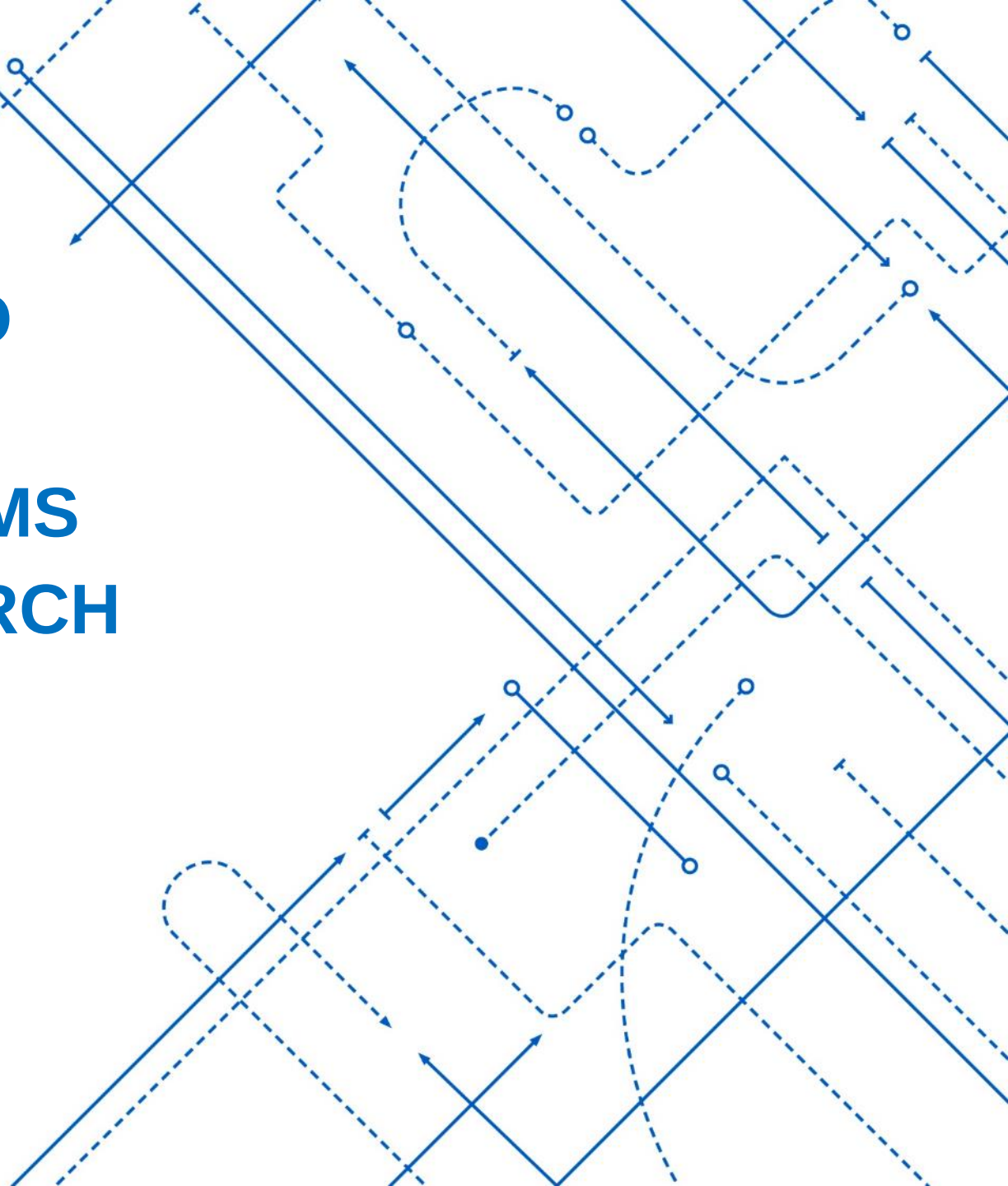
PREPARING FACULTY TO ENGAGE IN TRANSDISCIPLINARY TEAMS AND CONVERGENT RESEARCH

Session 2



University at Buffalo The State University of New York

Preparing Faculty To Engage In Transdisciplinary Teams And Convergent Research: Panel

- **Dr. Chitra Rajan**, *Associate Vice President for Research Advancement, University at Buffalo (Moderator)*
- **Jenifer Surtees, PhD**, ***Co-director, UB's Genome, Environment and Microbiome (GEM),*** *Associate Professor, Department of Biochemistry, Jacobs School of Medicine and Biomedical Sciences*
- **Samina Raja**, ***Co-director, Community of Global Health Equity (GHE),*** *Professor, Dept. of Urban and Regional Planning; Associate Dean for Research and Inclusive Excellence, School of Architecture and Planning*
- **Omar Khan**, ***Co-lead, Sustainable Manufacturing and Advanced Robotic Technologies (SMART),*** *Associate Professor, Department of Architecture*

University at Buffalo

Genome, Environment and Microbiome

Community of Excellence

GEM as a platform from which to launch

OUR GRAND CHALLENGE:

TO *ADVANCE OUR UNDERSTANDING OF THE GENOME AND THE MICROBIOME* AND TO *USE THESE ADVANCES TO BENEFIT HUMANITY* IN A JUST, BROAD-BASED, AND BENEFICIAL MANNER

GEM is a ***community***, addressing a common, complex challenge.

We are now in the “Genomic Age”. Advances in genomics promise changes in medicine, agriculture, biodiversity and our collective concept of what it means to be “human.” However, much remains to be learned.

At the same time, we have failed to keep pace in providing our citizenry with the tools and knowledge to understand, regulate, ensure ethical and equitable use of, and derive maximum benefit from these astonishing advances.

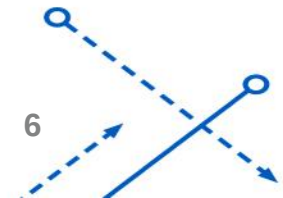
Ultimately, the success of genomic medicine depends on an educated public that understands, accepts and even promotes these endeavours.

TO *ADVANCE OUR UNDERSTANDING OF THE GENOME AND THE MICROBIOME* AND TO *USE THESE ADVANCES TO BENEFIT HUMANITY* IN A JUST, BROAD-BASED, AND BENEFICIAL MANNER

Challenge requires the convergence of disciplines and integration of research, education and engagement

Barriers to addressing our grand challenge:

1. Disciplinary silos
2. Resources – time, money, people – lack of infrastructure
3. Lack of expertise in sampling and/or data analysis
4. Lack of networks within UB, with K-12 schools and within our WNY community
1. Poor understanding of current literacy levels – not a built-in audience for a potentially intimidating topic

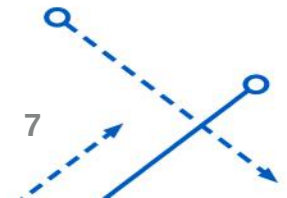


Approaches to building and sustaining a *COMMUNITY*:

1. Develop an infrastructure to support researchers, educators
2. Lay the foundation for research and literacy on which to build
3. Provide resources to seed projects that promote convergence of disciplines
4. Build a culture that encourages and facilitates interactions and sharing among the disciplines

These have been parallel and integrated efforts for research, education and engagement.

