

# ***A Perspective on MGI Networking***

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Georgia Institute of Technology**

**GUIRR Webinar  
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# Concept of a Network for Materials Innovation – “Accelerator Network”

In Existence: National Nanotechnology Infrastructure Network



<http://www.nnin.org/>

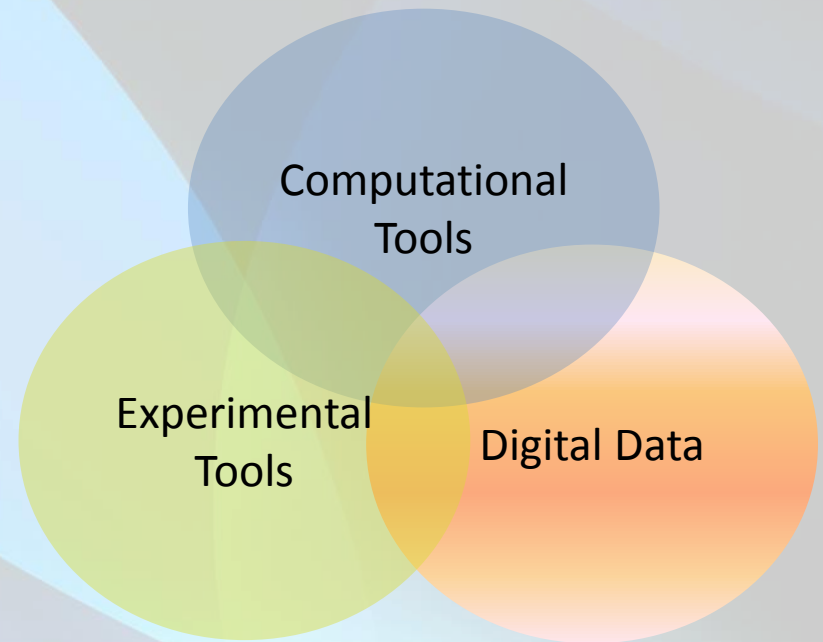
Broad scope of MGI is too large for single institutions – networking is essential for both capital and human resources. Transformation of education and collaborative work also key.

Is there a need for a NMIN (National Materials Innovation Network)? What would it look like?



# Likely Elements of MGI Networking

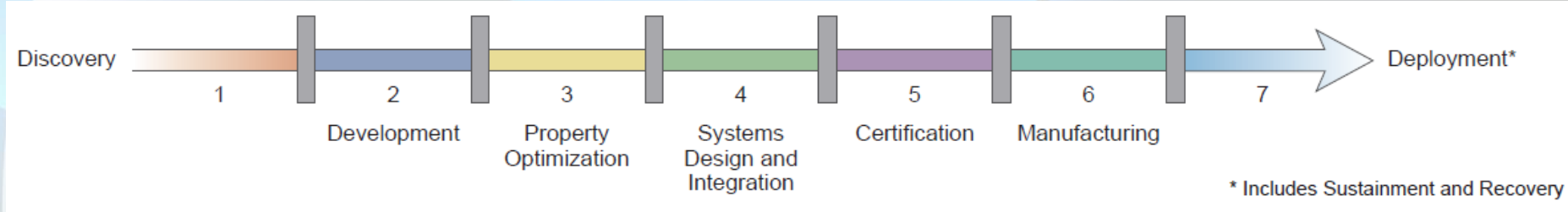
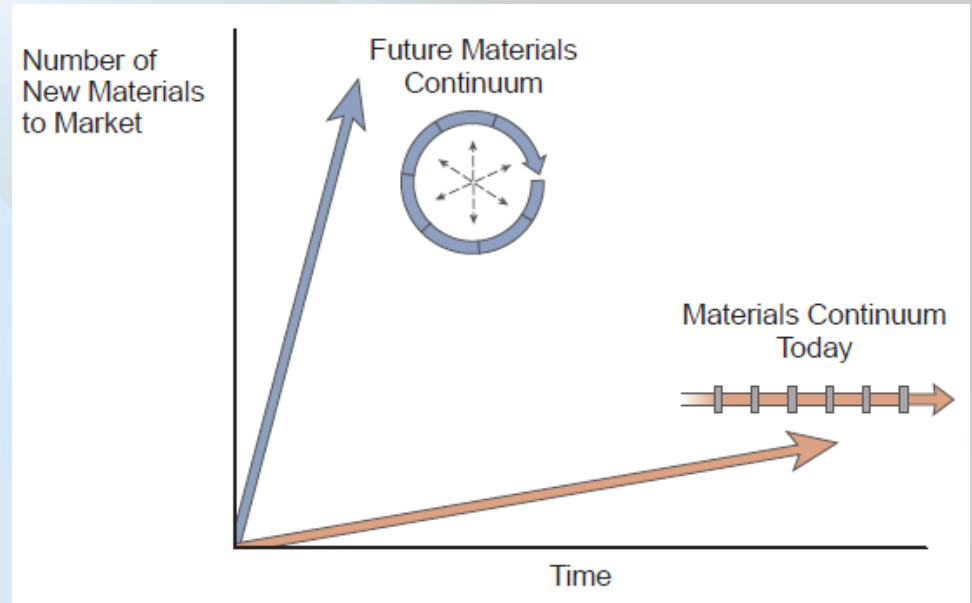
- Information infrastructure
- Educational infrastructure
- Shared facilities infrastructure



