

Board of Regents Committee on Economic Development and Technology Commercialization

March 25, 2021

Virtual (public listen only access at 443-353-0686, Conference ID: 316 220 802)

Committee Members will be sent Zoom information

Public Session Agenda

- (1) Featured Startup: Inventwood Josh Cable, CEO (Information Item)
- (2) Activating Fearless Ideas for Transformational Impact Supporting Companies Like Inventwood Julie Lenzer, Chief Innovation Officer, University of Maryland, College Park (Information Item)
- (3) Corporate Training and Development Dr. MJ Bishop, Associate Vice Chancellor and Director, William E. Kirwan Center for Academic Innovation at the University System of Maryland (Information Item)
- (4) USM Office of Economic Development Update Tom Sadowski, Vice Chancellor for Economic Development (Information Item)
 - a. COVID-19 Task Force Activity
 - b. Legislative Activity
 - c. Momentum Fund



BOARD OF REGENTS

SUMMARY OF ITEM FOR ACTION INFORMATION OR DISCUSSION

TOPIC: Featured Startup: Inventwood

COMMITTEE: Economic Development and Technology Commercialization

DATE OF COMMITTEE MEETING: Thursday, March 25, 2021

SUMMARY: Josh Cable, CEO of Inventwood, will present the company's progress to date. InventWood uses material science innovations to alter wood for different purposes, making it incredibly strong, transparent, or insulating. The company is based on technology developed by a team of material scientists at the University of Maryland, led Professor Liangbing Hu.

ALTERNATIVE(S): This item is for information purposes.

FISCAL IMPACT: There is no fiscal impact.

CHANCELLOR'S RECOMMENDATION: n/a

COMMITTEE RECOMMENDATION:	DATE:	
BOARD ACTION:	DATE:	
SUBMITTED BY: Tom Sadowski 410-576-5742		

INVENTWOOD

University of Maryland Regents Presentation
March 2021

We are InventWood

InventWood™ is committed to transforming the world by developing advanced wood materials that are high-quality, cost-effective, and environmentally-sustainable.

Structural & Support



MettleWood™

- Stronger than steel
- Light-weight
- Low-cost

Thermal Management



Insulating 'Nano' Wood

- Tunable strength
- Strong insulation properties
- Non-toxic, fully biodegradable



Radiative Cooling Wood

- Energy emitting, IR invisible
- Record-high cooling efficiency
- Low-cost and biodegradable

Optical & Light Management



Transparent Wood

- Light-channeling potential
- Lighter and tougher than glass
- 6x better thermal insulation



'Aesthetic' Wood

- Stunning visible grains
- 6x better thermal insulation
- Smart light management

...And many more to come!



The Challenge Ahead of Us

Three major environmental issues

Climate Change

- Greenhouse gas emissions
- Fossil fuel consumption

Ecological Imbalances

- Invasive species
- Mass deforestation

Waste Disposal

- Microplastics in waterways
- Non-biodegradable landfill waste





The Answer Grows on Trees

Wood is the solution!

Carbon Sequestering

Wood captures and retains CO2 during its lifecycle

Naturally Insulative

Wood is far more insulative than steel, no concrete needed

Abundant & Plentiful

Most wood is sustainable and an ever-growing resource

Biodegradable

Wood decomposes naturally in a relatively short period of time

Ecologically Balancing

Invasive species can be used to encourage natural restoration

Biophilic

Exposure to wood has been shown to alleviate depression



An Introduction to Advanced Wood Materials

Addressing natural wood's shortcomings

	Regular Wood	Advanced Wood Materials
Strength	Weak (30-70 MPa for most species)	Very Strong (Up to 1,000 MPa)
Environmental Resistance	Varies and highly dependent on species and circumstances	Highly resistant to many environmental challenges like water, fire, and termites
Formability	Very difficult to shape and form like other materials	Can be easily shaped and formed like metals and plastics
Species Dependency	Yes, performance & aesthetic highly dependent	Can be made into consistent products independent of species
Economics	Regarded often as low-cost and low-value commodity	Can be high-value agricultural export, reinvigorating rural communities



An Introduction to MettleWood

The true 'green steel'