Infrastructure – Resources (time & money) - Culture



Omer Gokcumen, PhD
Biological Sciences

Animesh Sinha, MD
Dermatology

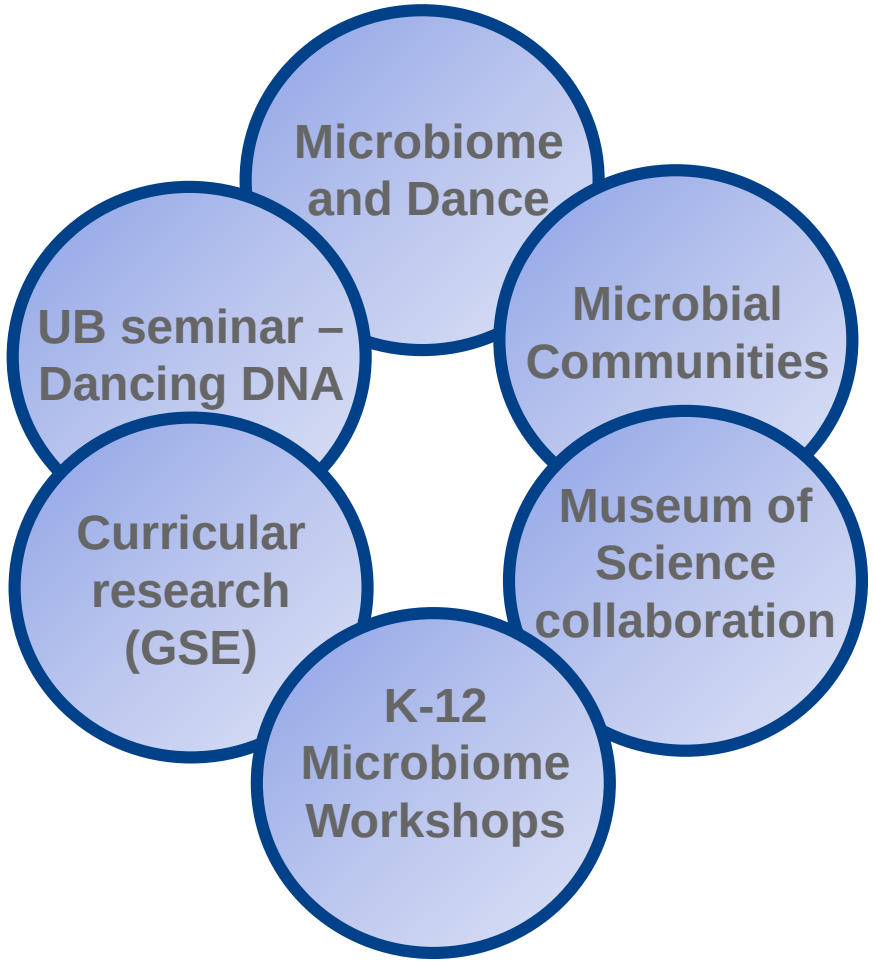
Mira Edgerton, DDS, PhD
Oral Biology

Jerry Koudelka, PhD
Biological Sciences

Laurie Read, PhD
Microbiology & Immunology

Integration of Research, Education and Engagement

Overlapping efforts of faculty members, groups and staff



Balancing Act—Dance and The Microbiome

GEM has greatly supported the development and presentation of my creative research over the past 4 years and has expanded my teaching into new areas.

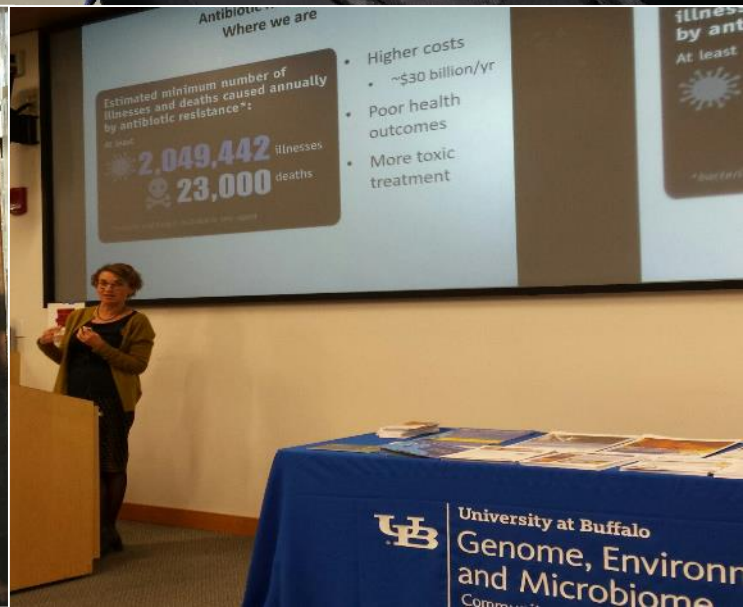
I feel very fortunate to be part of this unique group. I think that interdisciplinary endeavors are necessary for a deeper understanding of contemporary issues. – Anne Burnidge, Theater and Dance

Second Grade Microbiome Workshop

- Buffalo Public Schools, Sweet Home, East Aurora, Elmwood Village Charter School, Amherst Schools, West Seneca Schools
- Poster abstract selected for presentation at National Association of Biology Teachers Annual Conference 2019
- Manuscript being submitted to ASM's Journal of Molecular Biology and Biology Education

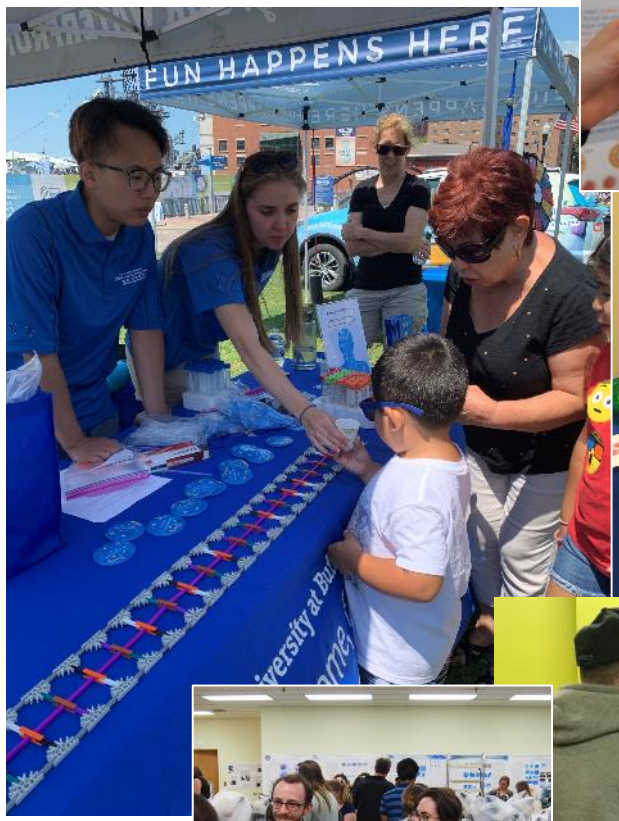
Mind Your Microbiome

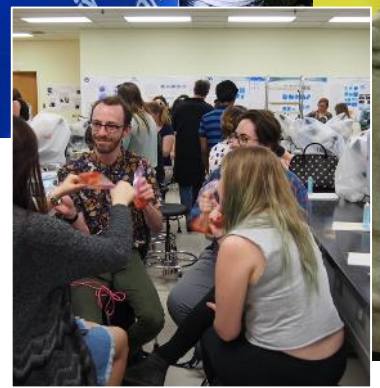
- Collaborators: School of Public Health & Health Professions, UB CTSI, Patient Voices Network, School of Pharmacy and Pharmaceutical Sciences, Buffalo Museum of Science



Integration of Research, Education (UB and K-12) and Outreach activities

Outreach at Community Events





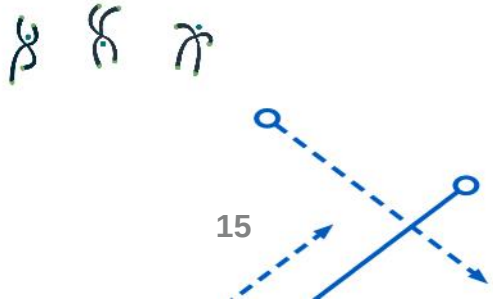
Engaging the community: facilitating a discussion about biomedical and clinical research

