



**OPEN ACCESS IN THE  
DATA-RESEARCH-COMPUTATION-INFORMATION  
PYRAMID**

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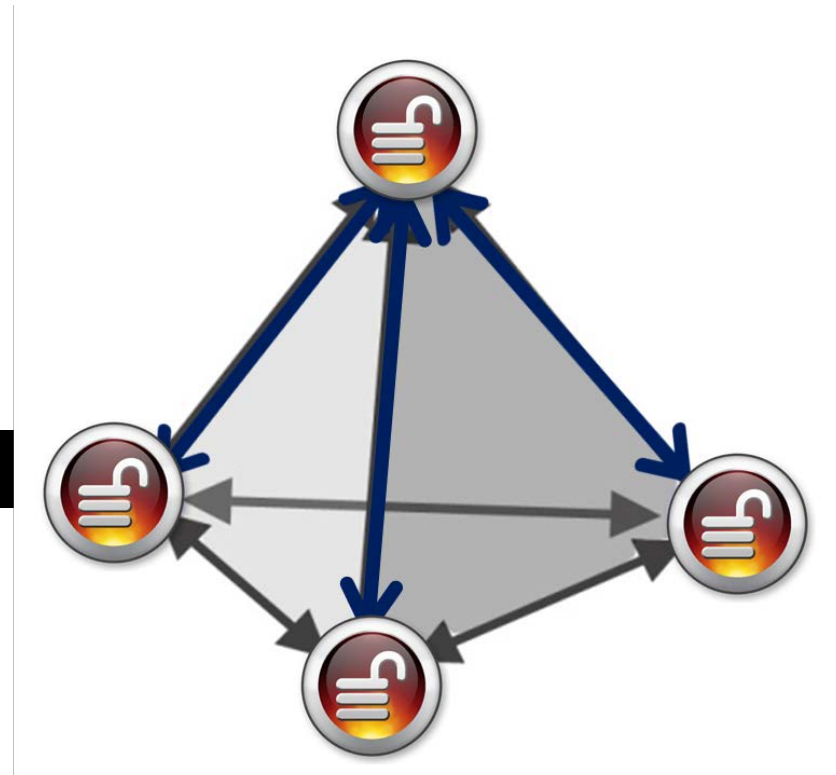
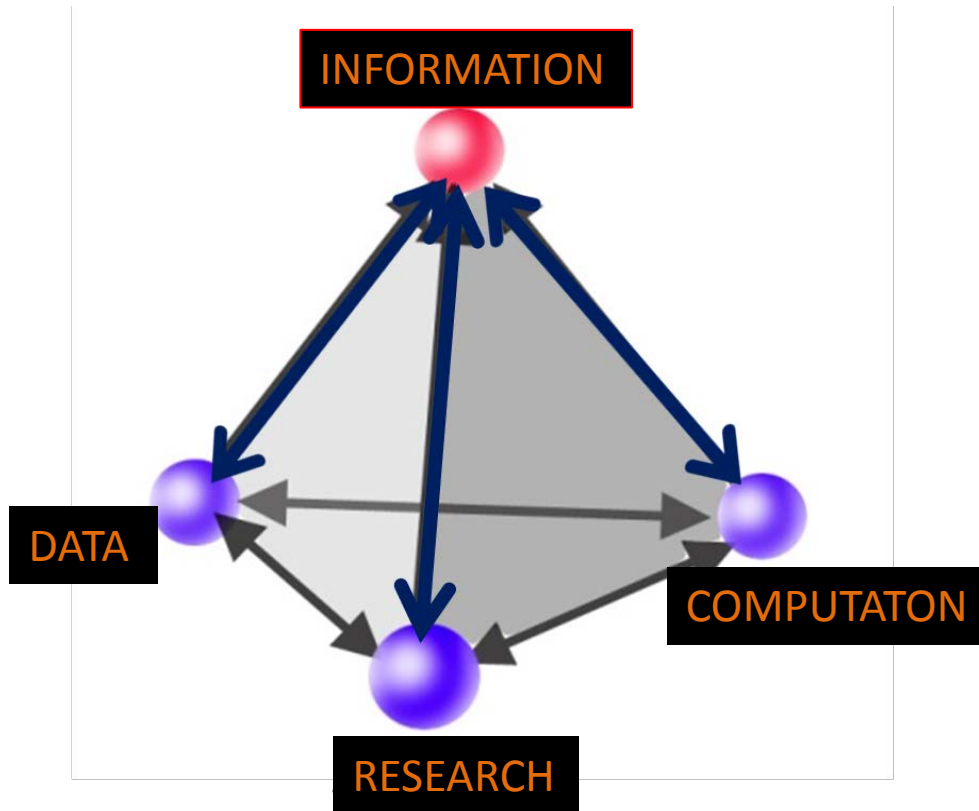
# OPEN ACCESS

