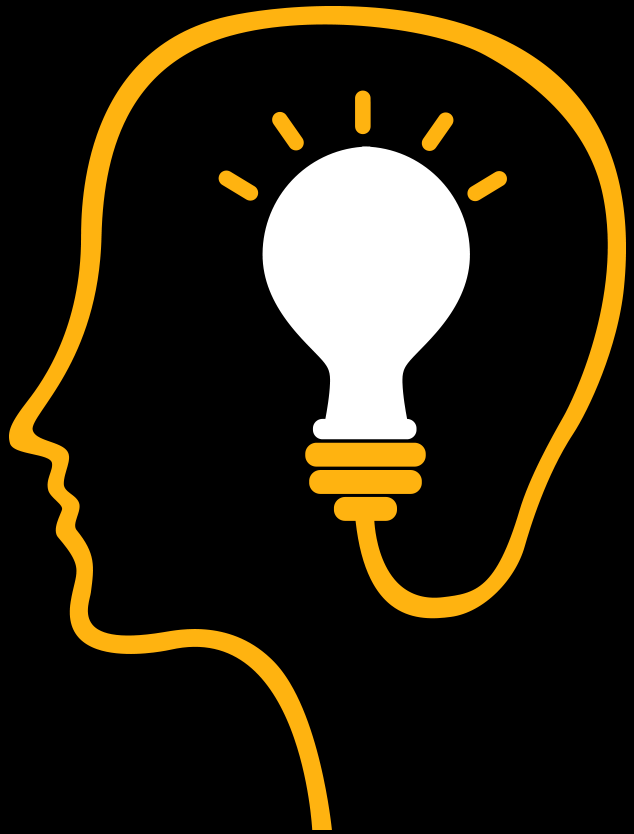
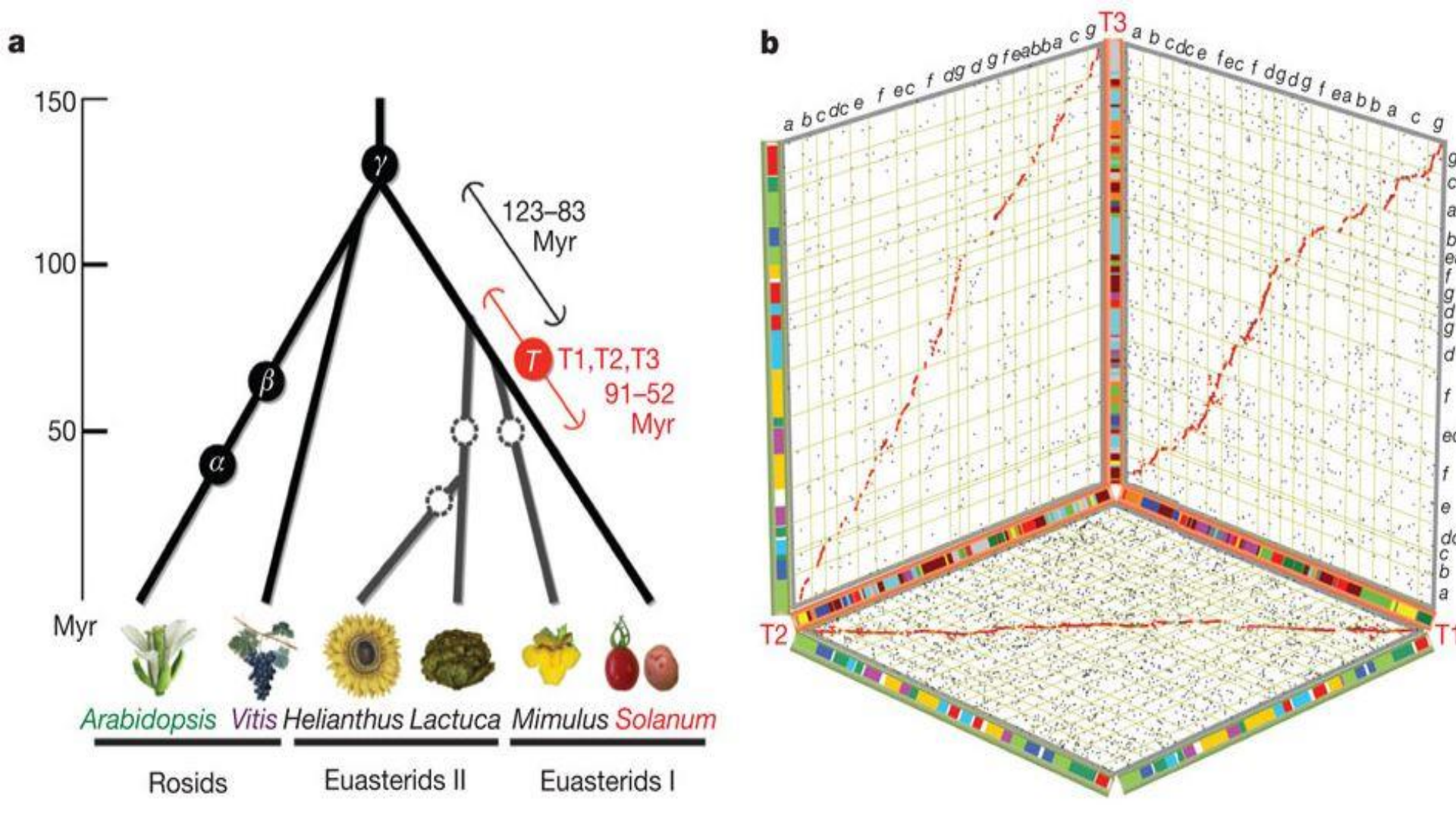
What is Innovation?

Michael M. Crow
Community Conversation
January 13, 2016




a
150
100
50
Myr
γ
β
α
123–83
Myr
T
T1,T2,T3
91–52
Myr
Arabidopsis
Vitis
Helianthus
Lactuca
Mimulus
Solanum
Rosids
Euasterids II
Euasterids I
b
T3
T2
T1

“If I had 20 days to solve a problem, I would spend 19 days to **define** it.