# Basic Concept of MGI

- Natural emergence from DARPA AIM, ICME, NSF Cyberdiscovery, etc.
- Enhancing the rate of materials innovation and deployment

*“half the time at half the cost”*

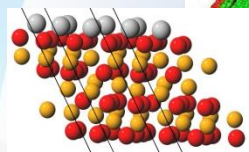


Obama Administration MGI  
announced June 2011

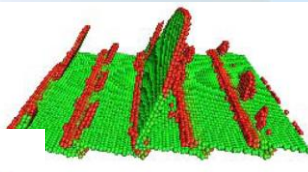


# Systems-Based Concurrent Product and Materials Design/Development

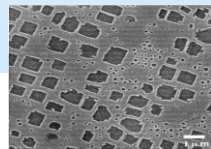
Limitation in  
Inverse problems



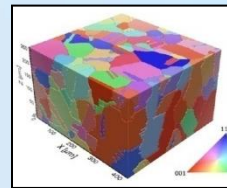
Quantum



Atomistic

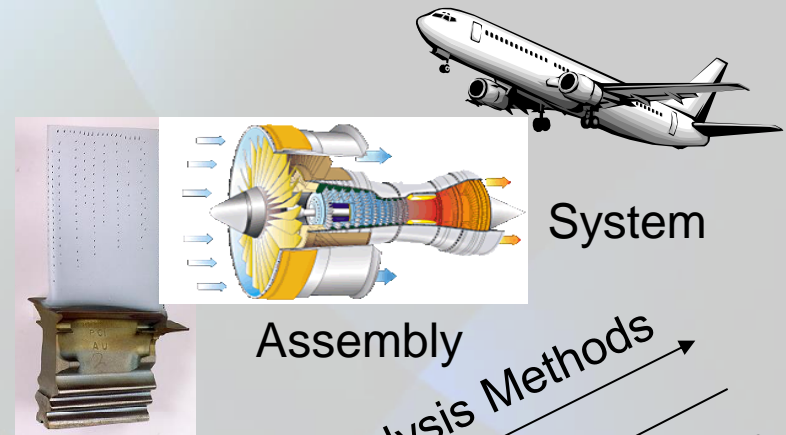


Mesoscale



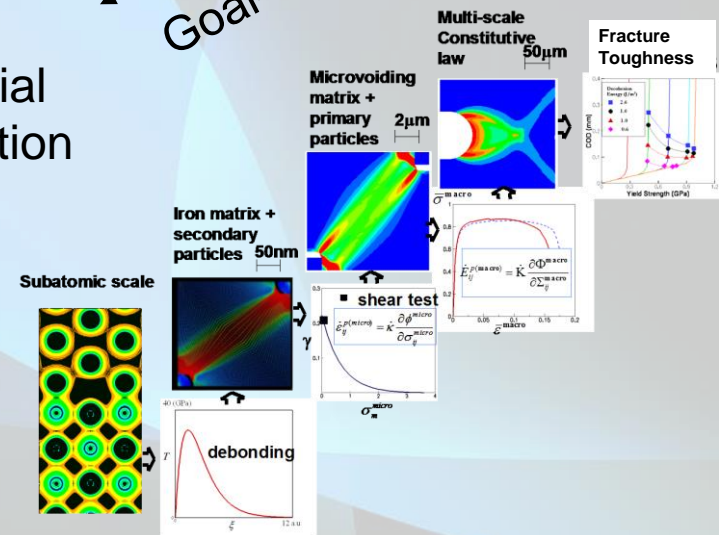
Continuum

Material  
Selection



Cause/Effect Analysis Methods  
Goal-Oriented Design Methods

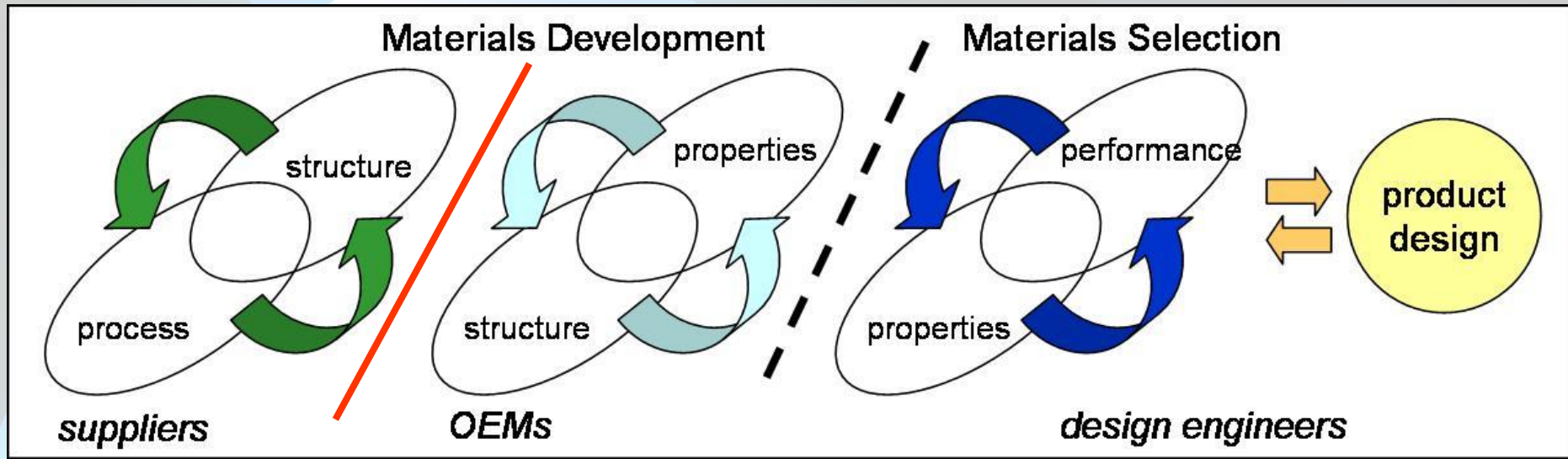
McDowell, D.L. and Olson, G.B., "Concurrent Design of Hierarchical Materials and Structures," *Scientific Modeling and Simulation* (CMNS), Vol. 15, No. 1, 2008, p. 207.



