at an enrollment of nearly 3500 students, but the number of degrees granted continues to increase, up 40% in 2022 relative to 2019, with nearly 950 bachelor's degrees in FY22. Annual degree production does fluctuate, and in FY23 there were 856 degrees conferred. UMCEED funds have been allocated towards additional faculty to support the very large enrollments. In FY22, a minor in Data Science was added through a collaboration between the departments of Mathematics and Computer Science. A Data Science major has been designed but not yet moved forward for approval, pending identification of resources. Additionally, the CS major was modified to include a Quantum Information track, to complement the existing specialty areas of Data Science, Machine Learning, Cybersecurity and CS education. The first degrees in the Quantum Information track were conferred in FY23. Also notable is that the number of master's degrees conferred has increased substantially since 2019, with 111 graduates in FY23.

- **Neuroscience**

Our newly established undergraduate major in Neuroscience successfully launched in Fall 2020, despite the emergency conditions of the pandemic, to help address a critical need to recruit and train talented students at UMD. The Neuroscience major offers rigorous training in the interdisciplinary study of brain and behavior, preparing students for a broad range of career paths, including scientific research, medicine, clinical psychology, allied health professions, and science-related government,

nonprofit, and private sector employment. In the Fall of 2020, there were 97 majors, of which 51 were direct admit new freshmen. As of Fall 2023, there are 357 current majors and 77 alumni.

The major is now projected to grow over the next three-year period to a steady state of approximately 500-plus students. The new neuroscience major will continue to encourage more academically talented Maryland residents to stay in-state for undergraduate training at their flagship institution, thereby increasing the probability that they will contribute to the local scientific, medical, and allied health professions workforce later, rather than going out-of-state for college and graduate training.

Recently approved academic programs and certificates

Three new undergraduate degree programs, one master's program and three new certificate programs were approved in FY22, related to the strategic areas of UMCEED.

- **Bachelor of Arts in Technology and Information Design**

As noted earlier, the Information College has also developed a new Bachelor of Arts in Technology and Information Design, launched in Fall 2022. The program has 67 enrolled students as of Fall 2023. This program broadens opportunities for those students who are less interested in the technical aspects of information science but more interested in meeting the needs of humans as information consumers. Enrollments are anticipated to be more modest than the Information Science major, but has already exceeded the projection of 50 students per year.

- **Bachelor of Science in Social Data Science**

This newly created major combines the technical requirements of data science with disciplinary areas within the social sciences. The major builds expertise in the complex skills needed to create and work with information that captures aspects of human behavior. Social data science encompasses all elements of the data life cycle, including measure conceptualization, data gathering, management, manipulation, analysis, presentation, archiving, and re-use. 67 students are enrolled in this major, with some students already in designated tracks: Economics (6 students), Geographical Sciences (1), Government and Politics (5), Psychology (9), and Sociology (3). In Spring of 2023, a new track in Public Health was approved.

- **Master of Professional Studies in Bioinformatics and Computational Biology**

This program was launched in Fall 2023 and has an initial cohort of 8 students. Students will learn multiple problem-solving methods in bioinformatics and computational biology and apply these methods to problems in biology and biomedical research.

- **Post-Baccalaureate Certificate of Professional Studies in Quantum Computing**

This certificate program was launched in Spring 2023 and has an initial cohort of 4 students. Students explore applications of quantum computing for the areas of optimization, chemistry, encryption, information theory, and communications.

- **Master of Professional Studies in Quantum Computing**

This program was approved in Spring 2023. It will provide students with foundational, practical and theoretical topics of quantum computing. Students in the certificate program may continue on with the master's program.

Research, Patents, IP, and Economic Development related to the UMCEED sectors

Inventive, patenting, and licensing activity for FY23 is listed below

While it is very unlikely to be able to make a direct correlation to an academic degree program and patents and licensing by faculty and students, the table below identifies new invention disclosures, patent applications, patents issued, and agreements executed across the six UMCEED areas of focus.

Area	Invention Disclosures	Patent applications filed	Patents issued	Agreements Executed
VR/AR	2	2	1	0
Neuroscience	2	3	0	0
Biomedical Devices	21	17	7	2
Data Analytics	7	2	0	0
Cybersecurity	0	2	3	0
Quantum	20	25	11	0

- **Brain and Behavior/Neuroscience Initiative**

The Brain and Behavior Institute (BBI) was launched in January 2021 to elevate and expand neuroscience research efforts across our campus and with UMB. The focus of the BBI is to solve challenges in global health and wellness related to nervous system function in development, aging and disease, and is establishing the University of Maryland and the State of Maryland as a nexus for excellence in research and education in the field of neuroscience. The BBI advances Maryland neuroscience through the recruitment of a cohort of world-class scientists, the development of cutting-edge tools, the facilitation of collaborations with diverse partner disciplines, and the promotion of the translation of basic science.