- Albert Einstein

Management
Excellence
Value
Disruptive
Need-based
Access
Design
Strategic
Entrepreneurship
Risk
Opportunity
Innovation
Impact
Problem-solving
Technology
Service
Research
Knowledge
Ideas
Growth
Solutions
Change
Discovery
Collaboration
Engineering

Innovation

- a new idea, device, or method

- the act or process of introducing new ideas, devices, or methods

Merriam-Webster 2015

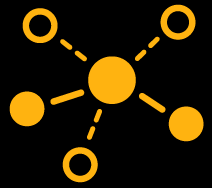
Types of Innovation

Tools

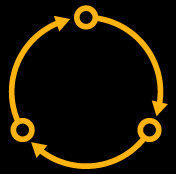
Push vs Pull

Technology and Products

Solutions



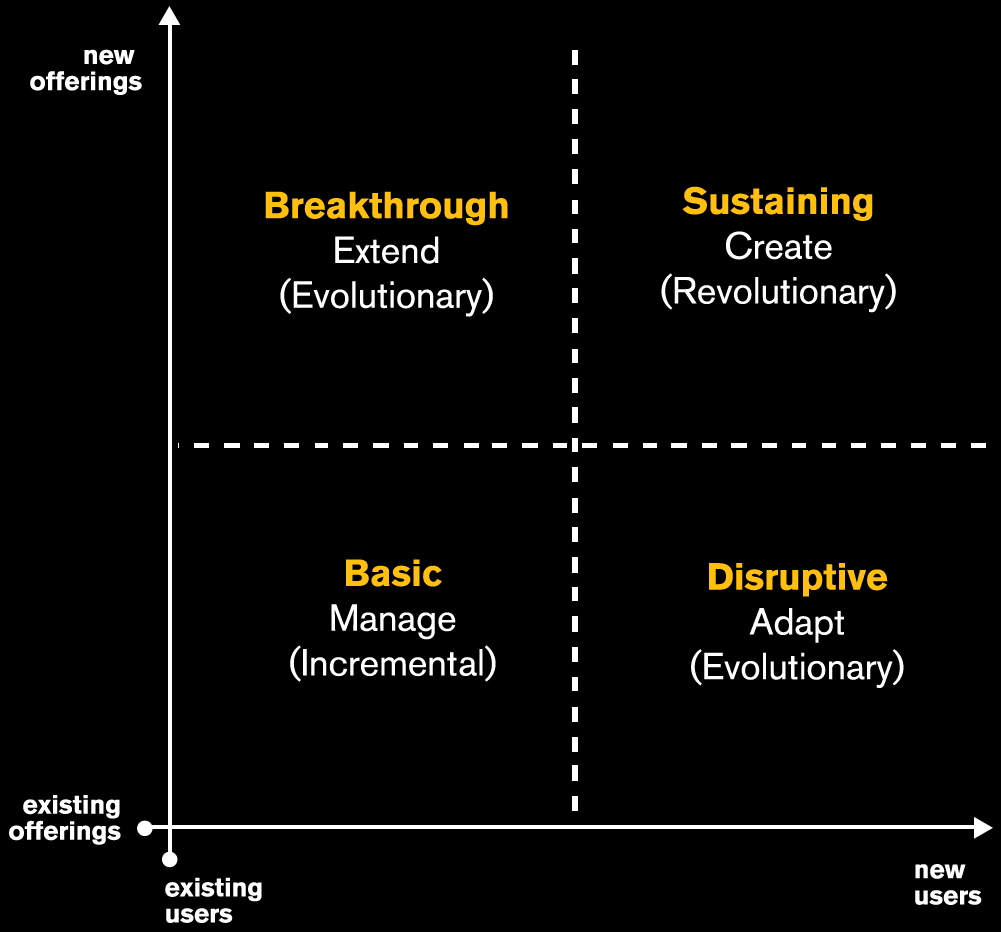
Organizational Models



Process

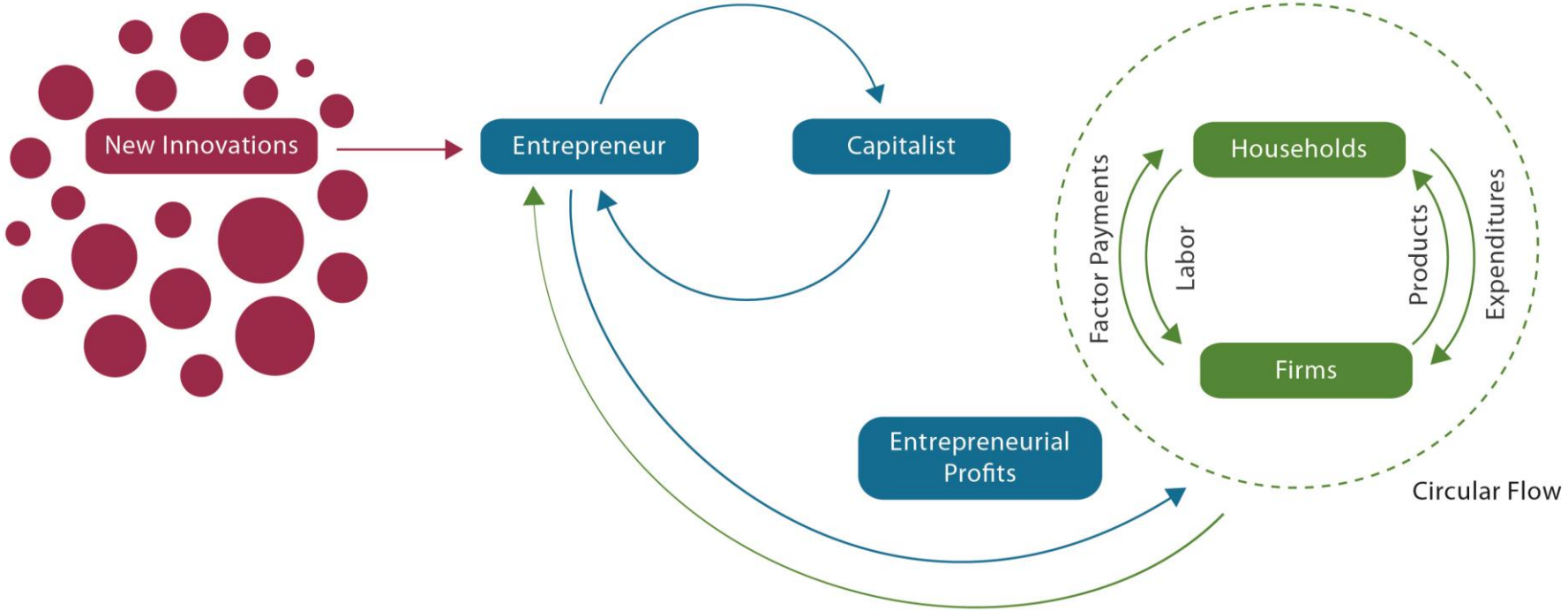
Design

Philosophies


new offerings
Breakthrough
Extend
(Evolutionary)
Sustaining
Create
(Revolutionary)
Basic
Manage
(Incremental)
Disruptive
Adapt
(Evolutionary)
existing offerings
existing users
new users