University at Buffalo
Institute for Genomic Literacy

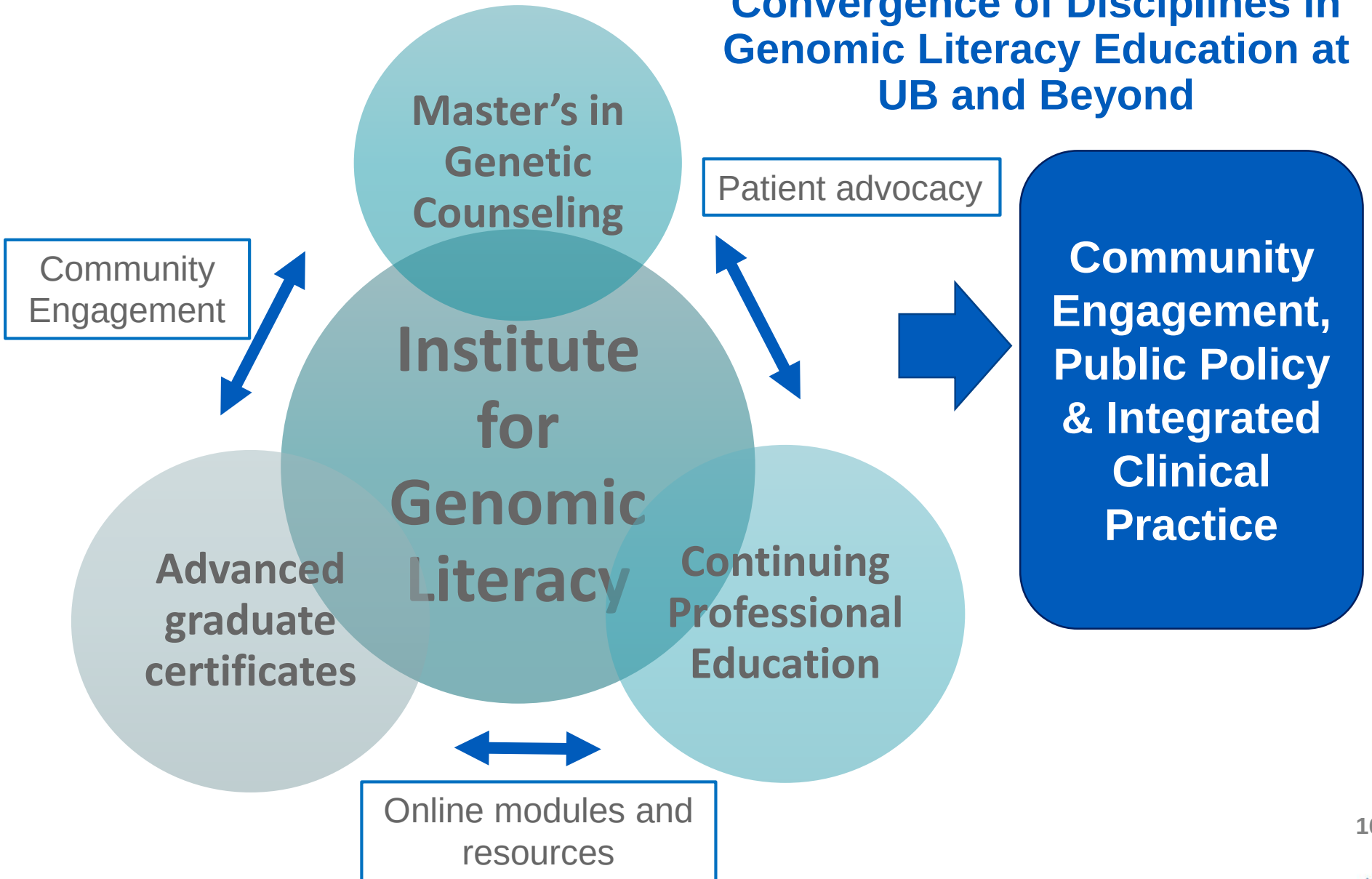
MISSION

The Institute will devise an educational strategy that will prepare professionals and the general public to understand and promote advances in genomics that promise significant changes in medicine, agriculture and biodiversity and our collective concept of what it means to be "human"

- Building a culture of genomic literacy radiating from within UB outward to our region and beyond
- Empower the use of genomic research in the lives of individuals and in the larger public health and lifestyles of our community
- Create better understandings about our common humanity as well as our differences



Convergence of Disciplines in Genomic Literacy Education at UB and Beyond



A FINAL THOUGHT

"Genomic medicine will touch virtually every individual in the United States in the forthcoming generations…Preparing the public to make educated personal and family health decisions in a time of rapidly evolving genetic and genomic knowledge will require new partnerships between the education system, healthcare systems, government, community advocacy organizations, consumers, and the media."

Hurle et al. (2013) "What does it mean to be genomically literate?: National Human Genome Research Institute Meeting Report

GEM is addressing a common, complex challenge. We have brought diverse people together and facilitated novel, innovative initiatives and projects by aligning resources and efforts from multiple disciplines.

community members engaged at GEM Outreach tables in WNY: >**4,616**
K-12 students engaged in classrooms and in the community: >**3,582**
UB students employed by GEM: **>40**
UB students who have engaged with our WNY community: **>60**
faculty who benefited from GEM: **~100**
faculty who moved outside of their field and brought their students with them: >**44**
publications: **>100**
grants funded: **>20**

Impact on the community:

- **Social responsibility**
- **Workforce development**
- **Pipeline for UB**

Lessons learned:

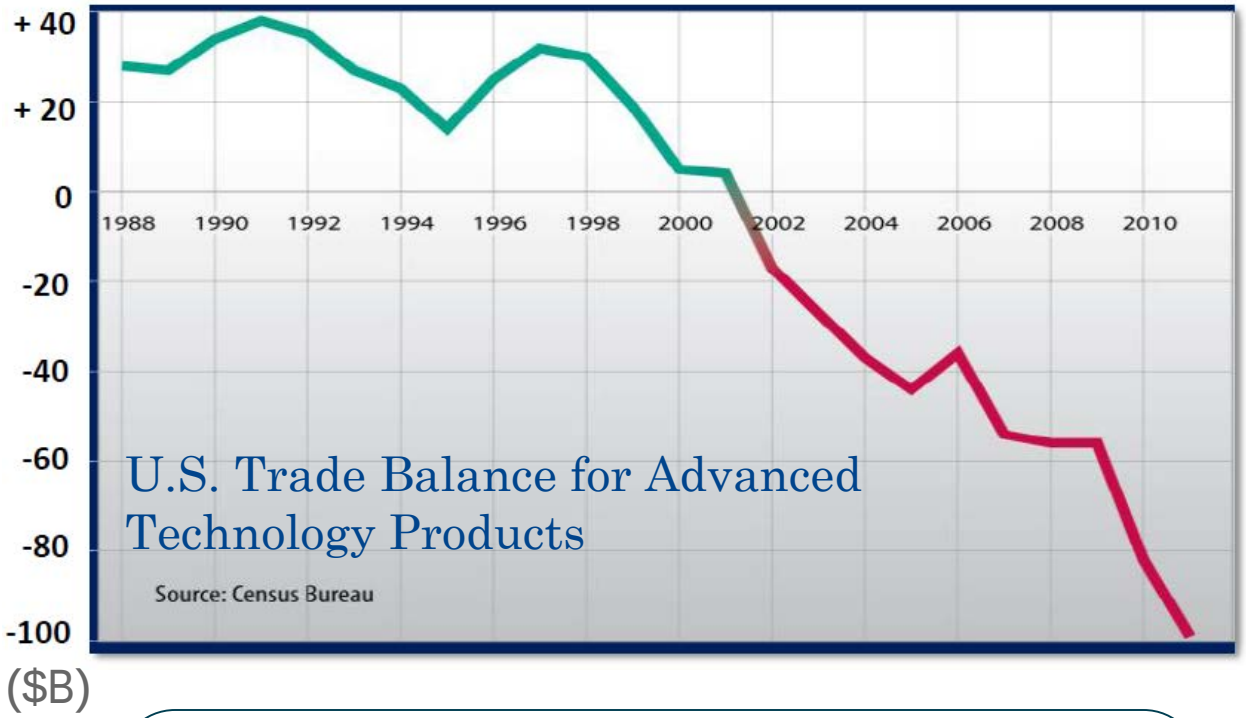
- Face-to-face interactions matter
- Don’t assume you know someone’s interests (or lack of interest!)
- Give it time
- Think broadly and be inclusive
- Communication – sometimes with purpose and sometimes without
- Students can be drivers of change – and can bring faculty with them
- Having the right support is critical

SMART
COMMUNITY OF EXCELLENCE

University at Buffalo
Sustainable Manufacturing and Advanced Robotic Technologies (SMART)
Community of Excellence


Communities of Excellence
SUSTAINABLE MANUFACTURING AND ADVANCED ROBOTIC TECHNOLOGIES (SMART)
University at Buffalo The State University of New York

National Manufacturing Challenges



The loss in the US manufacturing base in advanced technology products has exposed a need for fundamental scientific and educational scholarship.