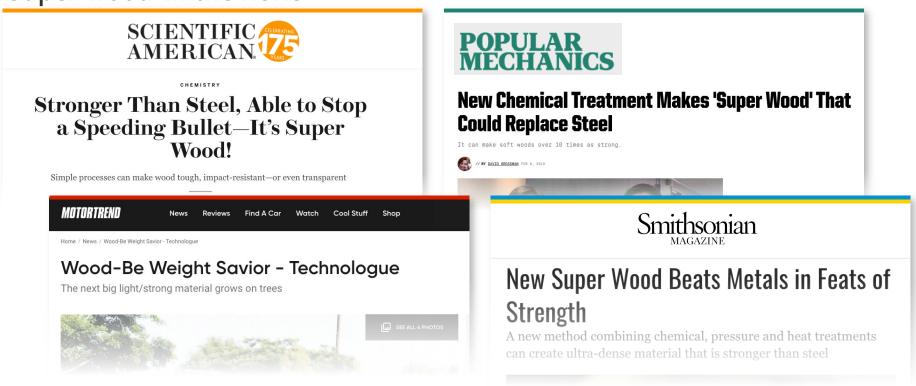


- ✓ Lightweight with High Specific Strength
- ✓ Incredibly Strong & Unbelievably Tough
- √ Cost-Efficient
- ✓ Durable & Resilient
- ✓ Sustainable & Biodegradable



A Few Recent Headlines

'Super wood' in the news





MettleWood Creation Process

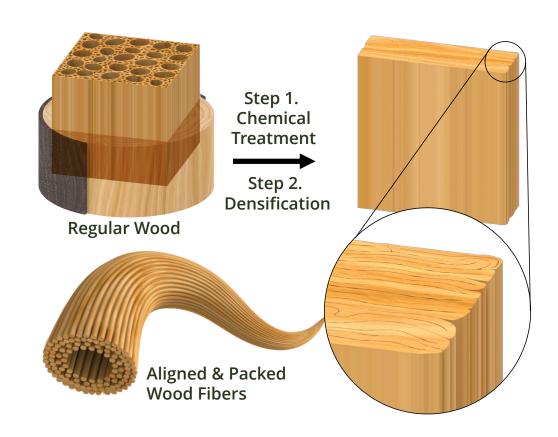
Efficient, low-cost, sustainable

MettleWood vs. regular wood:











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Why MettleWood?

Clear benefits

Compared to structural steel, MettleWood is:

80% Lighter

50% Cheaper*

Zero Emissions**

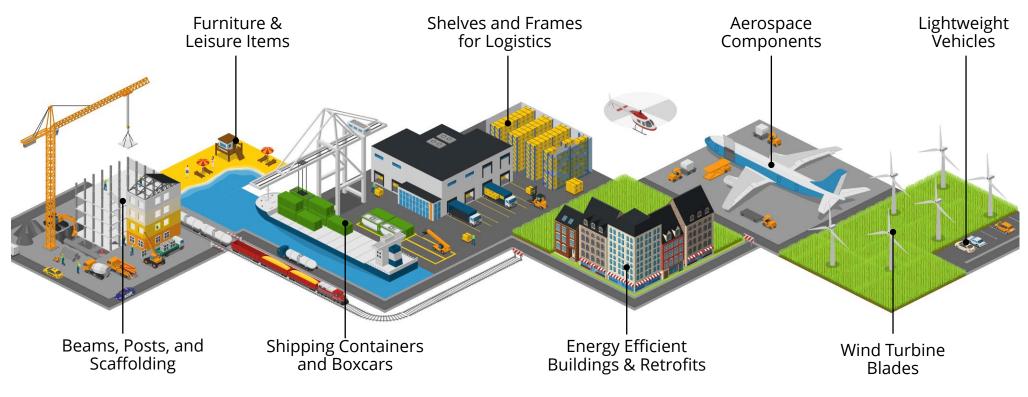
^{**} Assumes green energy (i.e. zero emissions) is used in production and transport



^{*} Cost target; final costs may vary on a number of factors

Unlimited Potential, Countless Applications

Real-world possibilities for MettleWood



InventWood™
From Nature | For the Future

InventWood's Timeline

Progress toward widespread adoption



Founding

InventWood founded as a spin-off of the University of Maryland 2019

Validation

1st customer exploration project begins for use of MettleWood in a commercial application.

IP Licensing

InventWood concludes an exclusive license agreement with the University of Maryland to license a portfolio of technologies.