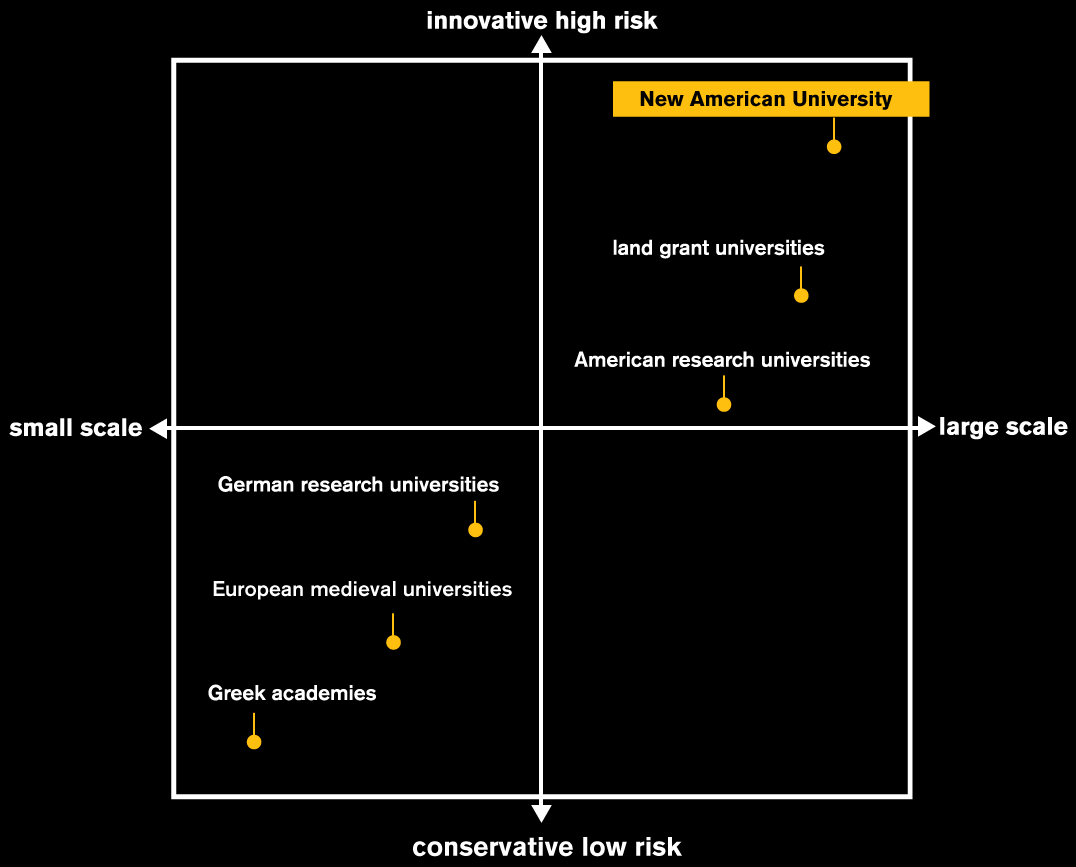
Creative Destruction

Shumpeterian Growth Model



University Innovation

Universities have commonly been associated with basic (or incremental) innovation.


innovative high risk
New American University
land grant universities
American research universities
small scale
large scale
German research universities
European medieval universities
Greek academies
conservative low risk

Innovation Outcomes

- Improved value
- Greater efficiency
- Enhanced productivity
- Satisfaction of market and national/public needs
- Greater competitiveness
- Beneficial partnerships
- Better outcomes
- Improved quality of life

Innovation at ASU

ASU Charter

ASU is a **comprehensive public research university**, measured not by whom it excludes, but by **whom it includes** and how they **succeed**; advancing **research and discovery** of public value; and assuming **fundamental responsibility** for the economic, social, cultural, and overall health of the **communities** it serves.

What does Arizona Want

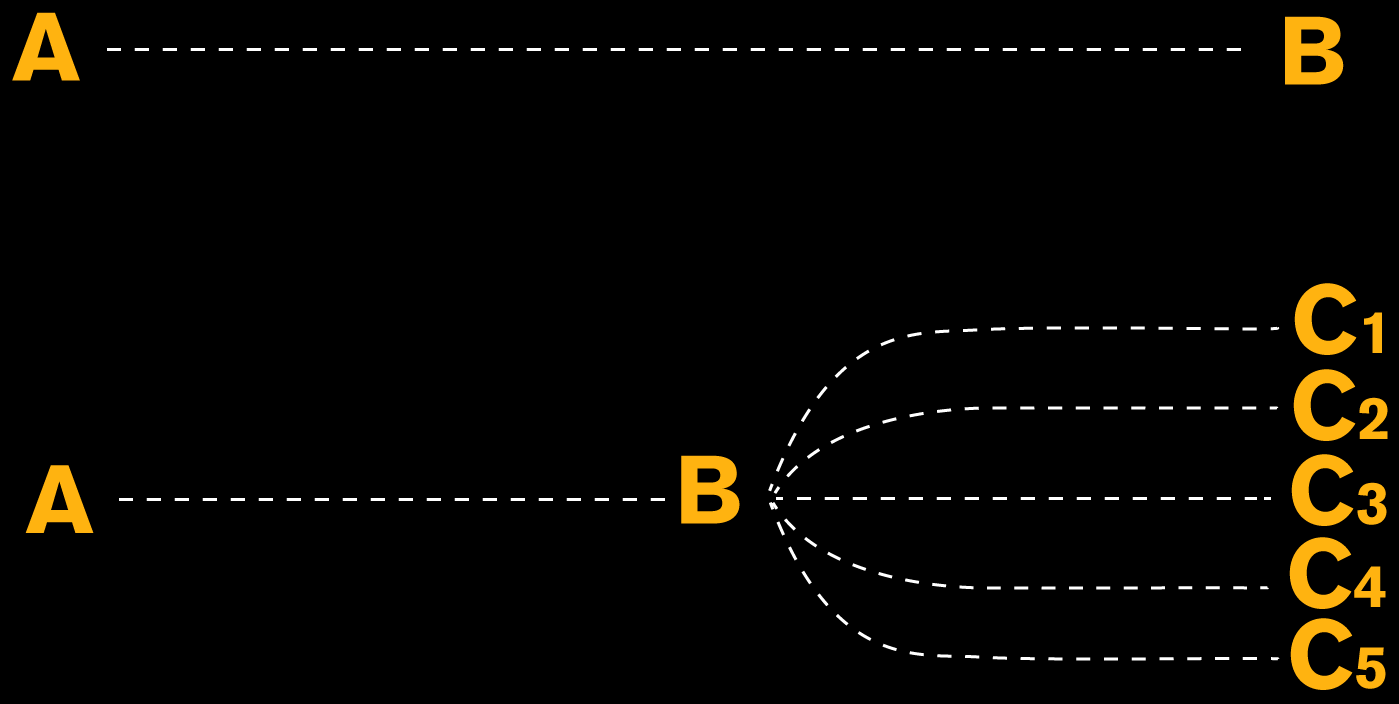
85

The percentage of Arizona voters who:

- Acknowledge the broader value of higher education
- Believe graduating more degree-holders will improve Arizona's economy
- Support a world-class education for all