Global movement, 20 + years

- .edu, .com, .gov, .org
- North America, EU, Australia, Asia Pacific
- Digital Commons, Creative Commons
  - Open Courseware, open data, multidisciplinary
- Open/Collaborative innovation and design

**Minsky: “Can you imagine that there was a time when the books in a library didn’t talk to each other?”**

# Open Pyramid of Science



ONE OF MANY OPEN ACCESS SIGNS

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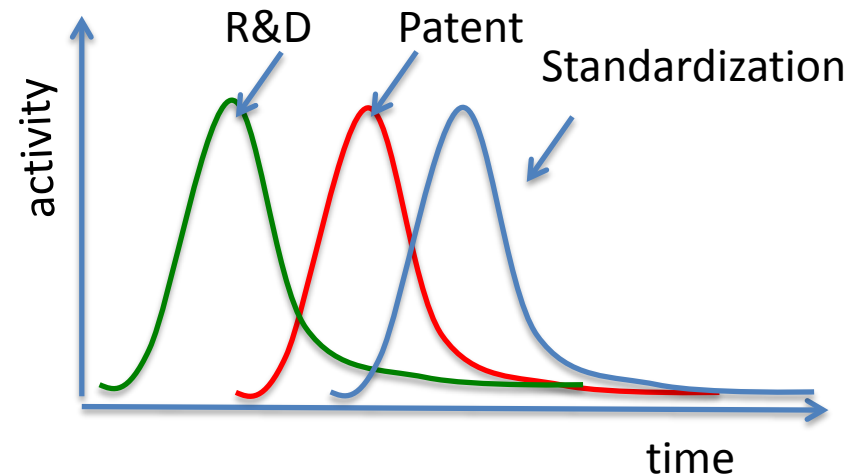
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# ENGINEERING; TECHNOLOGY

- Publish or perish
- Fear of publishers
- 3<sup>rd</sup> Generation University
- Open, shared infrastructure, Data Cloud