NATIONAL ACADEMY CHALLENGES FOR MANUFACTURING IN 2020

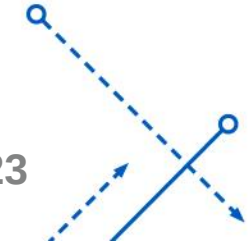
- "Near zero" production waste and environmental impact
- High quality & customization
- Develop design tools to support concurrency of operations
- Innovative materials and processes
- Broadening smart materials to smart products
- Human-machine collaboration

GRAND CHALLENGE

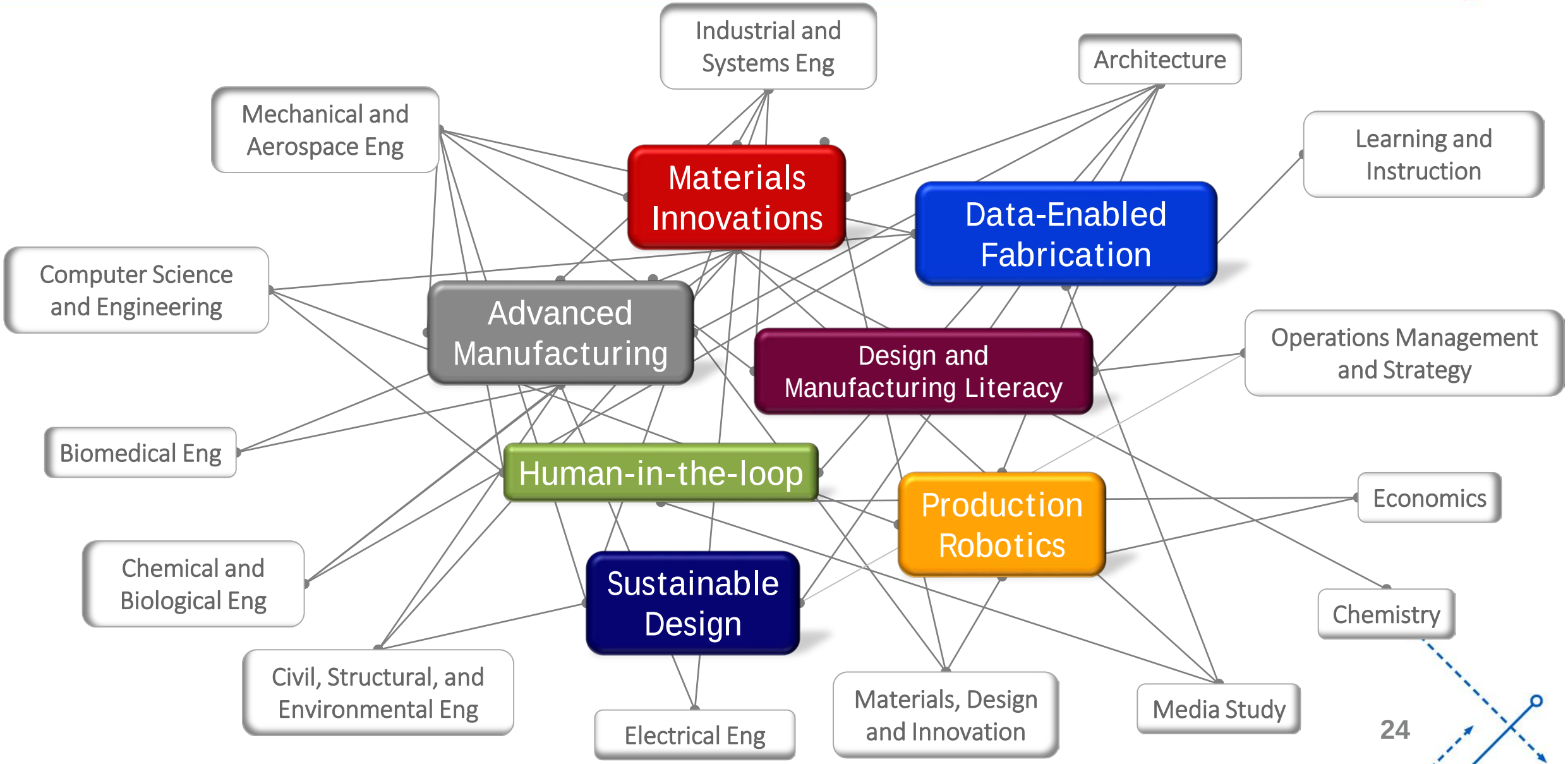
Develop advanced materials, technologies and processes that enable the sustainable, data-driven, cost effective production of high quality, customizable products.

IMMEDIATE IMPORTANCE

The emergence of ***Industry 4.0*** where factory, production, and construction processes self-govern, and analytics and data science capture multi-scale behavior across materials, machines, products, and people.

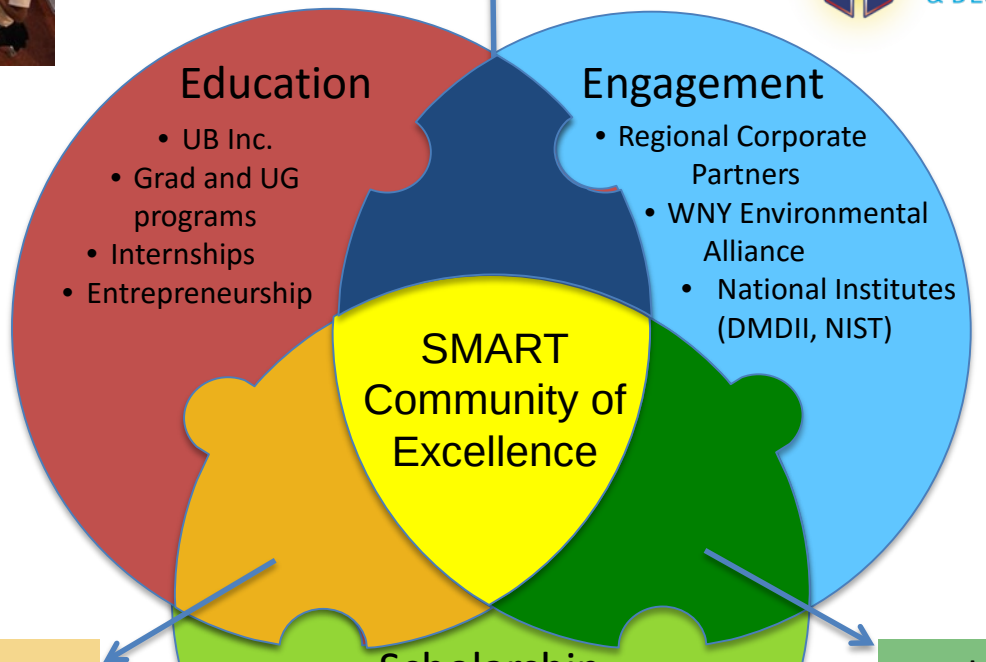


UB EXPERTISE



COMMUNITY VISION

Workforce Development, Service Learning, and K-12 STEM Education



DIGITAL MANUFACTURING & DESIGN INNOVATION INSTITUTE

BUFFALO MANUFACTURING WORKS

Insyte consulting

STARTUP NY

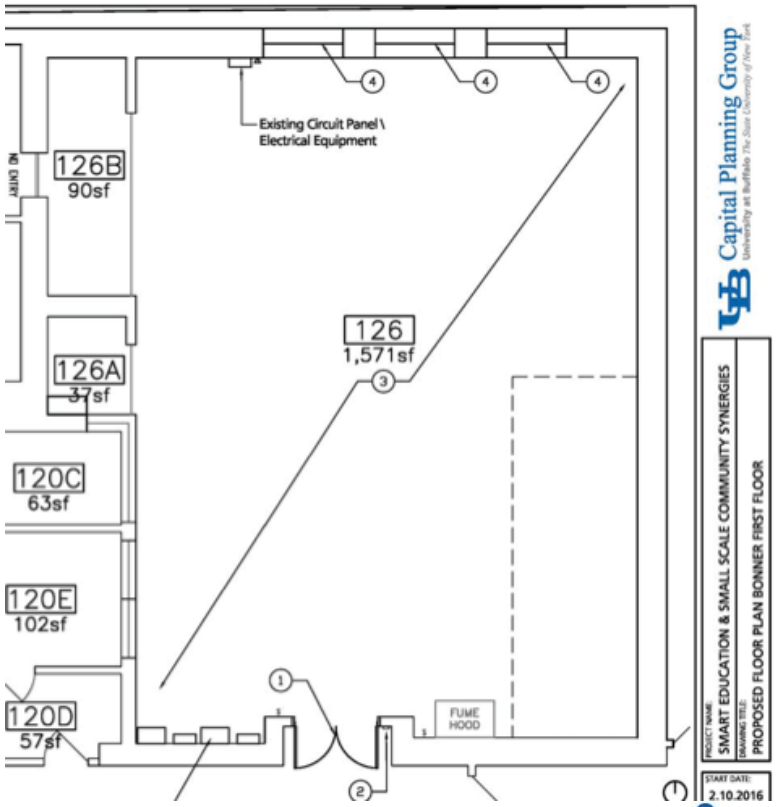
Experiential Learning, Technological Entrepreneurship, and Professional Practice