# Microstructure Taxonomy

## Structural Materials

Properties (Materials Selection) - OLD

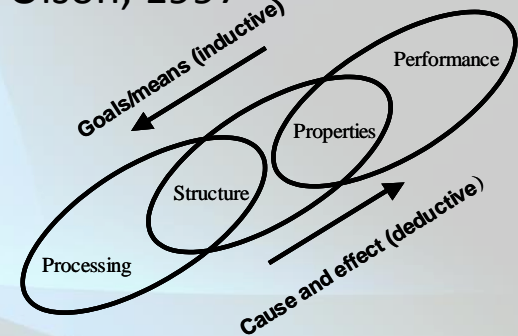


processing

properties & responses

Microstructure (Genome) - NEW

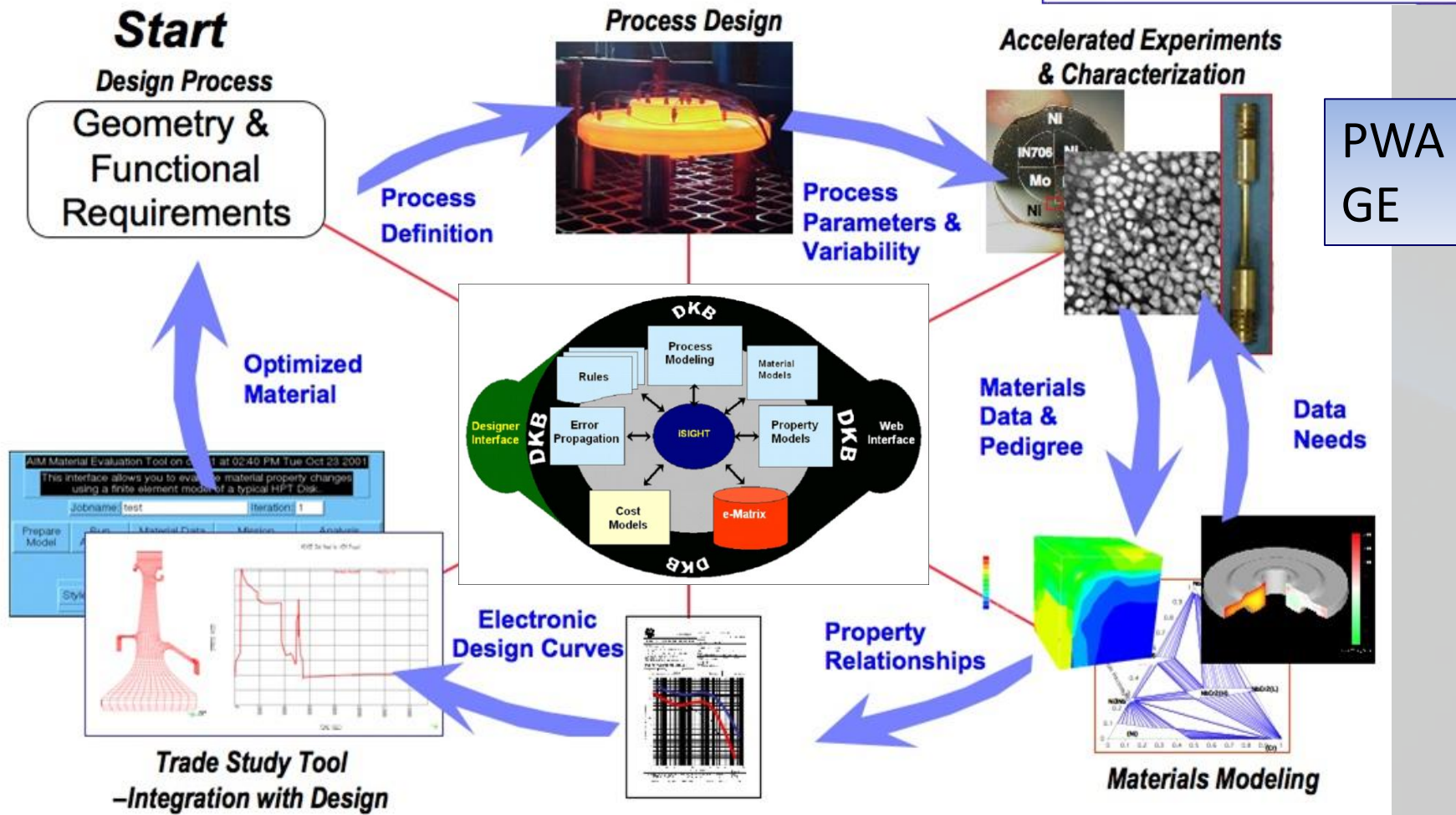
Olson, 1997



# Designer Knowledge Base: Integration

Ni-base superalloys for aircraft gas turbine engines

Dr. L. Christodoulou



DARPA AIM: McDowell, D.L. and Backman, D., "Simulation-Assisted Design and Accelerated Insertion of Materials," Ch. 19 in *Computational Methods for Microstructure-Property Relationships*, Eds. S. Ghosh and D. Dimiduk, Springer, 2010, ISBN 978-1-4419-0642-7.



# Critical Aspects for Universities

- **Innovation infrastructure** (shared resources and cyber infrastructure for materials data, analytics, and decision support), coordinated with National Labs and major university-based user facilities.
- Cultivating interdisciplinary **exploration** of emerging research themes in the critical path (e.g., mesoscale science, scaling, validated modeling protocols, 4D experiments, high throughput methods).
- **Strategic engagement** with industry.
- **Complementary relations** among stakeholders to establish MGI “network”.