Expect More Arizona, Arizona Statewide Public Opinion Survey, 2015

The ASU Pathway



ASU Outcomes

People

Ideas

Things

ASU Teaching and Learning Realms

01
Full Immersion
On-campus
Technology Enhanced

02
Digital Immersion
Online
Technology Enhanced

03
Digital Immersion
Massive Scale
Technology Enhanced

04
Education through Exploration
Technology Enhanced

Innovation across ALL disciplines and platforms

#1 in the U.S. for innovation

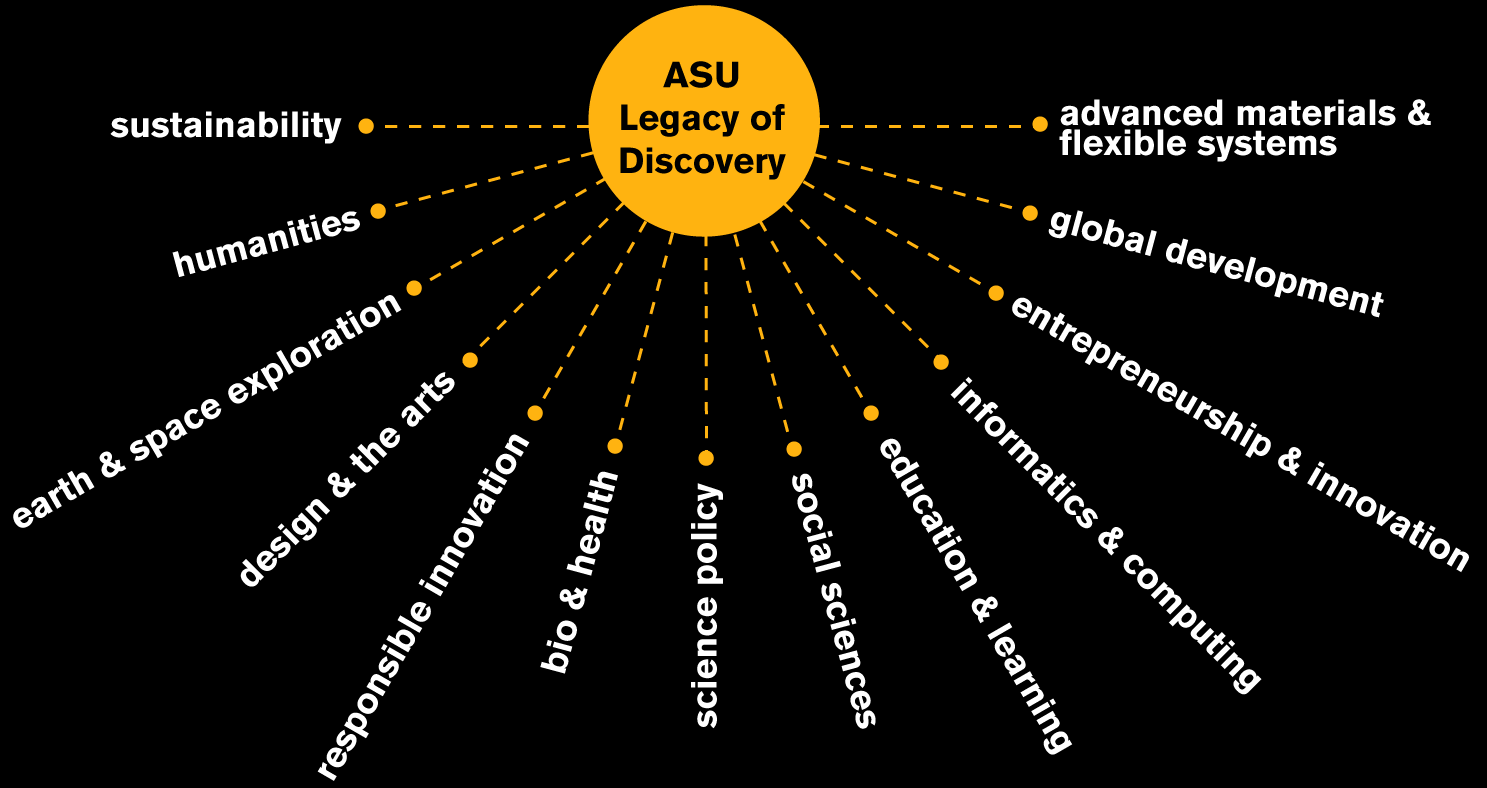
2016 U.S. News & World Report

#1 ASU