Technology Translation and Industry Partnerships

Community Foundations - Space and Equipment

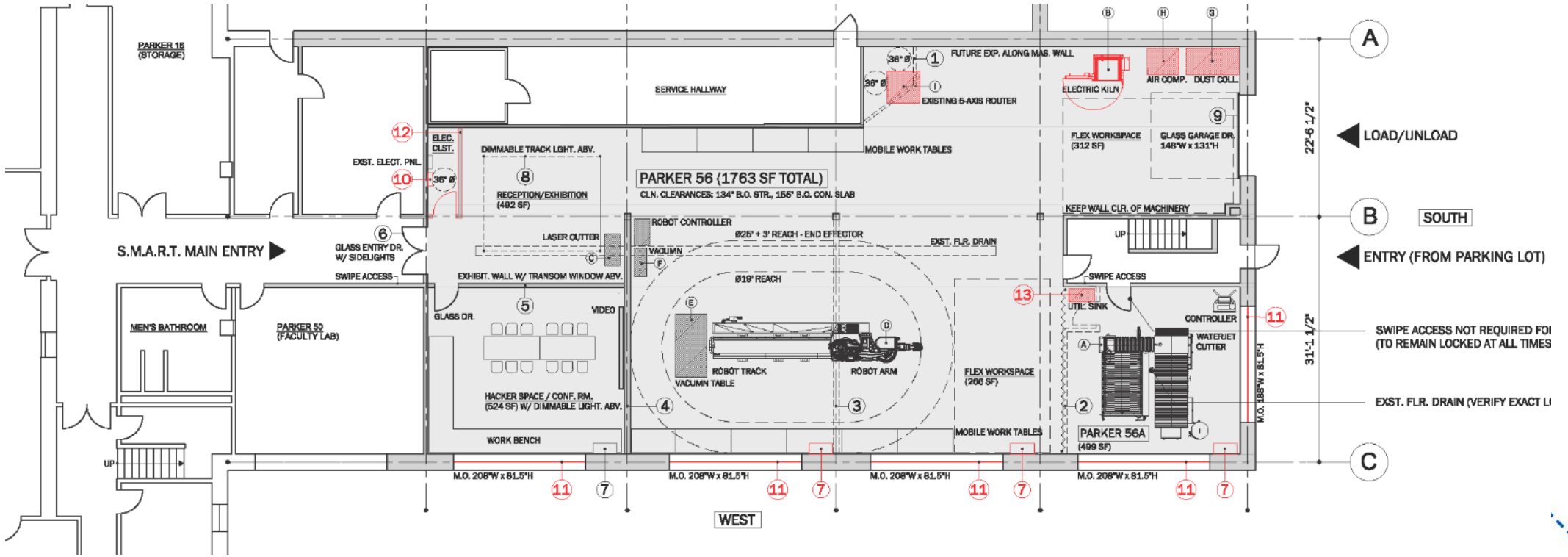
Community Foundations – Motion Capture Lab

- Facility for small scale production/ manufacturing, and test environment for robotics and advanced manufacturing technologies.
- Vicon Vantage V8 and Vero v2.2 Optical Motion Capture System



Community Foundations -Space and Equipment

- Parker Hall
  - Learning spaces with full scale fabrication equipment (e.g., robot arm, water jet cutter, kiln)



OMAX Waterjet

Universal Laser Cutter

Community Highlights – Research and Scholarship

- Center-level proposals (CAT, MRSEC, DOE Cybersecurity Institute for Energy Efficient Manufacturing
- Moog Prof. of Innovation & SMART Sustainability Fund (Sara)
- Partnering with the Drone Dome on large-scale research initiatives and proposals.
- Partnering with the Boston Valley Terra Cotta on annual professional workshop
- Continuing to foster the emergence of convergent strengths at UB (currently **38 projects using Motion Lab and/or Automation Sandbox**)
- Launch mobile manipulator for outdoor autonomous robotics.

Community Highlights – Educational Outcomes

- New Minors in Manufacturing and Robotics (the demand was there – we simply had to tell people they could do it and we would support it)
- Graduate Certificate in Advanced Manufacturing & MS in Robotics program
- SMART Facilities are supporting over 15 courses in Architecture, BME, CSE, MAE, and ISE
- First ever MOOC in Digital Manufacturing and Design (w/Coursera) – 85 countries - 10K enrolled

Community Highlights – Outreach & Engagement Outcomes

- SMART launched the Innovation Conversation series to focus conversations on cross-cutting topics.

wot.io™

University at Buffalo
Department of Materials Design and Innovation
School of Engineering and Applied Sciences
College of Arts and Sciences

MOOG

LPCiminelli

Construction Robotics
"Advancing Construction"

- Architectural Ceramic Assemblies Workshop (ACAW) multiyear partnership
- $1.5M Moog Endowed Professor
- $250K additive manufacturing donation
- Many other collaborations and programs in manufacturing, robotics, & architectural processes – BMW/SMART Intership Program, Tesla Placement program, Siemens, OMAX, Rigidized Metals, Construction Robotics.
- K-12 initiatives & programs – Design Camp with BMW

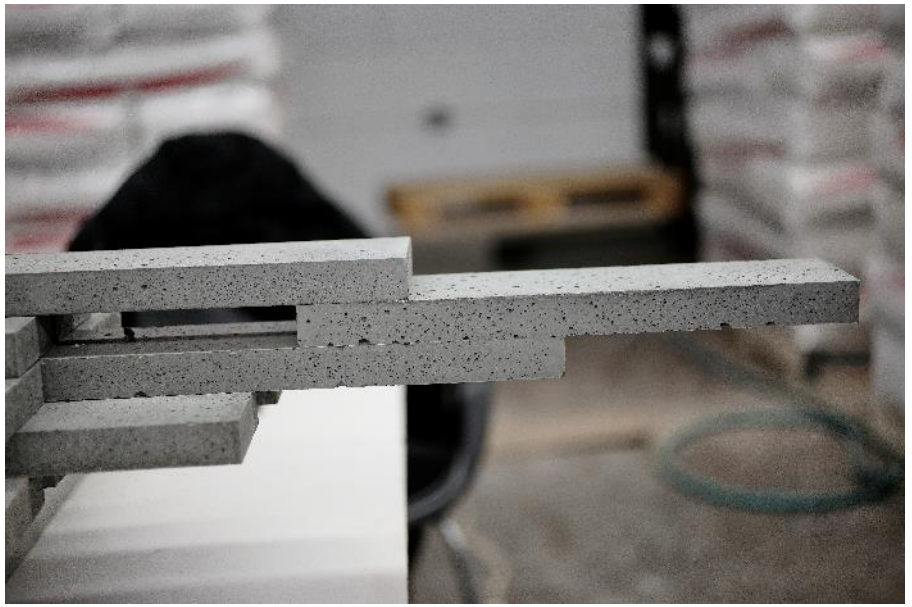
UB EXPERTISE

Active Research and Industry Engagement

- Innovative use of thin gauged metal for architectural scaled structures (N. Bruscia and C. Romano)