Since 2016, UMD has invested in the Brain and Behavior Institute (née Initiative), including \$3.5 million in the form of seed grants that have been successfully translated into \$28 million in new research

funding. Resources to support the institute are drawn from UMCEED, The Clark Family Foundation gift, E-Nnovate funds and contributions from the Provost, Vice President for Research, and the Deans of participating colleges. Three new BBI faculty hires have opened their research labs as of Fall 2023, and a fourth investigator has signed his contract and will open his lab at UMD in August 2024.. The BBI has also facilitated recruitment of affiliate faculty in computer science, psychology, and philosophy to College Park. To expand campus research in molecular and behavioral science, the BBI has procured and staffed new state-of-the-art equipment cores, including the BBI-Advanced Genomic Technologies Core (BBI-AGTC) and the BBI-Small Animal MR Imaging facility (SAMRI). The BBI-AGTC, which opened in April 2021, offers the latest approaches to molecular biology and bioinformatics. Following a successful international search for a nuclear physicist to direct the core, imaging is underway at the BBI-SAMRI, where UMD undergraduates in mechanical and bioengineering are also gaining hands-on experience by completing keystone projects to streamline the acquisition and analysis of scanning data. Additionally, the BBI has ordered equipment to expand campus's focused ion beam scanning electron microscopy capabilities to allow for 3D reconstruction of biological ultrastructure, including the nervous system, for the first time. The BBI hopes to open this third core, a cryo-FIB-SEM facility, in 2024.

The BBI also made a major contribution to the upgrade to the campus MR facility, which facilitated the success of BBI investigators in garnering research grants from the NIH HEALTHy Brain and Child Development (\$7.5 million over five years) and the NSF Learning the Rules of Neuronal Learning (\$3 million over five years). The BBI's grants development office actively promotes the formation of interdisciplinary research teams to compete for large extramural awards, and strategic partnerships forged by the BBI continue to promote the expansion of basic science. In June 2021, the BBI secured funding from MPower to participate in the UMB Institute for Clinical and Translational Research, and UMD faculty, postdocs, and graduate students have competed for multiple awards through this UMB CTSA. In 2023, the BBI development office contributed to the successful funding of UMD faculty in the KL2 and ATIP programs and of two Neuroscience and Cognitive Science graduate students in the ICTR's TL1 program.

Strengthening the brain and behavior community will continue the success of UMD and UMB in recruiting talented faculty to perform cutting-edge, interdisciplinary research. Synergy with the emerging MPower initiatives focused on neurobiology, aging and global health will afford support and collaboration opportunities for existing and new faculty in brain research, amplifying clinical trial capabilities at UMD while elevating and extending our competitiveness to acquire external funding from leading federal agencies.

- **Quantum Technology - Establishing the Capital of Quantum**

Building on UMD's decades of global leadership in advancing quantum information science and technology, UMD is now leading regional efforts to build an inclusive quantum innovation ecosystem. The Institute for Robust Quantum Simulation, one of just five NSF Quantum Leap Challenge Institutes, became operational in 2022 as UMD's latest major quantum research center. UMD has also invested \$20 million to accelerate practical quantum computing and networking through the unique National

Quantum Laboratory (Q-Lab) partnership with IonQ, a UMD spin-off that became the first publicly traded pure-play quantum computing company in 2021. Q-Lab's physical colocation space opened in Fall 2023, and it is already supporting research projects in high-energy physics, materials science, image processing, cybersecurity and computational fluid dynamics.

UMD is preparing the workforce through a wide range of quantum education efforts at all levels. These include a new quantum information specialization in computer science, training for local K-12 teachers to integrate quantum education into their classrooms, summer programs for high school and middle school girls and underrepresented minority students, an international bootcamp to build a community of quantum computing and earth science researchers and graduate students, quantum hackathons, and launching the Quantum Machine Learning stream in the First-Year Innovation & Research Experience (FIRE) program. As noted above, a new post-baccalaureate certificate in Quantum Computing was approved in spring 2022. To support these new educational efforts, UMD has allocated \$1M in UMCEED funding towards new tenure track faculty hires in Computer Science and in Engineering.

UMD also leads the Mid-Atlantic Quantum Alliance, which enables collaboration between over 30 regional partners from government, industry, academia and non-profits.