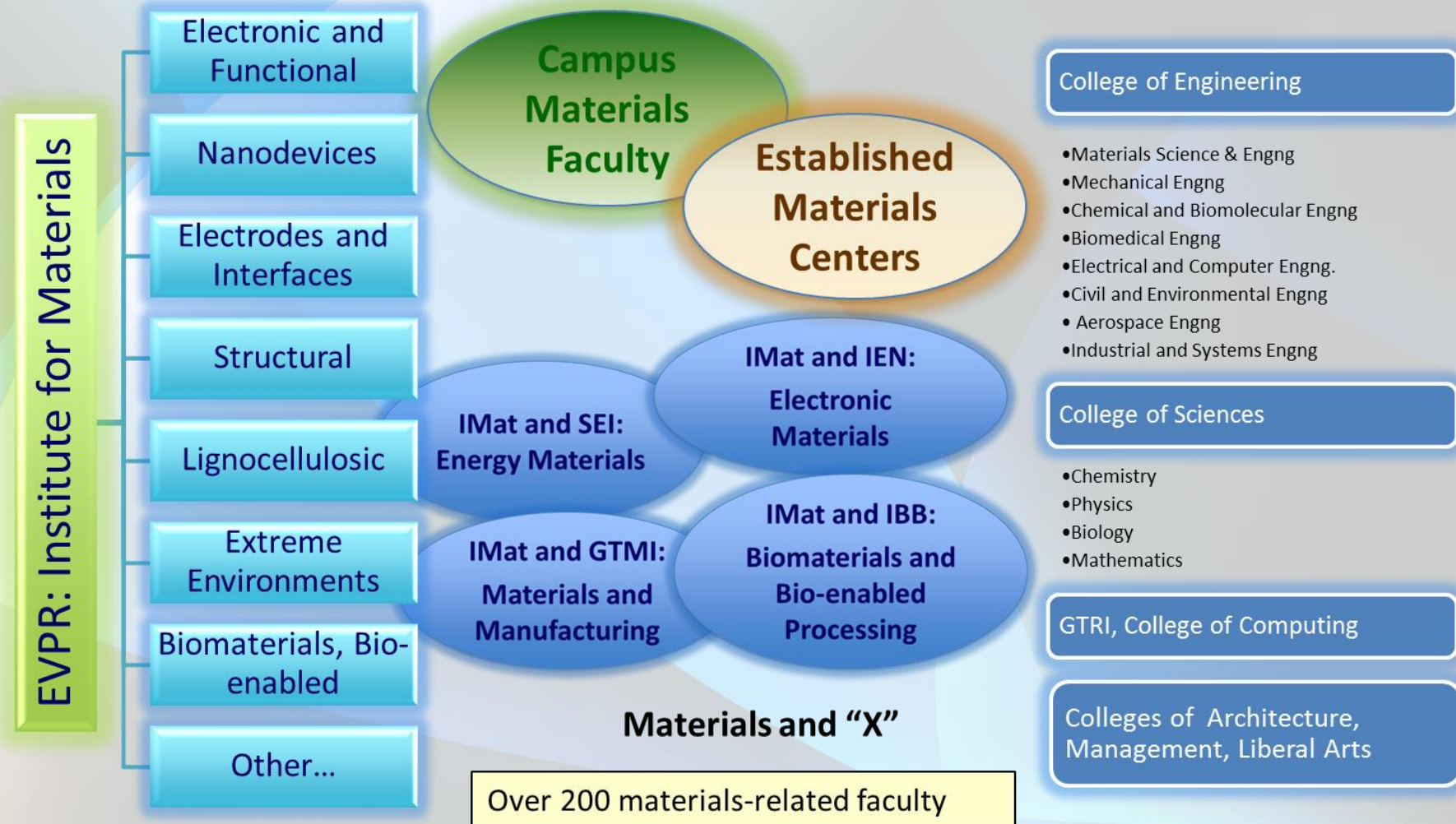


GT Initiative... IMat



# Materials Innovation Ecosystem @ GT

- Societal Impact – mobility, energy, health, infrastructure, communications, security
- Economic Impact – future workforce, 21<sup>st</sup> century economy



# IMat: *Materials Innovation Ecosystem @ GT*



**Vision:** To be an international leader in the research, development, and innovative use of materials to solve scientific and technological grand challenges.



# Some Implications of MGI → IMat

- Systems integration – building engineering and science bridges between materials and manufacturing
- Integration of materials characterization, modeling, experiments, and databases with data sciences/big data → high throughput is a focus
- Testbeds for collaborative MGI concepts across disciplines and with industry/labs, including educational and workforce programs
- Workshops, seminars, study groups as necessary to support MGI development and implementation



IMat was formally launched June 24, 2013 in a press release from White House OSTP related to the 2<sup>nd</sup> anniversary of the Materials Genome Initiative

#### About Us

##### Vision

##### People

- ▢ Staff
- ▢ Georgia Tech Materials Faculty
- ▢ Cabinet
- ▢ External Advisory Panel

##### Research Areas

- ▢ Graphene & New Electronic Materials
- ▢ Organic Photonics & Electronics
- ▢ Mechanical Properties

##### Industry Applications

- ▢ Computing & Electronics
- ▢ Energy
- ▢ Health
- ▢ Mobility
- ▢ Security
- ▢ Sustainability

##### Shared Resources Initiatives

##### Materials Innovation Initiatives

- ▢ Materials Collaboration Hub
- ▢ Accelerating Discovery & Development
- ▢ Workforce of the Future
- ▢ Materials Solutions to Grand Challenges

##### Partnering

##### Philanthropic Opportunities

##### News/Events

##### Education

- ▢ Certificate Programs
- ▢ International Opportunities
- ▢ Graduate Study
- ▢ Undergraduate Research
- ▢ Student Chapters
- ▢ Professional Societies

##### Contact Us

##### Internal Only

- ▢ Materials Facilities
- ▢ Workshops



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### Materials Innovation Initiatives