75 years 1940-2015 RIGIDIZED® METALS CORPORATION

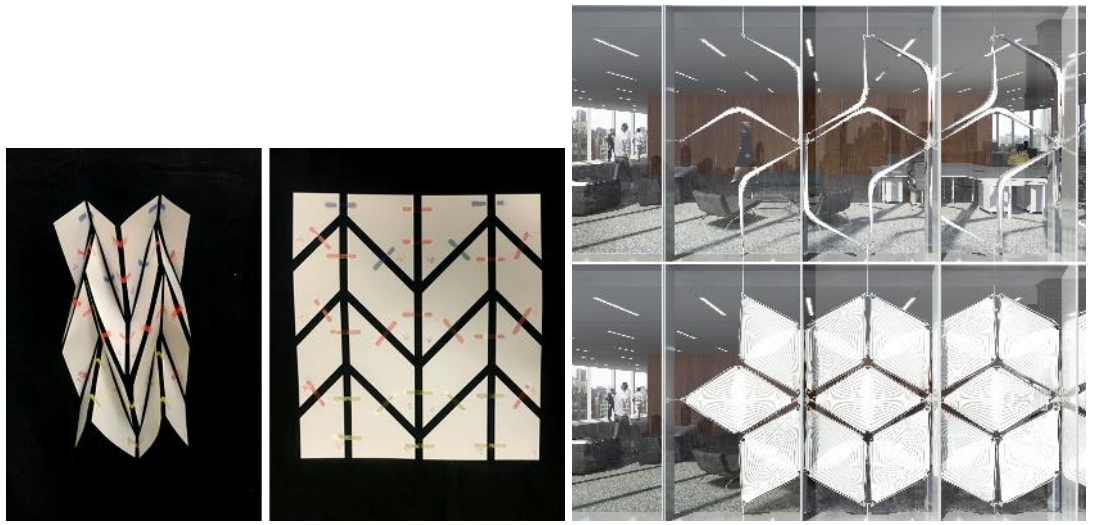
- Robotic construction of dry-stacked, corbelled, compressive structures built with elements that do not require mortar, fasteners, reinforcement or formwork (Georg Rafailidis (Architecture), Nils Napp (CSE), Andreas Stavridis (CSEE))



CEMEX

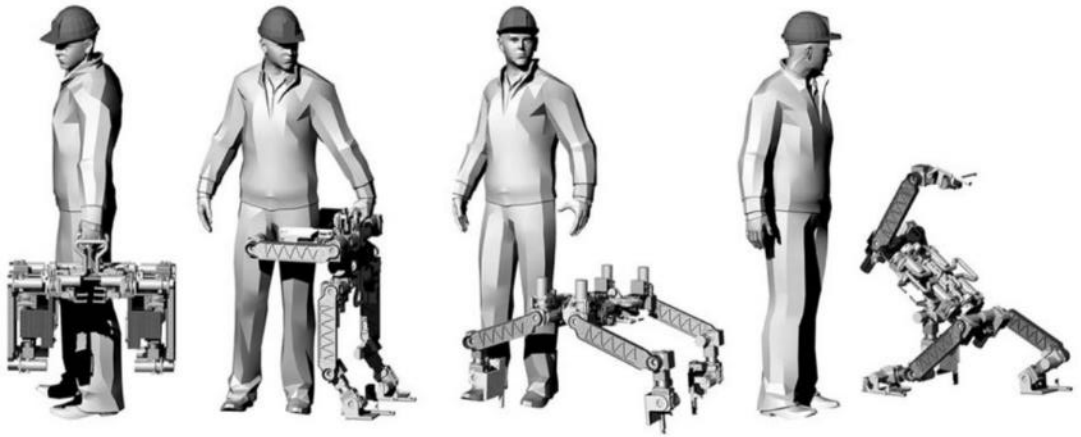
UB EXPERTISE

- Zero Energy Adaptive Façades (ZEAF) integrate a photochemical responsive polymer sheet into building façades through an origami inspired folding pattern to efficiently control the heat gain, and thus enhance the building energy efficiency. (H. Lin (CBE), J. Y. Song (Architecture), J. Shim (CSEE))



- On-Site Construction Robot (OSCR)- Co-robotics solution for construction site masonry work (M. Silver)

Construction Robotics
"Advancing Construction"

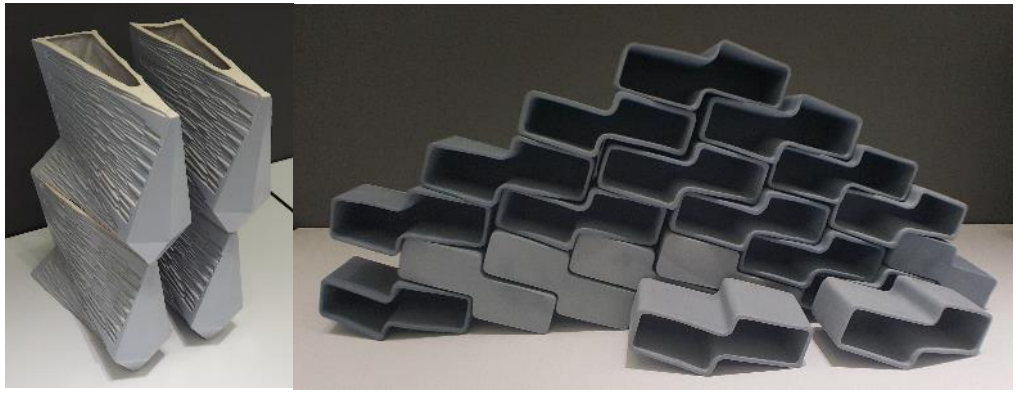


UB EXPERTISE

Active Research and Industry Engagement

- Innovative designs focused on bioclimatic performances of ceramic building assemblies (L. Garofalo and O. Khan)

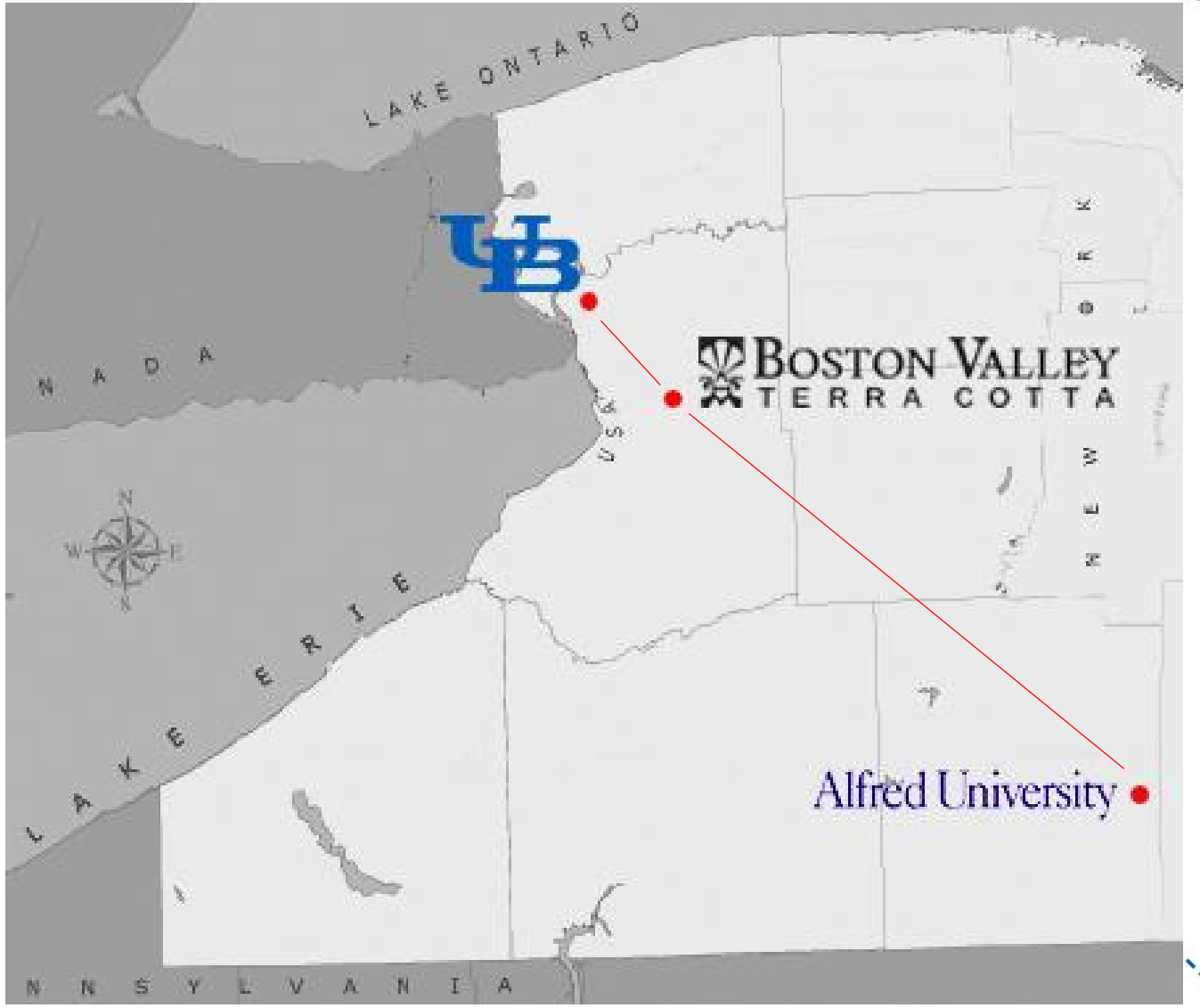
- Ceramic Assemblies Workshops- Bringing industry, the building professions and academia together around research and design.(L. Garofalo, O. Khan, and M. Bring)