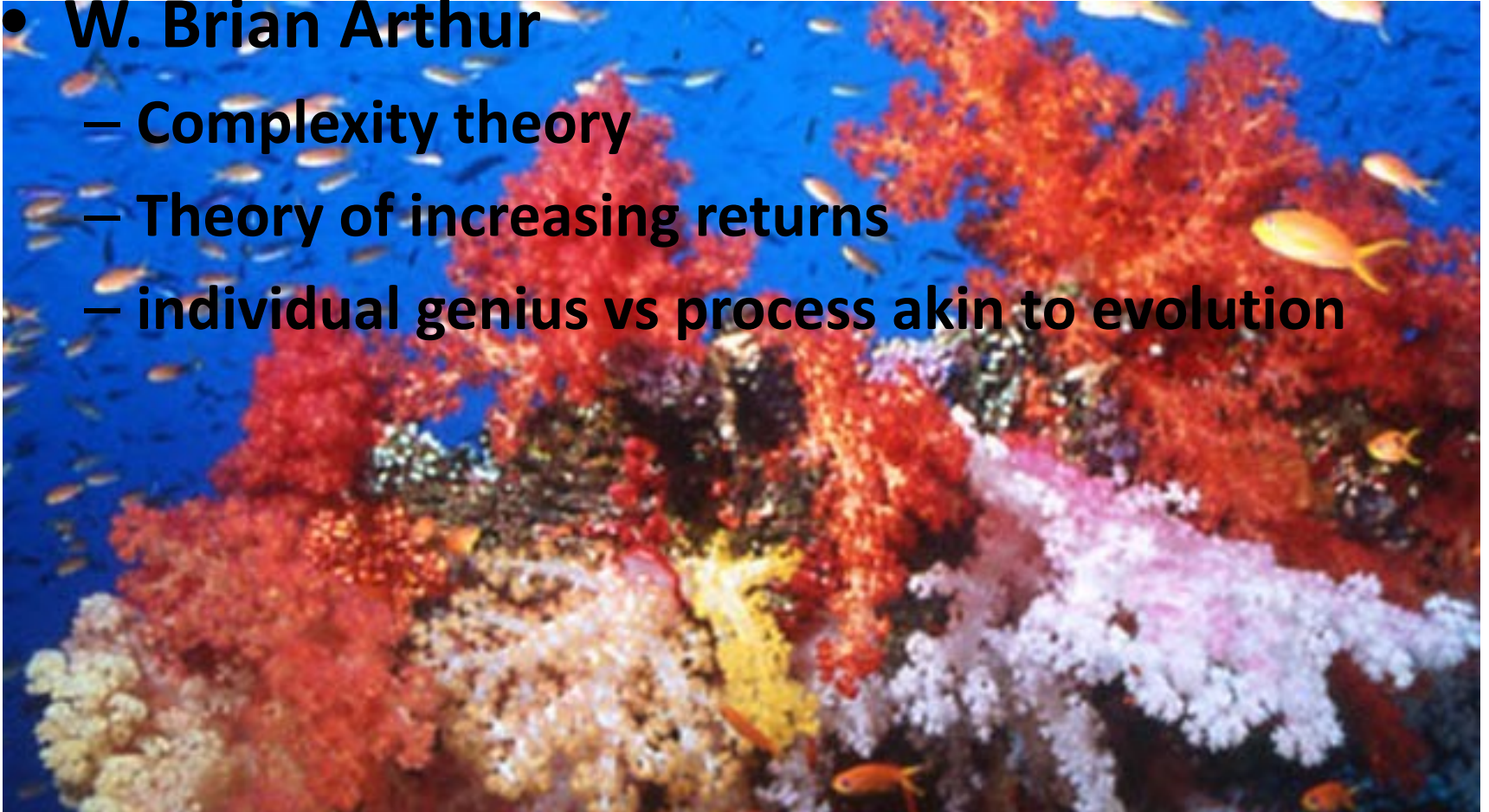
## UNIVERSITY-INDUSTRY

- Pre-competition R&D collaborations
- R&D and standards
- Patents



# The Evolution of Science, The Nature of Technology

- **W. Brian Arthur**
  - Complexity theory
  - Theory of increasing returns
  - individual genius vs process akin to evolution



# Digital Revolutions

- Computing
- Communication
- Manufacturing



Data in the cloud





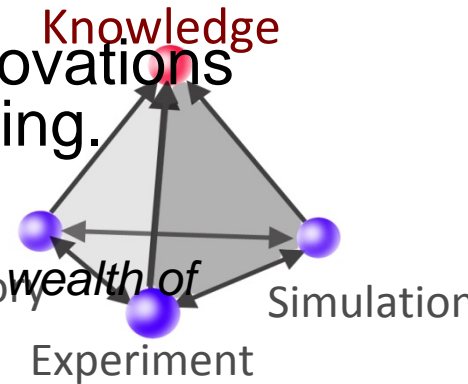
# US NSF

## Cyber Enabled Discovery and Innovation

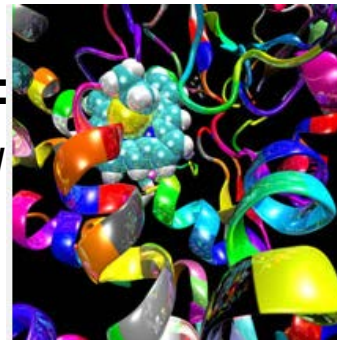
transformative research in general themes, via innovations in, and/or innovative use of, computational thinking.

- **From Data to Knowledge:**

*enhancing human cognition and generating new knowledge from a wealth of heterogeneous digital data;*



- **Understanding Complexity in Natural, Built, and Social Systems:**  
*deriving fundamental insights on systems comprising multiple interacting elements;* and



- **Building Virtual Organizations:**

*enhancing discovery and innovation by bringing people and resources together across institutional, geographical and cultural boundaries.*





# OPEN DESIGN

## 3. Digital Revolution

- Digital Design
- Public movement
- Maker movement
- FabLab



Computer controlled manufacturing

3D printing

CNC

Laser cutting

PCB

# FabLab International Network

300+



# FABLAB Principles

- **Open Access**
  - Democratic usage for personal expression or invention
  - Free puublic access
- **Shared Tools and Processes**
  - Machinery and materials
  - open source software and freeware
  - All FabLabs to share designs and resources, across national boundaries
- **Global FabLab Network**
  - Workshops, projects
  - Fab Academy, Fab Research

# FabLab Charter

- This is a copy of the original English version of the Charter published October 20, 2012.
- **What is a fab lab?**
- Fab labs are a global network of local labs, enabling invention by providing access for individuals to tools for digital fabrication.
- **What's in a fab lab?**
- Fab labs share an evolving inventory of core capabilities to make (almost) anything, allowing people and projects to be shared.
- **What does the fab lab network provide?**
- Operational, educational, technical, financial, and logistical assistance beyond what's available within one lab
- **Who can use a fab lab?**
- Fab labs are available as a community resource, offering open access for individuals as well as scheduled access for programs
- **What are your responsibilities?**
- *safety*: not hurting people or machines
- *operations*: assisting with cleaning, maintaining, and improving the lab
- *knowledge*: contributing to documentation and instruction
- Who owns fab lab inventions?
- Designs and processes developed in fab labs can be protected and sold however an inventor chooses, but should remain available for individuals to use and learn from
- How can businesses use a fab lab?
- Commercial activities can be prototyped and incubated in a fab lab, but they must not conflict with other uses, they should grow beyond rather than within the lab, and they are expected to benefit the inventors, labs, and networks that contribute to their success