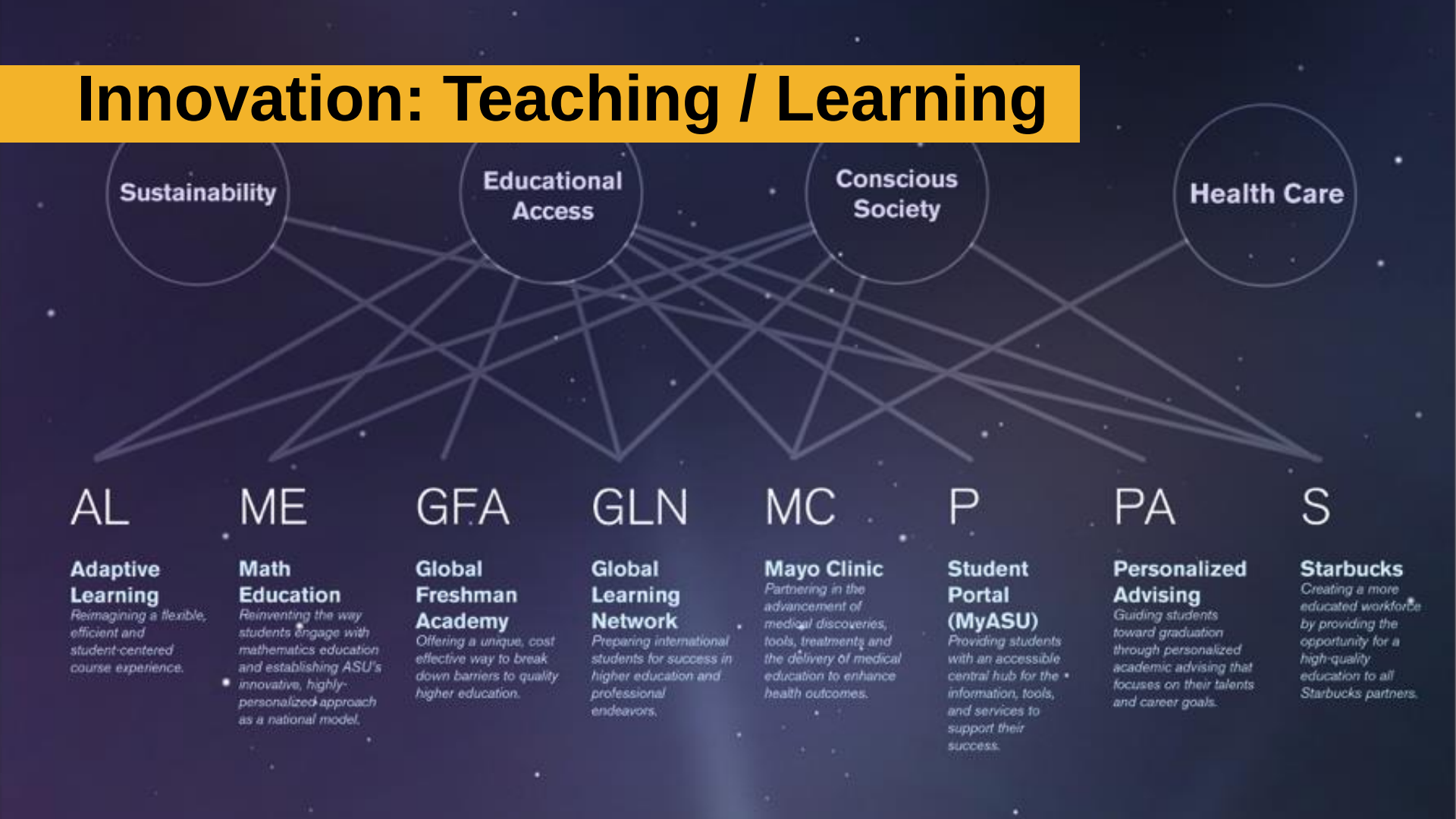
#2 Stanford

#3 MIT

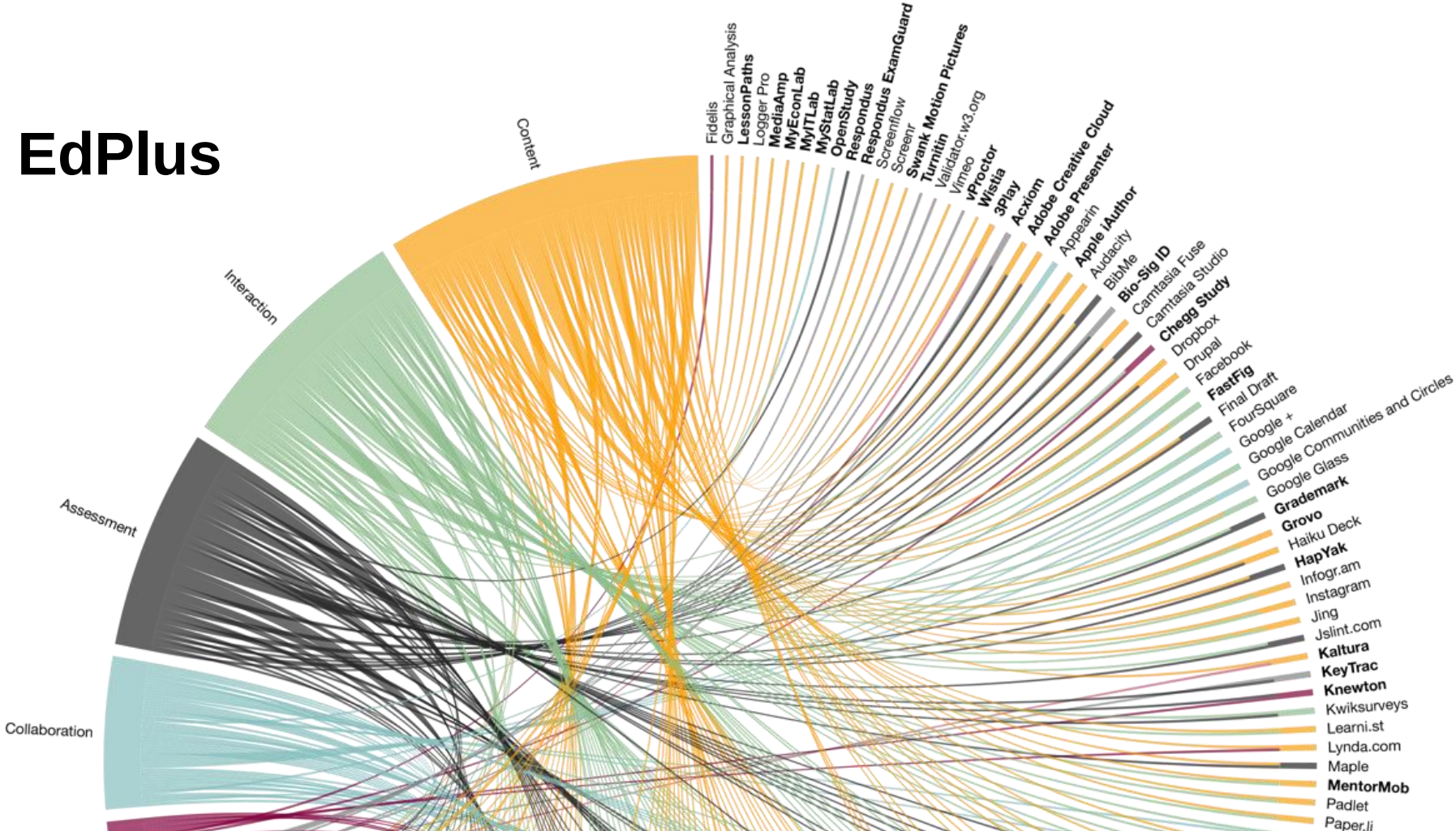
Innovation: Transdisciplinary Research



Innovation: Teaching / Learning



EdPlus

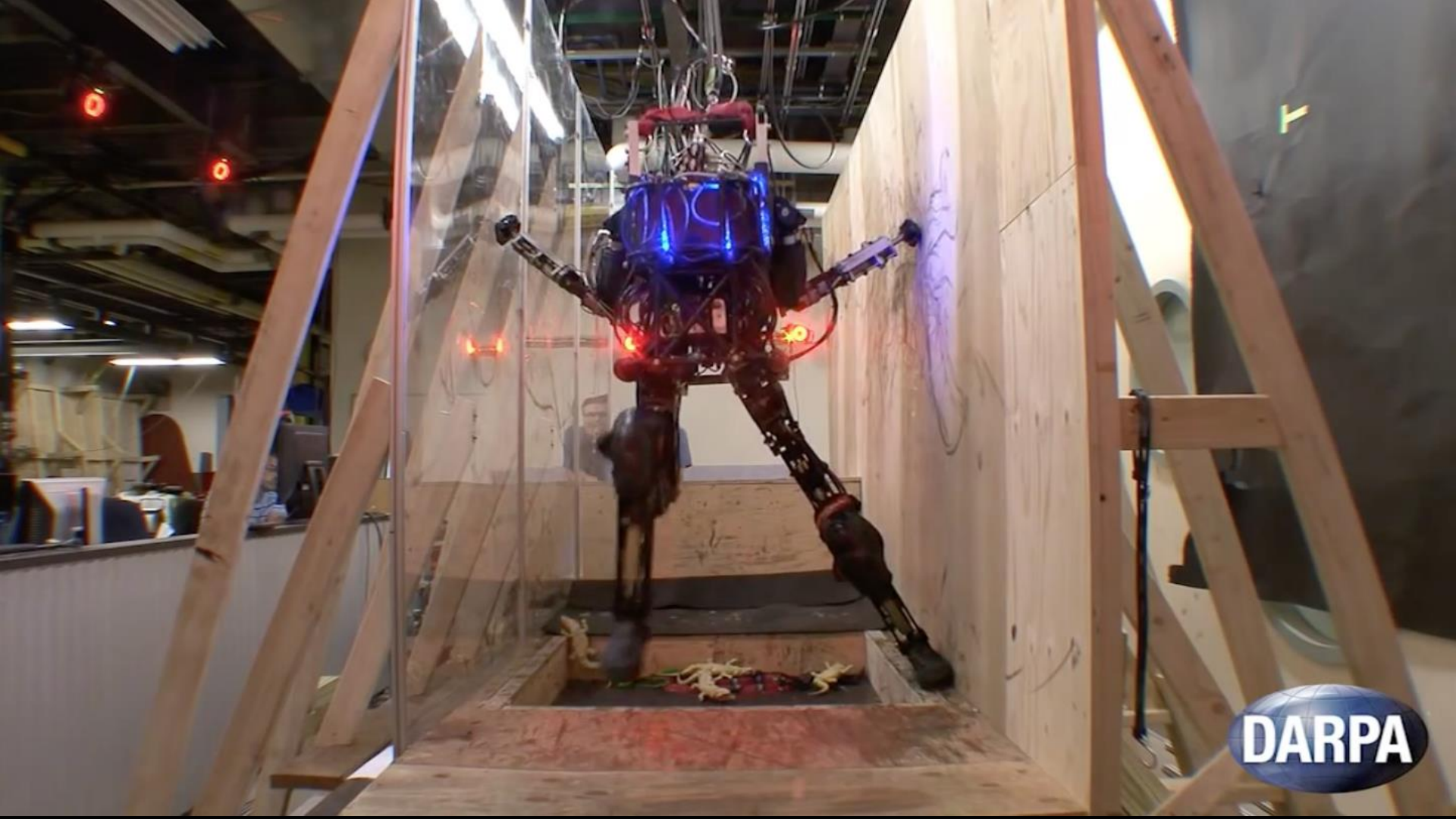

Content
Interaction
Assessment
Collaboration
Fidelis
Graphical Analysis
LessonPaths
Logger Pro
MediaAmp
MyEconLab
MyITLab
MyStatLab
OpenStudy
Respondus
Respondus ExamGuard
Screenflow
Screenr
Swank Motion Pictures
Turnitin
Validator.w3.org
Vimeo
vProctor
Wistia
3Play
Acxiom
Adobe Creative Cloud