Boston Valley Terra Cotta

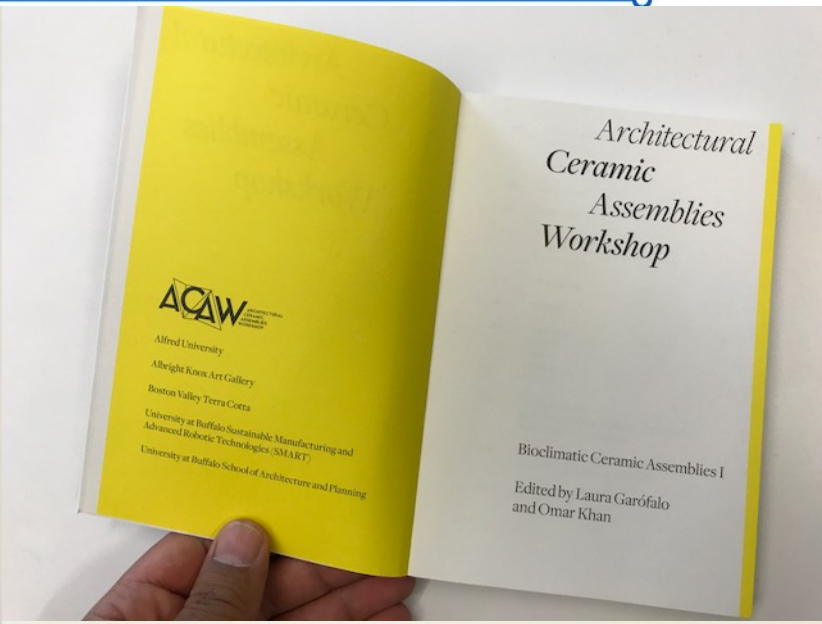
ENGAGEMENT OPPORTUNITY

- Boston Valley Terra Cotta is the largest architectural terracotta manufacturer in North America
- Alfred University College of Ceramics has expertise in ceramic engineering and ceramic art and design.
- UB SMART provides expertise in advanced manufacturing technology across architecture, engineering and management.
- This triad forms a unique nexus of expertise unparalleled globally.




Designing end effector for shaping fin along specific curve

Water-jet cutting terra cotta extrusions

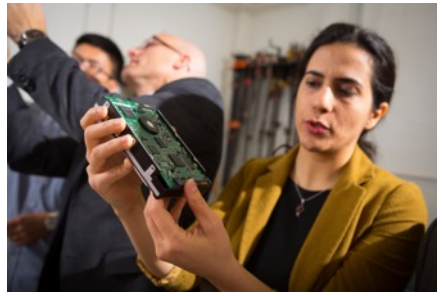


Each workshop is chronicled in a high quality publication.

Lessons Learned

- Space and equipment as a glue for community
- Regularize sharing of research within the community
- Provide opportunity to listen to industry's needs
- Develop multiple models for engagement: research, education, fee for service
- Develop tiered seed granting
- Develop broad criteria for assessing impacts

Sustainable Manufacturing And Advanced Robotic Technologies (SMART) Community Of Excellence

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Questions

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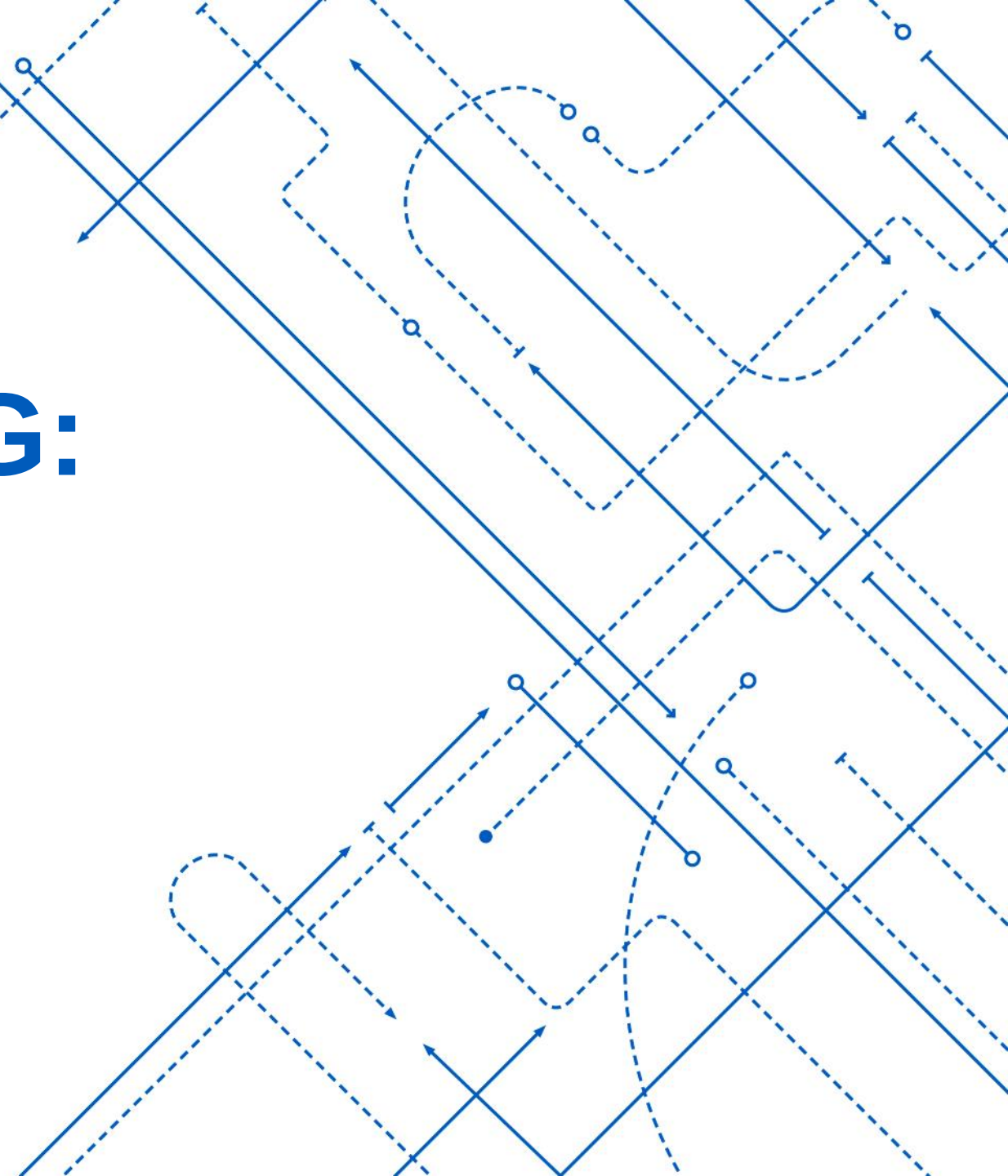
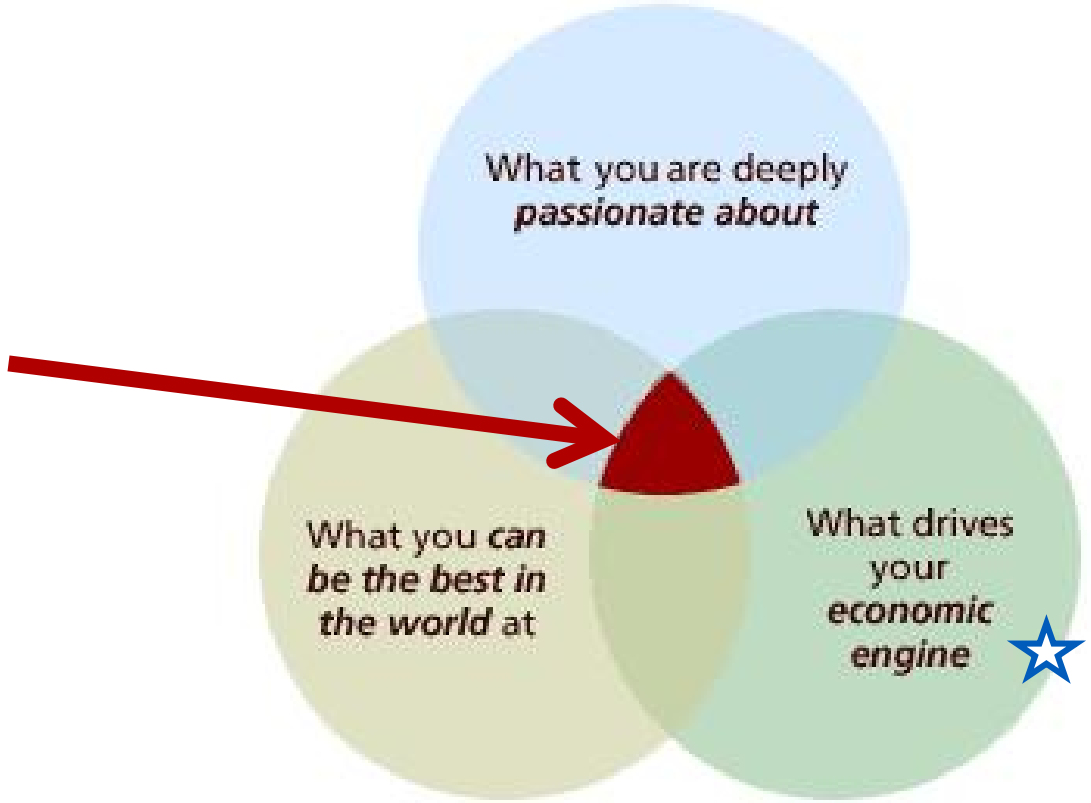
STRATEGIC AND DESIGN THINKING: ROLLING OUT AN INITIATIVE