Paid Pilot

InventWood receives first commercial revenues for MettleWood validation project.

InventWood formally begins commercial prospecting with hiring of core leadership team and the formalization of a business strategy.

Formation

InventWood receives ARPA-E federal grant award funding for MettleWood research and commercialization.

Grant Awards

InventWood formally opens its own labs and begins sample production.

Development

InventWood plans to manufacture and release 1st batch of MettleWood products.

2021 Product Sales!



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InventWood Team

Focused, experienced, and innovative



Liangbing Hu* Ph.D. Founder



Josh Cable CFA CEO



Amy Gong Ph.D. CSO



Jiaqi Dai Ph.D. CTO



Liza Pikus MBA VP, Strategy



Soo-Hwan Jang MSc. Materials Engineer



^{*} Non-employee equity shareholder

University of Maryland Resources

It takes a village!

















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Thank you!

For additional inquiries, please contact info@inventwood.com



BOARD OF REGENTS

SUMMARY OF ITEM FOR INFORMATION

TOPIC: Fearless Ideas for Transformational Impact - Supporting Companies like InventWood

COMMITTEE: Economic Development and Technology Commercialization

DATE OF COMMITTEE MEETING: Thursday, March 25, 2021

<u>SUMMARY</u>: Julie Lenzer, Chief Innovation Officer at the University of Maryland, College Park, will provide information about supporting startups based on intellectual property, such as the featured startup, InventWood. Ms. Lenzer will provide detailed examples of UMD efforts to commercialize technology, nurture new venture creation and growth, such as in the case of lonQ, which plans to go public soon.

ALTERNATIVE(S): This item is for information purposes.

FISCAL IMPACT: There is no fiscal impact

CHANCELLOR'S RECOMMENDATION: n/a

COMMITTEE RECOMMENDATION:		DATE:	
BOARD ACTION:		DATE:	
SUBMITTED BY:	Tom Sadowski 410-576-5742 tsadowski@usmd.edu		



Activating Fearless Ideas for Transformational Impact Supporting Companies like Inventwood



Julie Lenzer, Chief Innovation Officer jlenzer@umd.edu



Office of the Chief Innovation Officer



















Over 60 programs* across campus

#7 in entrepreneurship¹





#13 in innovation impact²









#28 worldwide in issued patents³



Maryland Technology Enterprise Institute







*See appendix for complete list with links





- 1 2020 Princeton Review and Entrepreneur Magazine
- 2 The Innovation Impact of US Universities, GWB Institute
- 3 National Academy of Inventors

Specifically for spin-offs...

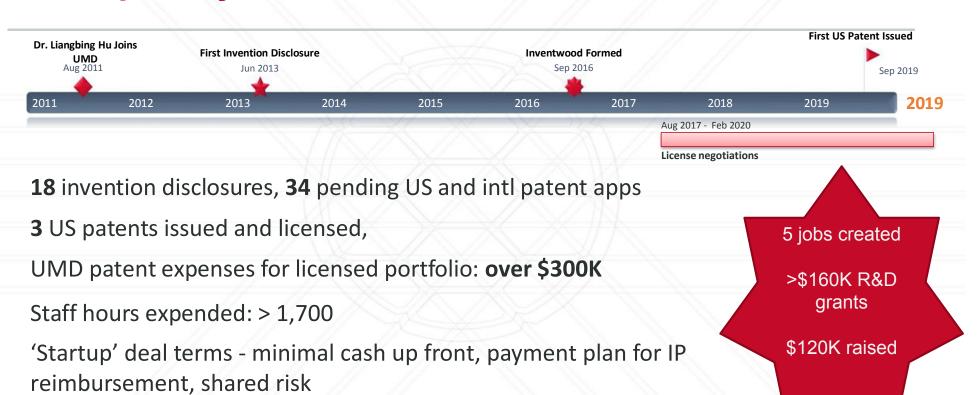
- Startup Resource Guide <u>startupguide.umd.edu</u>
- Business Fundamentals for Scientists
 - in 2020: 72 workshops
 - >1,600 attendees
 - 360 YouTube channel views
- 4 EiR's, 3 Site Miners, I-Corps
- > \$8M in MII funding
- Maryland Momentum Fund invested in 6 UMD spin-off's
- 7 listed in MD Governor's Future 20