Adobe Presenter
Appearin
Apple iAuthor
Audacity
BibMe
Bio-Sig ID
Camtasia Fuse
Camtasia Studio
Chegg Study
Dropbox
Drupal
Facebook
FastFig
Final Draft
FourSquare
Google +
Google Calendar
Google Communities and Circles
Google Glass
Grademark
Grovo
Haiku Deck
HapYak
Infogr.am
Instagram
Jing
Jslint.com
Kaltura
KeyTrac
Knewton
Kwiksurveys
Learni.st
Lynda.com
Maple
MentorMob
Padlet
Paper.li

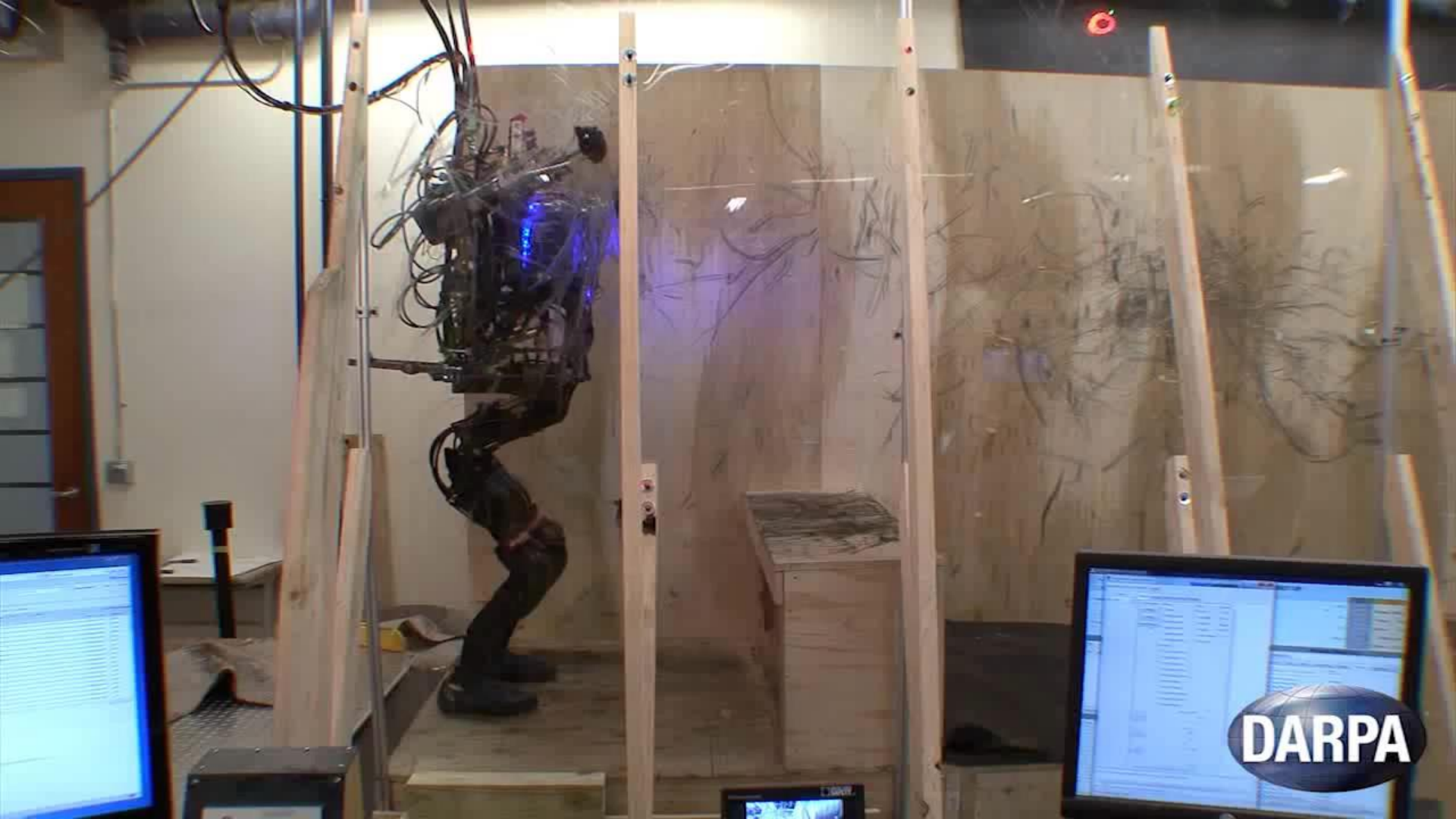
School for Future of Innovation in Society

Planning now for the kind of futures we want.