SESSION 2: Breakout



BIG HAIRY AUDACIOUS GOALS (BHAGS)



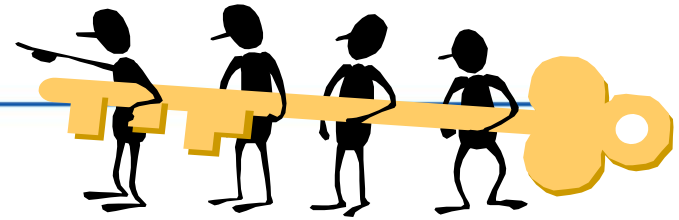
Three circles of the Hedgehog Concept

☆ Important question to address
Societal or community need

Collins & Porras (Sept-Oct, 1996). Building Your Company's Vision, *Harvard Business Review, 65-77*.

EXERCISE

You are a team of faculty and administrative leaders at the University for Transformative Education. At your table, develop a Big Hairy Audacious Goal that advances transdisciplinary team-driven convergent research, extension outreach, or a community engagement initiative. Your school has already received recognition for its innovative approaches in higher education and your team is seeking to broaden their impact.



Question:

- What are the key features, elements, characteristics, and/or behaviors associated with your ***"success?"***
- How would you specifically define ***collaborative/synergistic success*** - what does it look like?
  - e.g., "I see faculty doing…"
  - "I see students, faculty, staff, alumni and others involved in…"
  - "We have succeeded with…")

Strategic Direction:

- Transforming abstract goals into a concrete mission with guiding principles for action

TOOLS FOR STRATEGIC PLANNING

SWOT analysis

- Useful *organizing* framework to gather data
  - Internal strengths and weaknesses
  - External opportunities and threats

TWOS matrix

- Important *analytical* framework to use SWOT by creating actionable strategies
  - Capitalizing on strengths by matching to opportunities or threats
  - Overcoming weaknesses by leveraging opportunities or negating threats

SWOT ANALYSIS

Research has shown that most successful strategies address four aspects of the setting within which an organization operates

- **S**trengths and

  Weaknesses of the organization's abilities

- **O**pportunities and

  Threats within its external environment

SWOT analysis is a useful organizing framework for the *questions* one should ask when choosing a strategy

SWOT ANALYSIS

Organizational Analysis

Strengths

Weaknesses

Environmental Analysis

Opportunities

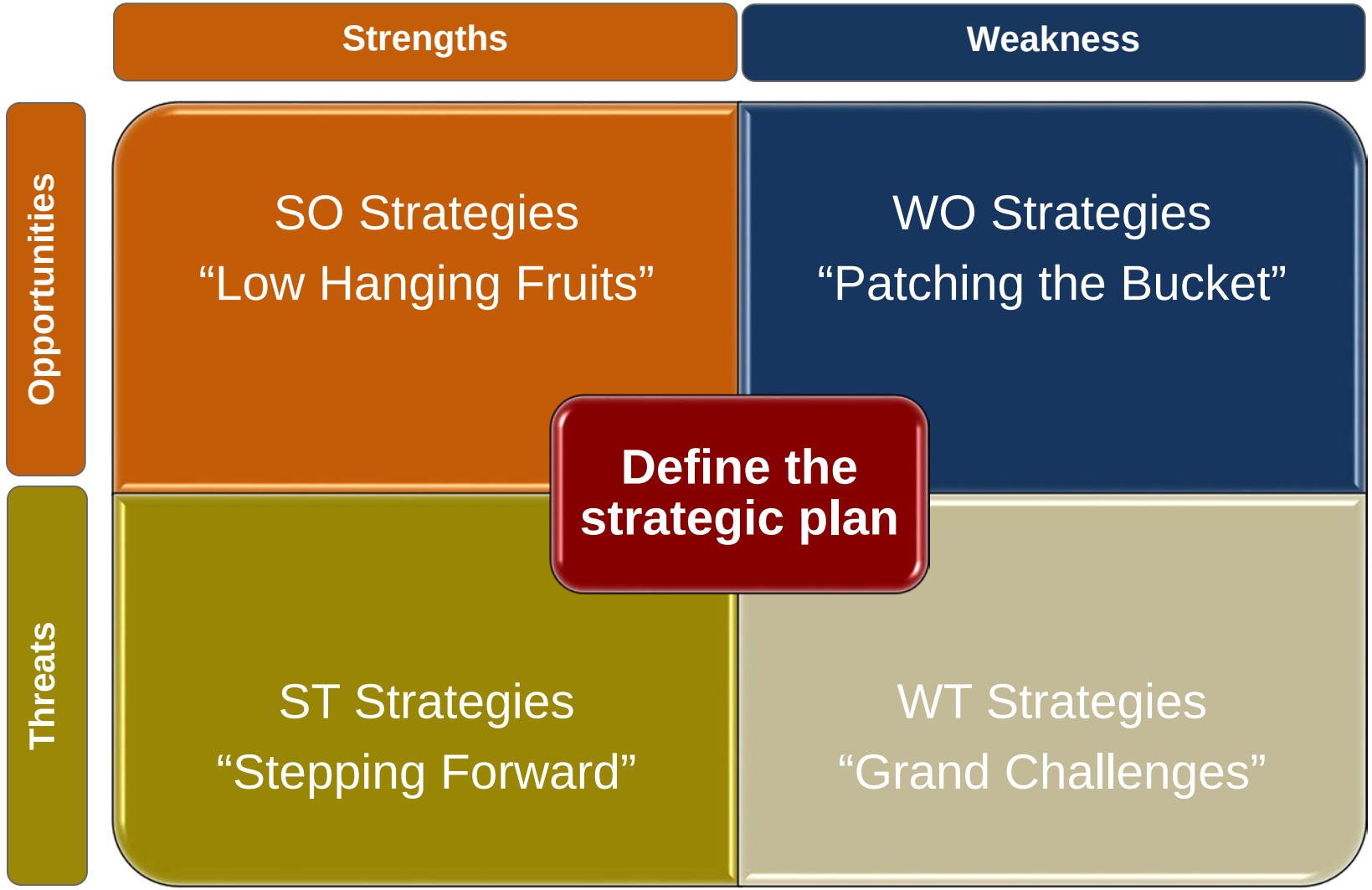
Threats

Strategic Choices

Consideration of all combinations

Evaluation of best match of environment and resources

THE TWOS MATRIX



THE TWOS MATRIX

	Strengths (S) List internal strengths here	Weaknesses (W) List internal weaknesses here
Opportunities (O) List external opportunities here	SO Strategies Generate strategies here that use strengths to take advantage of opportunities	WO Strategies Generate strategies here that take advantage of opportunities to overcome weaknesses
Threats (T) List external threats here	ST Strategies Generate strategies here that use strengths to avoid threats	WT Strategies Generate strategies here that minimize weaknesses and avoid threats

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Reporting Out