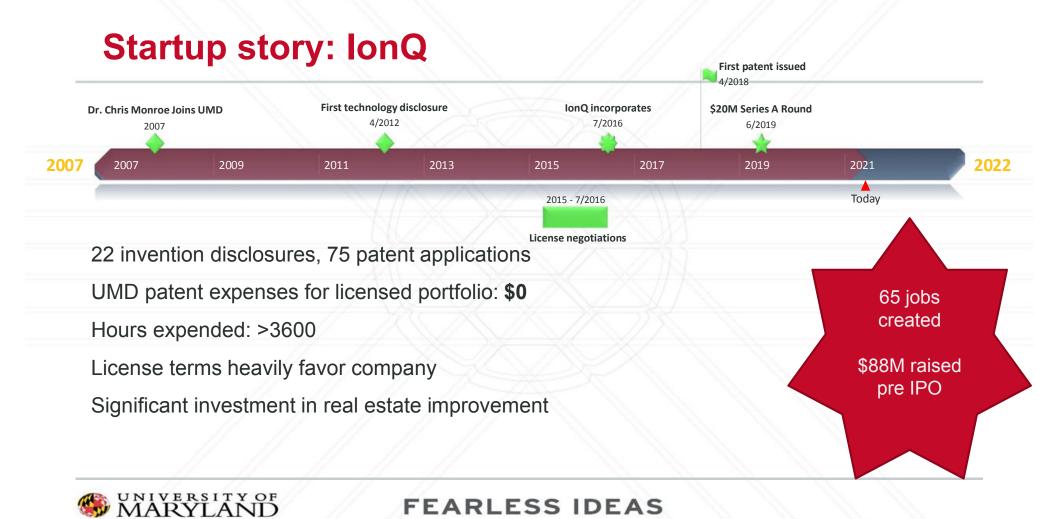




Startup story: Inventwood







Startup story: Ion Storage Systems





reimbursement, low royalties

Bottom Line

- It takes time and resources to see success
- Investible IP is foundational for startup success
- For every 'success' there are 10 others, all requiring similar resources
- Diversity of technologies requires more and varied resources (ecosystem breadth, alumni outreach)
- MII and Momentum Fund are strong assets, but many companies need more and earlier capital



APPENDIX



UMD Innovation / Entrepreneurship Programs (find all via innovate.umd.edu)

Academy for Innovation and Entrepreneurship (AIE)

AgEnterprise Challenge

School of Architecture Fabrication Lab (FabLab)

Bitcamp

Booklab (English Department Makerspace)

Business Fundamentals and Scientists Workshops (run by UM

Ventures)

<u>Center for Social Value Creation</u> (CSVC) <u>Chesapeake Bay Seed Capital Fund</u> (Mtech)

Consult Your Community (student consulting group)

Contrary (a student-run venture capital group)

Corprenect (Mtech)

Dingman Center for Entrepreneurship

Dingman Center Angels

Discovery District

Do Good Institute

Do Good Accelerator

De Cocca / toccolorator

Do Good Ambassadors

Do Good Challenge

Ed Snider Center for Enterprise and Markets

enTERPreneur (student entrepreneurship club)

Faculty and Graduate Student Startup Guide

Global Consulting Fellows (run by Center for Global Studies in Smith

School)

Gold Public Health Innovation Award

Graduate Innovation Fellowship (run by AIE)

Hinman CEOs Program

Honors College Entrepreneurship & Innovation Program (EIP)

I-Corps

<u>Innovation and Entrepreneurship Minor</u> (run by the Smith School)

Innovation Catalyst Program

Innovate Maryland Consulting Practicum (run by CSVC)

iSchool iConsultancy Experiential Learning Program

John and Stella Graves Makerspace

Ladies First (run by Dingman)

Makerspace Initiative (MSI)

Maryland Center for Humanities Research

Maryland Energy Innovation Accelerator

Maryland Global Consulting Fellows (run by the Smith School)

Maryland Industrial Partnerships Program (MIPS)
Maryland International Incubator (on hiatus)

Maryland Momentum Fund

Maryland Small Business Development Center

Master of Professional Studies in Technology Entrepreneurship (Mtech)

Michelle Smith Collaboratory for Visual Culture

Minor in Technology Entrepreneurship (Mtech)