What knowledge needs to be produced for human betterment?

Can nanotechnology, synthetic biology, geoengineering and artificial intelligence be developed and governed responsibly? Should they be?


DARPA


DARPA

School for Future of Innovation in Society

Dave Guston

Darlene Cavalier

Andrew Maynard

Lee Gutkind

SFIS Faculty

Dave Guston (Yale/MIT)
Founding Director & Professor

Andrew Maynard (University of Cambridge)
Professor & Director, Risk Innovation Lab

Lee Gutkind (University of Pittsburgh)
Professor, Hugh Downs School of Communication & Writer in Residence, SFIS
“Godfather of creative nonfiction”

Darlene Cavalier (Temple and University of Pennsylvania)
Professor of Practice, CSPO & Founder, Science Cheerleader

Center for Science and the Imagination (CSI)

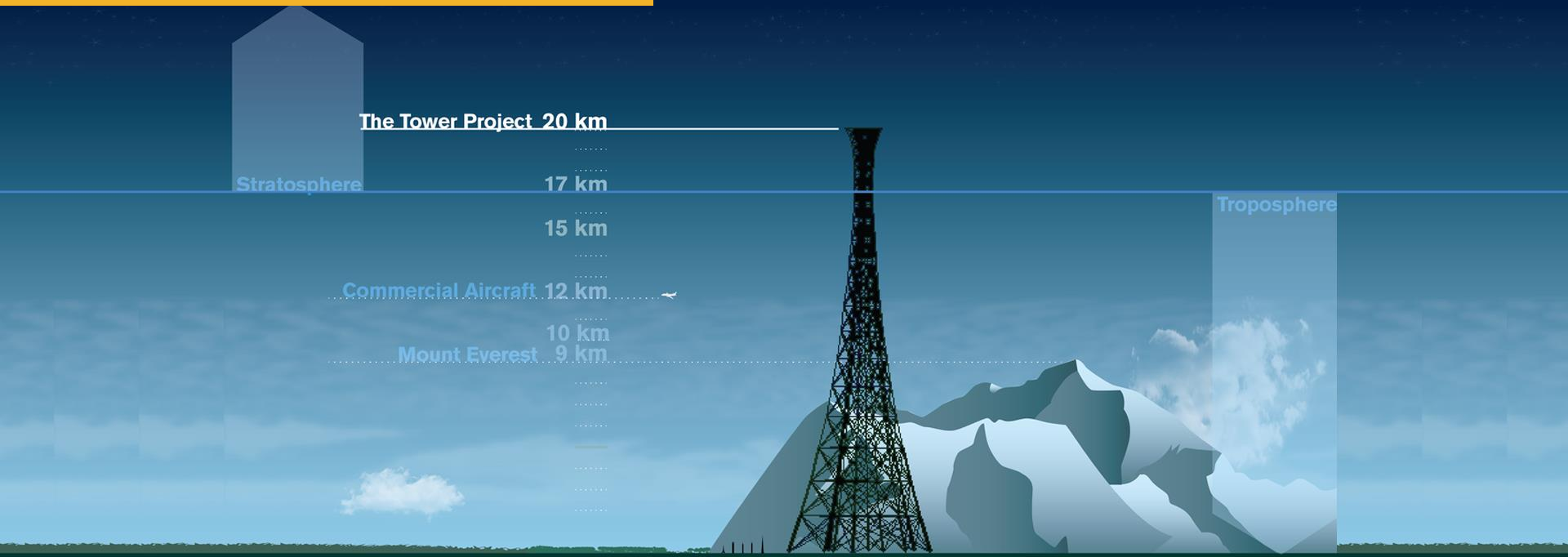
CSI convenes writers, artists and other creative thinkers to collaborate with scientists, artists, engineers and technologists to reignite humanity's grand ambitions for innovation.

Partners include Intel, NASA, the World Bank, the U.S. National Science Foundation.

Renowned futurist Brian David Johnson recently left Intel to join the CSI as its Futurist in Residence and SFIS as a Professor of Practice.

Brian David Johnson, Futurist in Residence and Professor of Practice

The Tower Project



School of Human Evolution and Social Change

In 2006, SHESC merged traditional archeology with programs in global health, mathematics, and the social sciences.

10 years later, it is a leader in experiential learning, related field technologies and global inquiry.

In 2015, SHESC anthropologist Sarah Mathew became an inaugural Carnegie Fellowship winner, receiving $200,000 to expand her research on culture and war.

Sarah Mathew, Assistant Professor

School of Earth and Space Exploration

In 2006, the separate departments of Geological Sciences, Physics and Astronomy were merged into SESE.

Research is organized by transdisciplinary themes, not methodologies.

An SESE team is now leading its first moon mission (2018), building a NASA-quality mini satellite to search for hydrogen.

Craig Hardgrove, Postdoctoral Research Associate
& Principal Investigator, LunaH-Map

NewSpace Initiative

Integrating academic and commercial space enterprises using ASU's core strengths in space science, engineering, and education.

Innovation: Teaching / Learning

Center for Education Through eXploration

New Teaching Philosophy:

- Explore the unknown instead of mastery of the known
- Focus on transdisciplinary questions instead of disciplinary silos
- Design, develop, deploy and research interactive, exploration-based learning using digital platforms and teaching networks.

Innovation: Teaching / Learning

Global Freshman Academy

Earn freshman credit after completing digital immersion courses hosted by edX and designed and taught by ASU.

More than 40,000 students from 163 countries participated in GFA since August 2015.

Global Freshman Academy

edX

Founded in 2012 by Harvard and MIT.

Mission: Increase access, teaching and learning innovation and the advancement of education through research.

ASU is an edX charter member, along with MIT, Harvard, Berkeley, Caltech and others.