- **Discovery Fund & Quantum Startup Foundry**

The [Discovery Fund](#) and the [Quantum Startup Foundry](#) are critical parts of the strategy to accelerate the quantum innovation ecosystem to achieve the vision of making Maryland the Capital of Quantum

The Discovery Fund is UMD's first ever venture fund. Its investments aim to spur growth of startups in high technology areas like quantum in the Discovery District and Prince George's County, and it is supported by \$1 million annually from UMCEED. Highlights from the Discovery Fund in FY2023:

- *5 investments for \$700K*
 - \$150,000 investment in [Medcura](#), a UMD startup housed in the Discovery District and spun out of the Fishell Bioengineering department that has developed an advanced wound treatment platform provides rapid and reliable bleeding management.
 - \$150,000 investment (2nd tranche) [alongside Toyota Ventures](#) and Alsop Louie in [Ion Storage Systems](#), a UMD startup spun out of Prof. Eric Wachsman's lab that makes smaller, lighter, safer, and more powerful batteries.
 - \$100K Convertible Note in Hungry Harvest, a startup [founded by UMD alum Forbes 30 Under 30 Evan Lutz](#).
 - \$125 K investment in [BEIT Inc.](#) a Polish quantum startup that has relocated business operations to College Park and is developing optimization algorithms for quantum computer hardware and software (April 2023).
 - \$125 K investment in Channel Program, a two-sided marketplace focused on the IT Channel and founded by a UMD alum (May 2023).
- *Expanded Advisory Board to include Jim Chung, Alex Castelli and Shane Kim*

- *Leveraged Discovery Fund as a tool to encourage companies to relocate to Discovery District (quantum and non-quantum companies).*

The Quantum Startup Foundry (QSF) at the University of Maryland creates a vibrant quantum commercialization ecosystem with everything quantum entrepreneurs and startups need to be successful. That includes access to UMD's research and education strengths, and UMD's talent and infrastructure. QSF also brings in investors and other funders, critical services like legal and IP support, and business expertise and mentoring like the [NSF Mid-Atlantic I-Corps Hub](#) innovation training program. Highlights from the QSF in FY2023:

Quantum Startups in MD

- Since its inception two years ago, the QSF incubator has already developed strong relationships with dozens of global quantum startups with 10 of them currently, or in the process of, establishing or relocating their headquarters at the QSF incubator here in College Park.
 - FY23 QSF leases/licenses with quantum companies conducting daily operations at QSF
 - QC82 is operating from QSF temporary location on a daily basis with at least one new hire (two persons total)
 - Error Corp. is shifting daily activities to QSF from their previous location
 - Additional new lease licenses at various stages of Facilities Use Application process include: BEIT, NanoQT, SwainTech, gSpin Tech, QRCrypto, and Psirch
- Funding for startups participating in QSF programs
 - Non-dilutive funding:
 - Error Corp & SBIR/STTR grants. After graduating from the QSF Pre-TraQtion Program, Error Corps has been awarded:
 - SBIR/STTR grants: Phase I from NSF; Phase I & II from the Department of Energy for the total of \$2.1M in non-dilutive funding; Phase I from NSF for the total of \$275k
 - MIPS grants: a graduate of Pre-TraQtion training and QSF TraQtion company received MIPS grant:
 - QC82 in partnership with Mario Dagenais/UMD: \$90k funding
 - Dilutive funding:
 - Discovery Fund has completed the investment in BEIT
 - Discovery Fund has a pipeline of quantum startup candidates for investment consideration
- Quantum startup pipeline:

- Engaged with a total of 30 quantum startups through ongoing TraQtion program
- Continued to develop a pipeline of quality quantum startups to be considered for current and future QSF programs

Space/new facilities in the Artemesia building at 8400 Baltimore Avenue

- Began the renovation project for an expanded and permanent QSF location at 8400 Baltimore Ave (in partnership with Facilities Management and the State of Maryland):
 - Conceptual Design phase was completed

Global visibility and quantum community participations

- Relationships with existing and emerging quantum hubs and public and private stakeholders
 - Deepened relationship with Qubit by Qubit (The Coding School)
 - Discovery Fund awarded QxQ with \$70k grant to offset QSF rent and fund the 2024 joint with QSF educational activities
 - Established new relationships with recently opened quantum hubs:
 - The Deep Tech Lab - Quantum in Copenhagen
 - Continued deepening relationship with Quantum Delta Netherlands through participation in their Quantum Days
 - Continued deepening relationship with local partners and stakeholders and secured QIS'23 sponsorships from:
 - Prince George's County Economic Development Corporation
 - Montgomery County Economic Development Corporation
 - Carter Deluca IP Law Firm
 - Continued a very fruitful collaboration with MD Department of Commerce:
 - Connected with foreign quantum startups who are looking to establish business in the U.S./MD, examples include: NanoQT, Qilimanjaro, Kiutra, ParityQC, HQS Quantum Simulations, Single Quantum, Qblox, Kipu Quantum, Qubig, Quantum Optics - Jena
 - Joined MD Commerce Global Gateway program. Four startups from QSF pipeline applied and were accepted into the program: BEIT, NanoQT, Aegiq, QRCrypto
 - Continued and deepened relationships with founding sponsors: EY and IonQ
 - Established relationship with the new quantum leader at McKinsey&Co

The number of University of Maryland graduates who are employed in Maryland based businesses.

39% (1502 students) based upon the 2022 Graduation survey report.

* "Employed" includes students who are employed FT, employed PT, volunteering or in a service program, serving in the military, or starting a business.