MAVRIC

Mtech Ventrues

Peer Innovation Coach Program (run by AIE)

Pitch Dingman Competition

QUEST Honors Program

Singh Sandbox

Social Innovation Fellows (on hiatus)

Southern Management Leadership Program (formerly the Hillman CEOs)

Startup Shell

Startup UMD

STEM Library (makerspace)



FEARLESS IDEAS

Sustainability Fund

Terps Makeathon

Terrapin Works

Libraries)

Terp Entrepreneur Network (TEN)

Terrapin Development Company

Consulting (student consulting group)

Terrapin Innovation Network

UM Ventures, College Park

Terp Startup Accelerator (run by Dingman)

UMD American Marketing Association RedBlack

Virtual Business Information Center (part of UMD

Technica

TechPort



BOARD OF REGENTS

SUMMARY OF ITEM FOR INFORMATION

TOPIC: Corporate Training and Development

COMMITTEE: Economic Development and Technology Commercialization

DATE OF COMMITTEE MEETING: Thursday, March 25, 2021

SUMMARY: A recent presentation to the Board of Regents by Deloitte indicated that, while "traditional higher education" still accounts for a very large portion of the U.S. educational market segments, the demand for corporate learning and development—as well as new strategies for learning and credentialling at scale—is growing rapidly.

The USM is well-poised move into these new market segments after several years of work led by the Kirwan Center in the areas of alternative credentials, MOOCs, and corporate partnerships. Additionally, UMGC and UMBC have been leading efforts to create a more systematic approach to addressing corporate learning and development needs in the region. However, transitioning to full-service offerings of customized learning opportunities for corporate clients will require a paradigm shift in the way higher education thinks about its customer base, marketing, staffing, content, pedagogical and instructional design approaches, and business models.

The Kirwan Center's Director will update the Economic Development and Technology Commercialization Committee on the groundwork that has been done to date, discuss ideas for how to chart a path forward, and share plans to engage system institutions in exploring corporate training and development opportunities.

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FISCAL IMPACT: There is no fiscal impact

CHANCELLOR'S RECOMMENDATION: n/a

COMMITTEE RECOMMENDATION:		DATE:	
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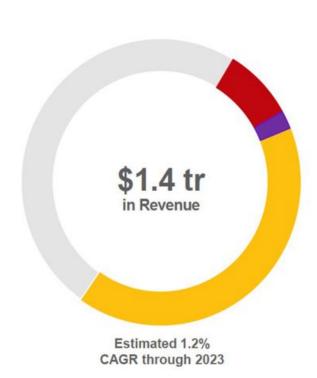






FROM BALTIMORE TO RICHMOND FOSTERING UNITY ADVANCING GROWTH

U.S. Educational Market Segments



Rest of US Education Market, including Childcare, K-12, Community Colleges, and Trade & Technical Schools

Traditional Higher Education

\$580bn (non-profit) & \$16bn (for-profit)

Includes non-profit and for-profit public and private universities and colleges in the U.S that offer academic courses and grant bachelors, graduate, and doctoral degrees and certificates!

Corporate Learning & Development

\$92bn

\$4bn

Includes providers in the training market and learning services market in the U.S. that offer in-person and online courses to corporations and enterprises. Strategies for learning and credentialling at scale.

MOOCs & OPMs1

Includes Massive Open Online Course providers and Online Program Management providers in the U.S. that offer courses, microcredentials, and fully-online degree offerings.

Figures are based on 2020 Market Size estimates; 1. MOOCs: Massive Open Online Courses, OPMs: Online Program Management