Anant Agarwal, CEO, edX, & Professor, Electrical Engineering and Computer Science, MIT

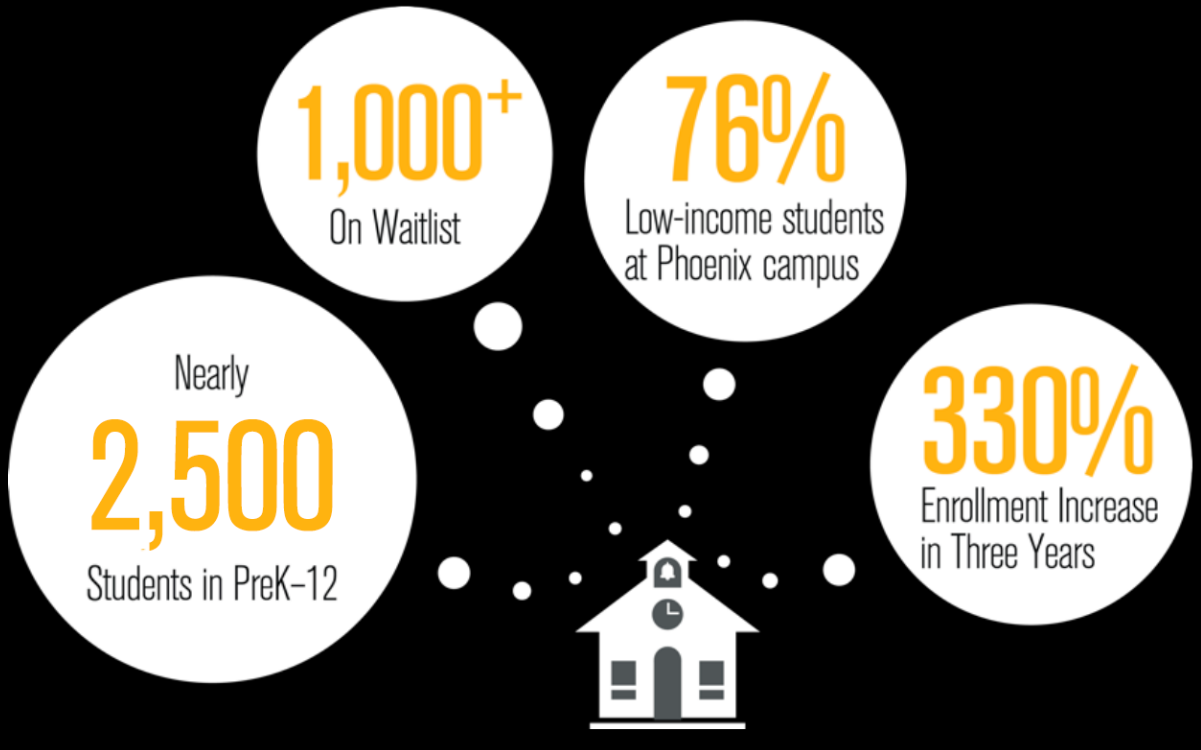
Innovation: K-12 Education

ASU Preparatory Academy

Two charter schools located in downtown Phoenix and East Mesa on the ASU Polytechnic campus.

Operating principles = “The Four Pillars”:

- Academics
- Partnership
- Leadership
- Innovation



ASU Preparatory Academy
ARIZONA STATE UNIVERSITY

ASU Preparatory Academy

Phoenix Performance

improved achievement levels across all grades

23% in Reading

3.7% overall average growth in state

24% in Math

3.6% overall average growth in state

Polytechnic Performance

outpaces the state on average across all grades by

20% in Reading

28% in Math

Innovation: Student Preparation

me3

Innovation: Human Capital

Starbucks College Achievement Plan

Launched in June 2014 and expanded to all Starbucks partners in April 2015

4 years of full tuition coverage to partners who attend one of ASU's 49 online degree programs

4,500 partners have enrolled to date

Goal: **25,000 graduates** by 2025

Mayo Clinic & ASU

Health Care

Medical Research

Education

MAYO CLINIC

ASU ARIZONA STATE UNIVERSITY

Innovation: Individual and Community Health

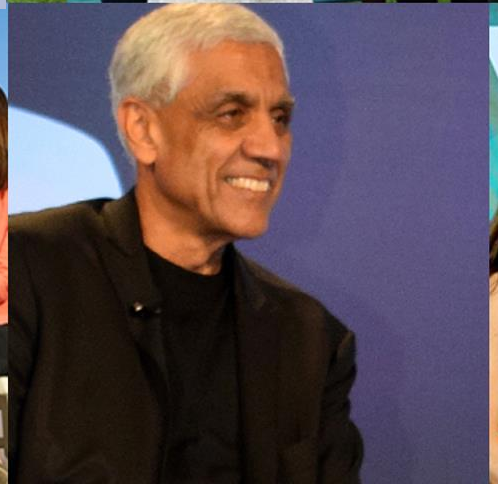
Mayo Clinic and ASU

- Shared facilities
- Collaborative research
- Shared faculty, appointments and graduate students
- Mayo Medical School in Arizona in collaboration with Arizona State University (2017)
- Joint education programs
- Joint seed-fund program
- Proton-beam therapy program
- School for the Science of Health Care Delivery

Innovation: Future of Education

2016 ASU GSV summit San Diego, California

"The **Must-Attend Event** for Education Technology Investors"
- The New York Times



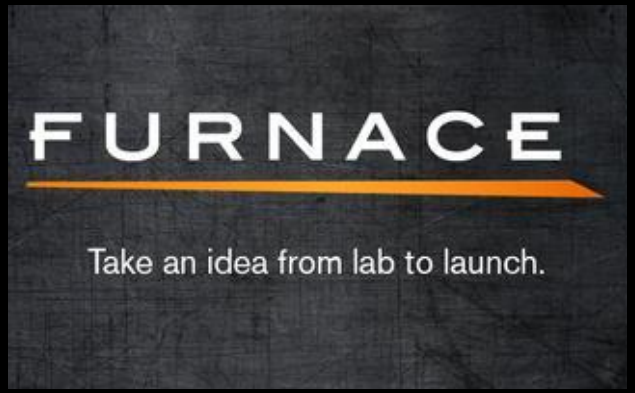
Culture of Innovation and Entrepreneurship

ASU Innovation Challenge

ASU Startup School

NeoLight
(jaundice technology)

Culture of Innovation and Entrepreneurship



Furnace

Entrepreneurship Outreach Network

Fluidic Energy

Technology Transfer

FY15:

- 270 invention disclosures
- 63 U.S. patents
- 12 new start-up companies
- 81 major licensing and option transactions

Spinout companies based on technologies developed by ASU researchers have raised over **$500 million** in external funding as of FY15.

FLUIDICENERGY™ heliae HealthTell™

Innovation: Private Sector Engagement

Microsoft

IBM

intel

Honeywell

at&t

Raytheon

BOEING

GENERAL DYNAMICS

LOCKHEED MARTIN

AMERICAN EXPRESS

JPMorganChase

WELLS FARGO

Bank of America

charles SCHWAB

StateFarm

KPMG

Innovation: Sharing Resources and Best Practices Globally to Benefit Arizona

Higher Engineering Education Alliance Program (HEEAP)

HEEAP

ASU IRA A. FULTON SCHOOLS OF engineering

intel

Sharing Resources and Best Practices

UNIVERSITY INNOVATION ALLIANCE

A unique consortium of public research universities established to help more students from all socioeconomic backgrounds graduate from college.

Sharing Resources and Best Practices

Our Future

The Future of ASU

The type of innovation that will revolutionize the future of education is not a tool, technique or device.

Real, meaningful disruptive innovation will come from **collaboration**.

We need your **ideas, engagement and advocacy** to help our students and Arizona to succeed.

For your ideas to grow

For your ideas to grow

ASU
ARIZONA STATE
UNIVERSITY