Materials Collaboration Hub



Workforce of the Future



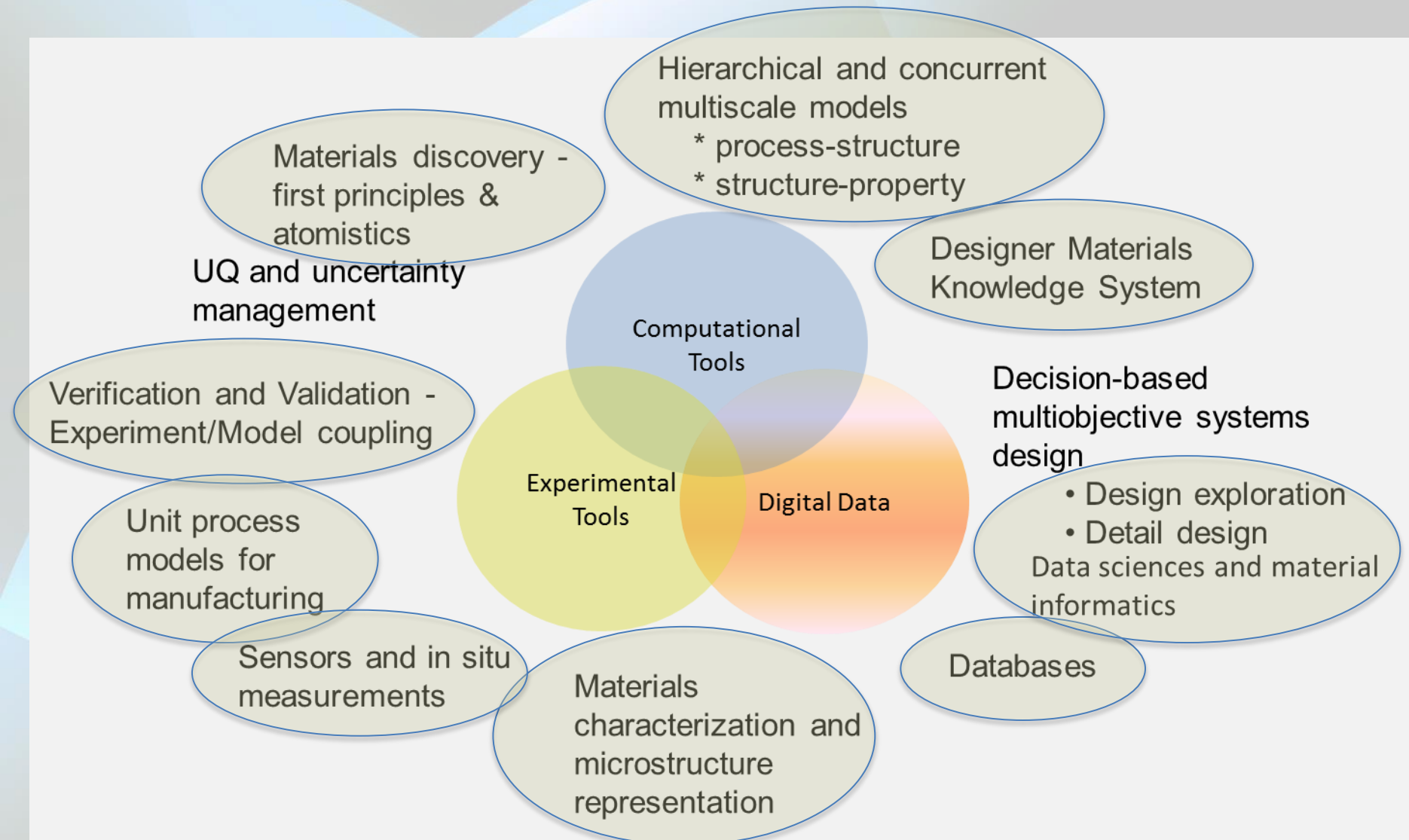
Accelerating Discovery & Development



Materials Solutions to Grand Challenges



# Materials Innovation Infrastructure



Expanded by DLM from OSTP Materials Genome Communication

[http://www.whitehouse.gov/sites/default/files/microsites/ostp/materials\\_genome\\_initiative-final.pdf](http://www.whitehouse.gov/sites/default/files/microsites/ostp/materials_genome_initiative-final.pdf)