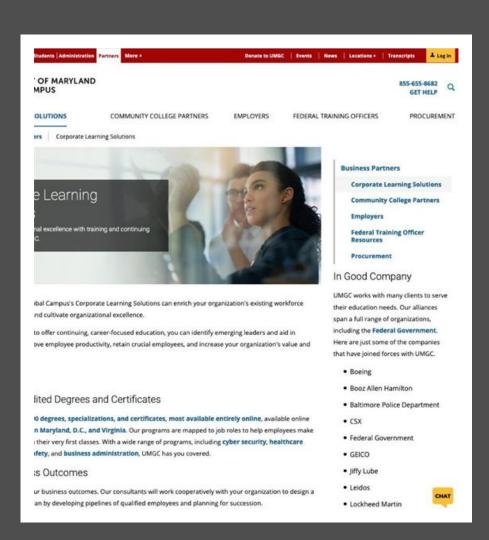
CAGR1

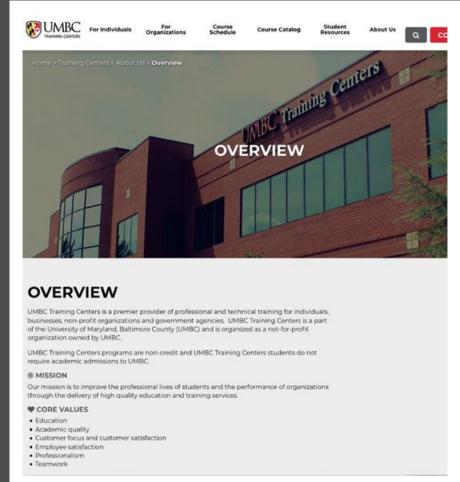
CAGR1

15%

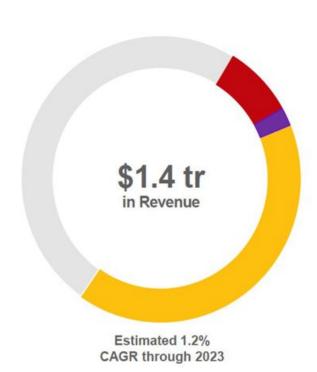
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CAGR1

3.5%

CAGR1

15%

CAGR1

Who are Our Customers?

Now and in the future...

Individuals

Seeking Degrees and/or Certificates

- "Traditional" 18-year-old students <5 years out of high school
- Adult learners >5 years out of high school (likely with work or military experience)

Seeking alternative credentials (could be on Degree/Cert path)

- Unemployed seeking upskilling
- Employed seeking upskilling

Corporate / Non-profits / Government

- Purchasing in "bulk"
- Upskilling/reskilling employees
- · Part of benefits package



Questions?

mjbishop@usmd.edu

http://www.usmd.edu/cai/



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BOARD OF REGENTS

SUMMARY OF ITEM FOR ACTION INFORMATION OR DISCUSSION

TOPIC: USM Office of Economic Development Update

COMMITTEE: Economic Development and Technology Commercialization

DATE OF COMMITTEE MEETING: Thursday, March 25, 2021

SUMMARY: Vice Chancellor Sadowski will provide an update on activities of the USM COVID Research & Innovation Task Force and discuss relevant state legislative activity, along with a brief Momentum Fund update due to the recent investment in the University of Baltimore-affiliated company Dynamhex.

ALTERNATIVE(S): This item is for information purposes.

FISCAL IMPACT: There is no fiscal impact.

CHANCELLOR'S RECOMMENDATION: n/a

COMMITTEE RECOMMENDATION: DATE:

BOARD ACTION: DATE:

USM Economic Development

Briefing for USM Economic Development and Technology Commercialization Committee

February 4, 2021





USM Economic Development Agenda

- COVID-19 Task Force Activity
- Legislative Activity
- Momentum Fund



USM COVID Research & Innovation Task Force

Ongoing and Forward Initiatives

USM Long-Term Strategy Workshop: Results of two-session internal/external expert discussions have been summarized and are under discussion.

Anticipate completed final USM Pandemic Preparedness report this Spring 2021

Bioproduction and Vaccine Development Strategy: Working with the Governor's Life Science Advisory Board (LSAB), MD Commerce and MD Tech Council on comprehensive strategy to develop MD's bio-manufacturing, vaccine development, medical supply chain and related workforce capacity; exploring federal funding and industry partnership opportunities.

 Engaged in talent supply / demand analysis, skill-set determination, and related workforce training needs

Connected DMV Pandemic Center Response Initiative Partnership: USM is lead academic partner in regional strategic planning and federal funding pursuit effort.

 Currently working on Pandemic Center HQ location and federal funding advocacy for strategic preparedness initiatives



USM COVID Research & Innovation Task Force Public Health Communications Challenge





Encouraging Marylanders experiencing "COVID fatigue" to remain vigilant, maintain sound public health practices and good hygiene, and when available, to get vaccinated. Winners here!







