The MATRIX Lab & Autonomy
Role of Research and Workforce Education

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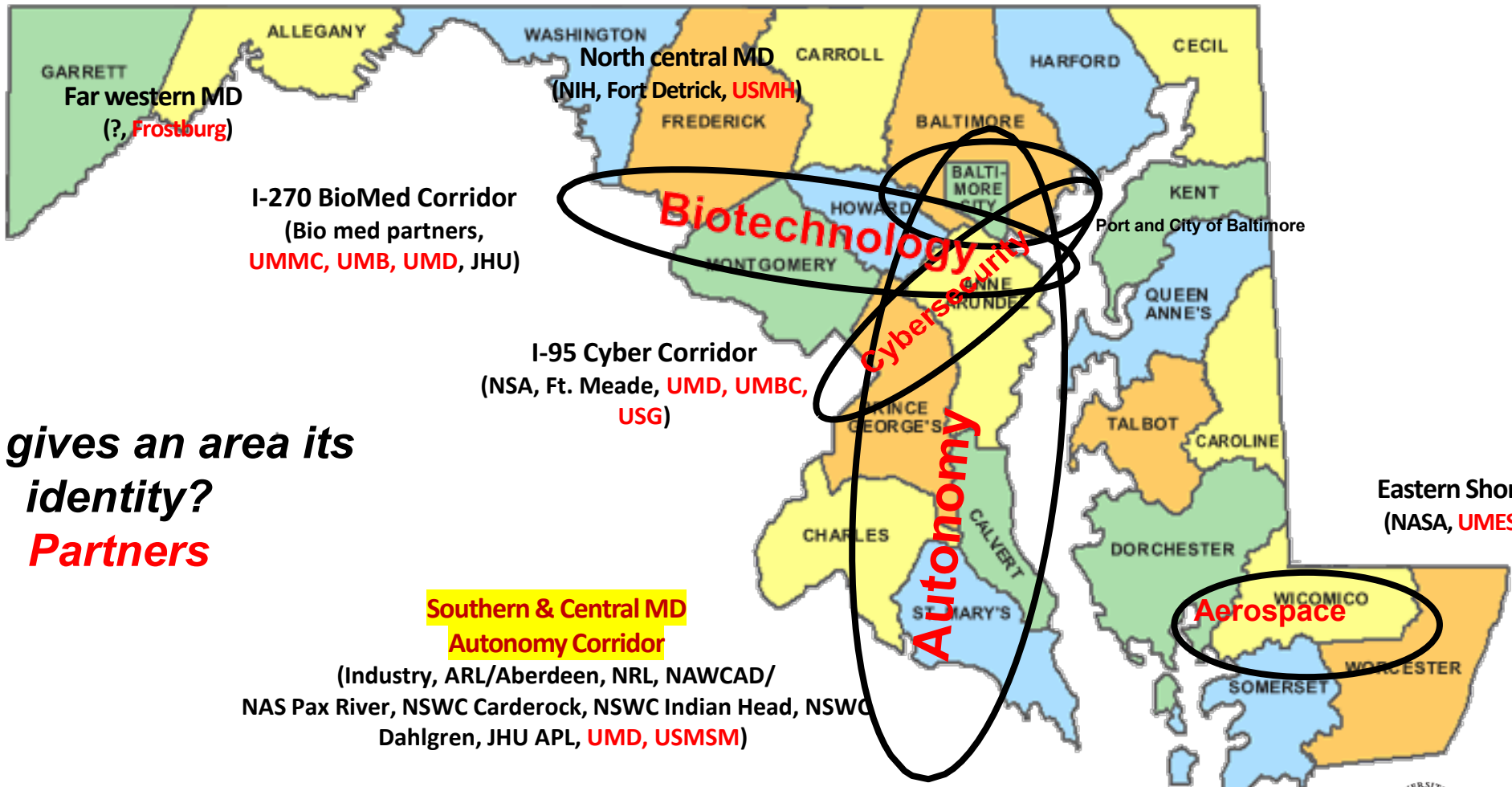
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MATRIX LAB | MARYLAND AUTONOMOUS TECHNOLOGIES RESEARCH INNOVATION & EXPLORATION

Our vision of high tech economies

Far western MD
(?, Frostburg)

North central MD
(NIH, Fort Detrick, USMH)