guided and supported by  
**Georgia Tech** Institute for Materials

*Components of the Materials  
Innovation Network MatIN at  
Georgia Tech.*

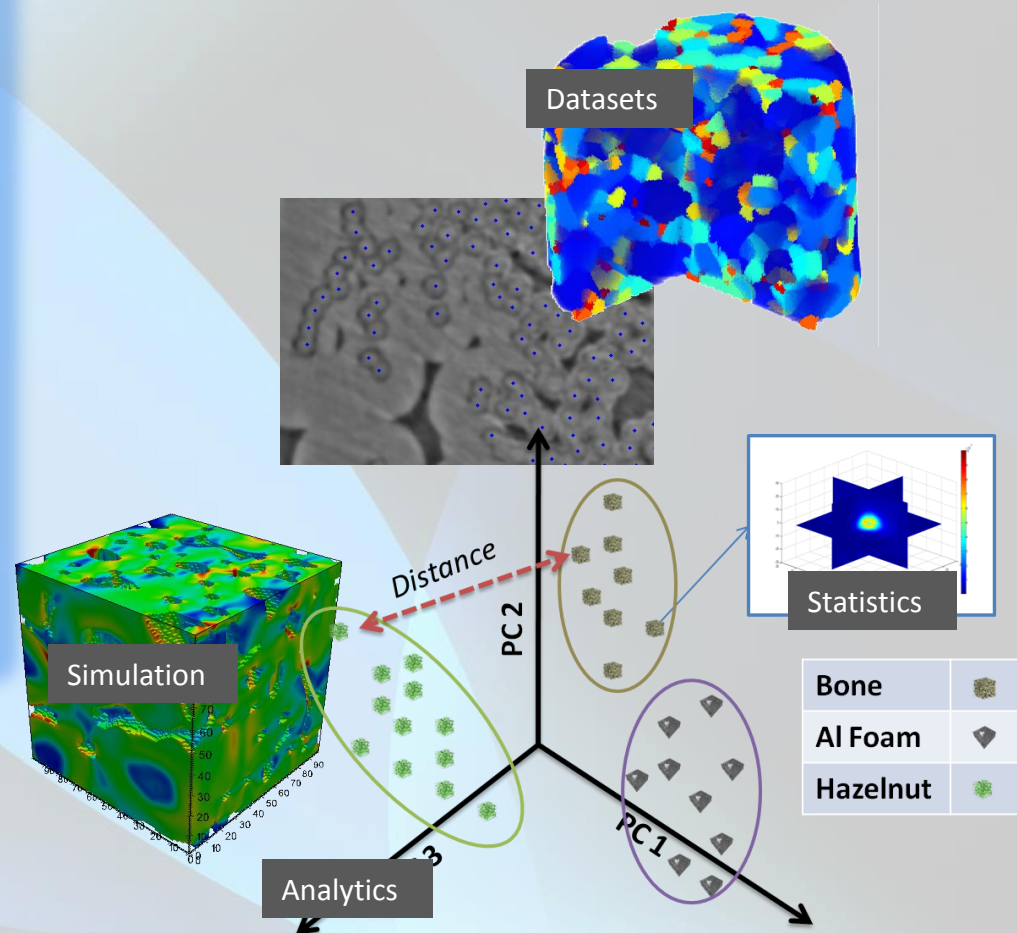
**COLLABORATION NETWORK**

**CODE REPOSITORY**

**DATABASE** Data, metadata, workflows

**INITIAL APPS** Correlation functions for  
microstructures

S. Kalidindi, A. Fast



# Opportunities for Engagement

## *GT Activities: Networking, Partnerships*

- March 28, 2014 SE USA regional workshop hosted by Georgia Tech
- MGI materials innovation accelerator network (June 5-6, 2014) – IMat hosting at Georgia Tech with co-organizers UW-Madison and Univ. Michigan

# For More Information

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