Chelsea Fowler
Graduate Student
University of Maryland Center for
Environmental Science

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USM COVID Research & Innovation Task Force Encouraging Industry Partnerships

- RNA Disease Diagnostics is licensing UMB/UMBC intellectual property to develop a highperforming COVID-19 test that doesn't have to be sent to the lab.
- Smith's Detection (formerly PathSensors) adapted a commercial instrument to identify COVID particles from an air sample. They are piloting a program with UMBC to allow their EHS department to test sensitive areas, monitor labs where people are working, and test the air post sanitation. They are looking for additional partnerships to understand if the ability to identify airborne COVID can help businesses and universities get back to normal faster.
- <u>BubbleLized Technolgies</u> is looking to bring multiple new, innovative commercial-ready and vetted technology solutions for COVID-19 but also for future disease control challenges, including future pandemics. They are looking to understand challenges in getting back to normal, especially where widely-available/standard technologies are insufficient.

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USM Legislative Update

Direct USM Impact – Place Making, Tech Transfer / Commercialization, Research Partnerships, New Venture Creation and Workforce Development

- RISE Zones: HB1279 (SB0778) Change to matching funding for rental assistance.
- **TEDCO:** <u>SB0639</u> Inclusion Fund; <u>HB1211</u> Pre-Seed Builder; Enhanced MII support <u>HB1169</u> (<u>SB0802</u>) naming Frostburg State & <u>SB0732</u> naming Bowie State and Salisbury
- Western MD/TEDCO: <u>SB0709</u> Pilot tech infrastructure program
- MTIP: <u>HB0307</u> and Lower GPA req.; <u>HB1215</u> incl. non-profits, humanities
- SBDC: [2020 veto override <u>SB0493</u>] Adding funding; SBDC in COVID-19 bill <u>HB1014</u> (<u>SB0772</u>)
- E-Novation: [2020 veto override <u>SB0465</u>] Extension, adjustments
- Clean Energy: <u>HB0419</u> (<u>SB0460</u>) Adding funding for Maryland Energy Innovation Institute
- Cyber: <u>SB0902</u> Cyber Workforce Program and Fund
- West North Avenue Development Authority (incl. Coppin State): <u>HB1293</u> (<u>SB0783</u>)
- Modification of U. of Md. Strategic Partnership Act of 2016 (UMB/UMD): SB0943

Green Text = Bill has been sent to the opposite chamber as of 3/22



USM Legislative Update

Indirect USM Impact - Economic Development

- Department of Small Business, Entrepreneurship, and Innovation: <u>HB0062</u>
 Establishes this new department, using parts of MD Commerce and MD Labor and all of the Governor's Office of Small, Minority, and Women Business Affairs.
- Manufacturing: <u>HB0443</u>/<u>SB0577</u> Makerspace bill incl. Western Maryland Works and Baltimore's OpenWorks. <u>SB0444</u>/<u>HB0658</u> Manufacturing in a Digital Economy.
- Investment Tax Credits:
 - <u>SB0019</u> Biotech. Lowers % back to investor; limits how much any one company can benefit in a given year and over time.
 - <u>SB0160</u> Cyber. Expands to "innovation" across certain industries (except biotech), determined by the Maryland Economic Development Commission after consulting with DOL. Allows three years of participation, up from one. Extends until 2025.
 - <u>HB0360/SB0246</u>. Angel tax credit.
- Other Tax Credit Modifications: <u>SB0196</u> R&D credit; <u>HB0278</u> job creation
- SBIR: <u>HB0654</u> incentive proposed; <u>SB0459</u> assistance bill modification

Green Text = Bill has been sent to the opposite chamber as of 3/22



Maryland Momentum Fund Dynamhex Investment

- The Dynamhex platform uses artificial intelligence to give carbon emission reduction recommendations that are personalized to each customer.
- Already, Dynamhex has provided data to Duke Energy, Constellation Energy, the National Resource Defense Council, and their clients.
- \$250,000 investment as part of a \$1.5M seed round, which includes Intelis Capital, the Exelon Climate Change Investment Initiative, the Chesapeake Bay Seed Capital Fund (funded by MD DNR and administered by UMCP), and KCRise Fund.
- First University of Baltimore-affiliated company to receive Momentum Fund investment. Dr. Sunny Sanwar is a Professor of Entrepreneurship.





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MMF(University+USMO) Investments: \$6.9M