I-270 BioMed Corridor
(Bio med partners,
UMMC, UMB, UMD, JHU)

Biotechnology

Cybersecurity

Port and City of Baltimore

I-95 Cyber Corridor
(NSA, Ft. Meade, UMD, UMBC,
USG)

What gives an area its
identity?
Partners

Autonomy

Eastern Shore
(NASA, UMES)

Aerospace

Southern & Central MD
Autonomy Corridor
(Industry, ARL/Aberdeen, NRL, NAWCAD/
NAS Pax River, NSWC Carderock, NSWC Indian Head, NSWC
Dahlgren, JHU APL, UMD, USMSM)

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Autonomy Corridor

- Effort focusing on technology research, education and economic development

- Government agencies, academia, <u>and</u> industry

Morgan State University

Army Research Lab
Aberdeen Proving Ground
Grace's Quarter

Baltimore Medical
Research Community

NSWC Carderock

Univ. of Maryland
Baltimore County

Army Research Lab
Adelphi

Johns Hopkins Applied Physics Lab

NASA Goddard

University of Maryland

Howard University
USAF Autonomy UARC

Bowie State

NSWC Indian Head

University of Maryland
Eastern Shore

**AeroPark Innovation
District / USMSM /
MATRIX Lab/UROC**

NSWC Dahlgren

NASA Wallops

NAWCAD
NAS Patuxent River

St. Mary's County — Technology Corridor

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AeroPark Innovation District

- USMSM with the SMART Building and MATRIX Lab
- UMD UAS Research and Operations Center (UROC)
- TechPort and the Navy's SoMD TechBridge
- St. Mary's County Airport
- Numerous specialized aviation, aerospace and engineering companies

Multi-domain research collaborations

- The Naval Air Warfare Center Aircraft Division (NAWCAD) at NAS Patuxent River
- The Army Research Lab (ARL) at Aberdeen Proving Ground
- The Chesapeake Bay Lab / UMCES in Solomons
- The Naval Surface Warfare Centers at Indian Head, Carderock and Dahlgren
- NASA Goddard and Wallops

USMSM SMART Building / UMD Matrix Lab

- Hosting multiple **USM** degree-granting institution partners
- **Research** into autonomous technologies across all domains – the **MATRIX Lab**
- Attract worldwide talent
- Basic to applied to operational research
- Build off existing **UMD** capabilities, partner with **Navy** and others
- Take advantage of colocation and the work of **UAS Research & Operations Center (UROC)**
- **Bring state/USM/UMCP programs and resources to SoMD**

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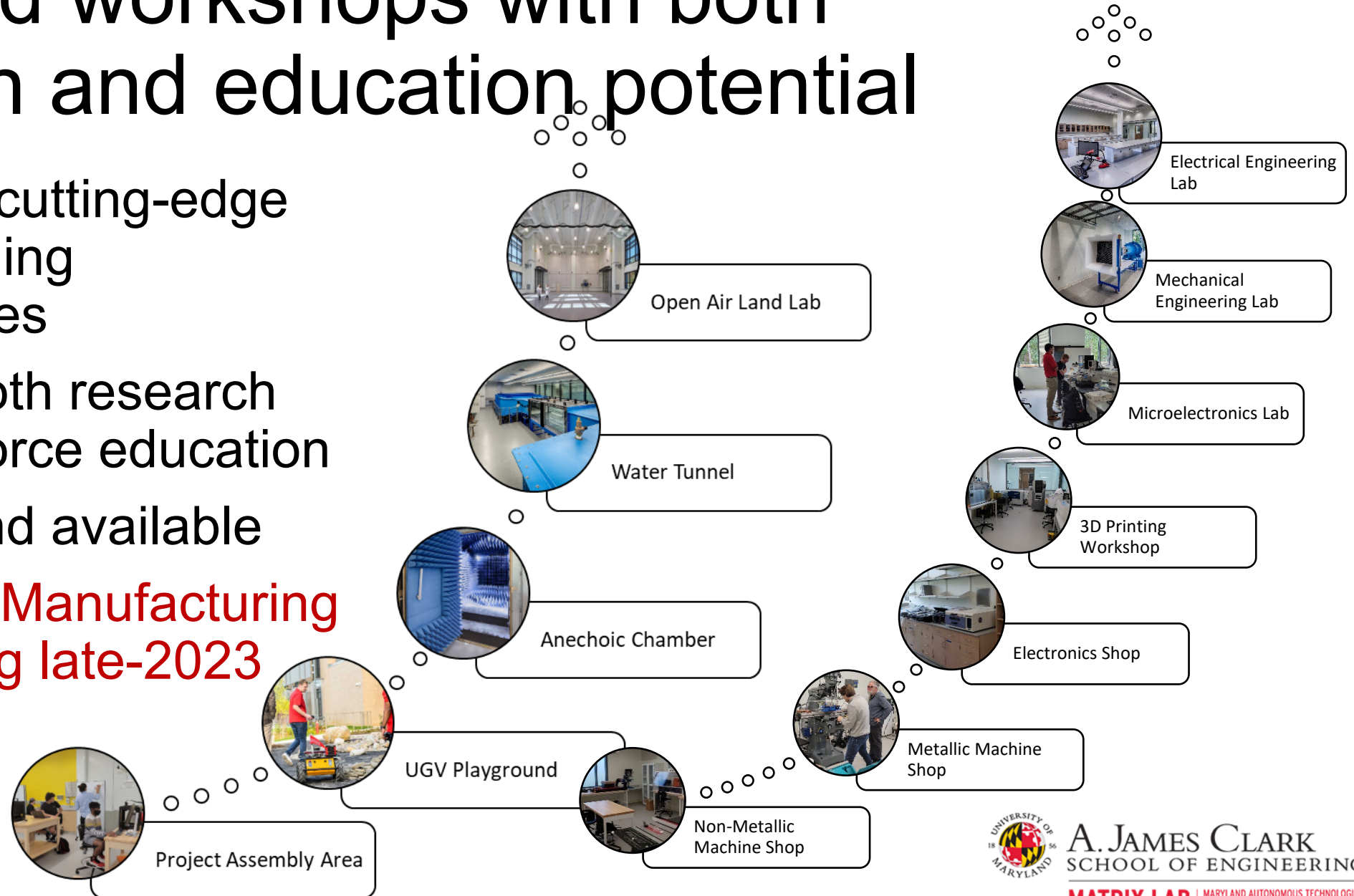
The MATRIX Lab focal points

- Researching **uncrewed**, **automated** and **autonomous** systems across all domains with industry, government and academia partners
    - **Innovation** – how do we learn to trust autonomy and how do we make it work for us
    - **Education** and **training** – creating the workforce of the future across technologies
- Integrating **talents**, **ideas** and **resources** from academic disciplines, organizations, and sectors
- Growing current **partnerships** and fostering new ones
- **One single space** for <u>basic</u>, <u>applied</u> and <u>**operational**</u> research
- Using uncrewed and autonomous technologies as **assists, then partners, then workers – human-machine teaming**
- Exploring **Level 4 and Level 5** autonomy

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UMCP research affiliates

- Institute for Systems Research
- Maryland Robotics Center
- Brendan Iribe Center for Computer Science and Engineering
- Electrical & Computer Engineering
- Mechanical Engineering
- Aerospace Engineering
- Computer Science
- …and many more

Dr. Derek Paley

Dr. Mumu Xu

Dr. Dinesh Manocha

Dr. John Baras

Dr. Cecilia Huertas Cerdeira

Dr. Reza Ghodssi

Autonomy and its components

- Sensors
- Processing
- Communications
- Vehicles (propulsion, structure, energy, etc.)
- Software
- Artificial Intelligence
- Machine Learning
- ***Autonomy Test, Evaluation, Validation and Verification***
  - Certification
- ***Ethics…***
- ***TRUST!***

Focus on T&E of Autonomy

- Autonomous systems serving DoD **as well as commercial/civil work** (FAA, commercial industry, etc.)
- **Multi-domain** autonomy (air, land, sea)
- **Basic and applied research** in the fundamental methods and applications of Test and Evaluation (T&E) to autonomy
- **Conduct T&E of autonomous systems**, be a resource for industry and government
- **Execute education and workforce development** for autonomy T&E skill sets, undergrad through PhD
- Consisting of scientists and engineers from **academia, industry and government, both research and education**

Ways we can work together

- Research
    - Basic, applied, operational
    - Funded or collaborative

- Workforce Development
    - K-12 outreach activities (build the pipeline)
    - Undergraduate
    - Graduate, both academic/thesis-based and professional
    - Industry training/certification

Thank You

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