



## **1. Talent (*people*)**

students, faculty, staff- and provide environment and culture to flourish.

## **2. Value (*programs*)**

Continuously adding value to curriculum, programs, infrastructure.

## **3. Thought Leadership (*papers*)**

Grand Challenges on energy and sustainability, security and infrastructure, health and medicine, and scientific and technological discovery.

## **4. Innovation and Impact (*patents, practices, prototypes*)**

Campus, Silicon Beach, Southern California, the United States, and the World.



- › Energy, Water, Air, Food
- › Basic Maslow Hierarchy Need
- › Individual, School, Campus, City, Region, Country, Planet
- › The era of convergence and the 4<sup>th</sup> Industrial Revolution.

Convergence

*of physical, chemical, geological, biological, behavioral and social phenomena*



## Findings and Action

- › Proposed to the Provost a UCAR-like Review for SWOT Analysis (Summer 2017)
- › Received and helped revise proposal on a Center for Sustainable Solutions (Fall 2018)
- › Received and coordinates reaching consensus on a variety of research topics from Dornsife faculty including related to the Wrigley Institute (Fall 2018)
- › Reached consensus on a USC-Wide Grand Challenges Scholars Program (January 2019)
- › On-going faculty conversations on programmatic support (Spring 2019)

Note: The committee paused deliberations in Spring 2018 awaiting for some key faculty hire.

\*Yortsos (chair), Ellis, Holder, Knott, Miller (established Fall 2016)



Not addressed but in need of addressing

- › Instructional USC-wide Programs
- › Articulating Grand Challenges for Sustainability
- › Operational sustainability related to USC (campus-wide)

\*Yortsos (chair), Ellis, Holder, Knott, Miller (established Fall 2016)

# WHY GRAND CHALLENGES?

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Powerful, Fast Evolving, Convergent Technology  
Allows Us to Set Achievable Goals for all Humanity

*Choosing Goals is an Ethical Question*



Make solar energy economical



Provide energy from fusion



Develop carbon sequestration methods



Manage the nitrogen cycle



Provide access to clean water



Restore and improve urban infrastructure



Advance health informatics



Engineer better medicines



Reverse-engineer the brain



Prevent nuclear terror



Secure cyberspace



Enhance virtual reality



Advance personalized learning



Engineer the tools of scientific discovery



GRAND CHALLENGES  
FOR ENGINEERING



# MASLOW'S HIERARCHY OF NEEDS



## SUSTAINABILITY

Make Solar Energy Economical, Provide Energy from Fusion.  
Develop Carbon Sequestration Method  
Provide Access to Clean Water



## SECURITY

Secure Cyberspace, Prevent Nuclear War  
Urban Infrastructure



## HEALTH

Engineer Better Medicines, Advance Regenerative Medicine  
Engineer the Brain



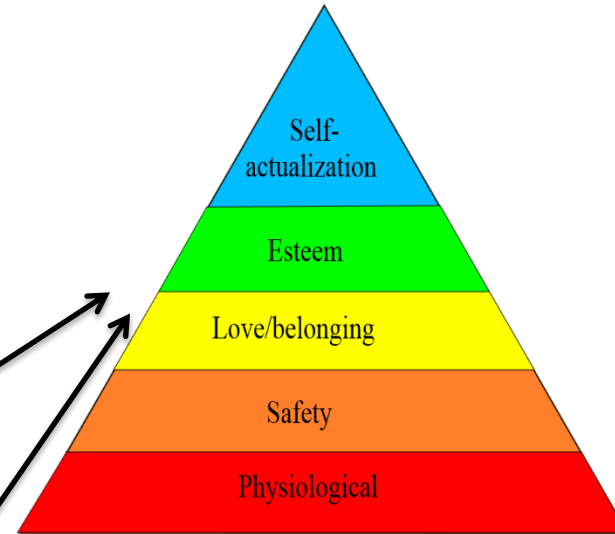
## ENRICHING LIFE

Enhance Virtual Reality, Advance Personalized Learning, Engineer the Tools of Scientific Discovery



## SOCIETAL ORGANIZATION?

Exploiting Social Phenomena (Through Digital Media, etc.: BIG DATA)

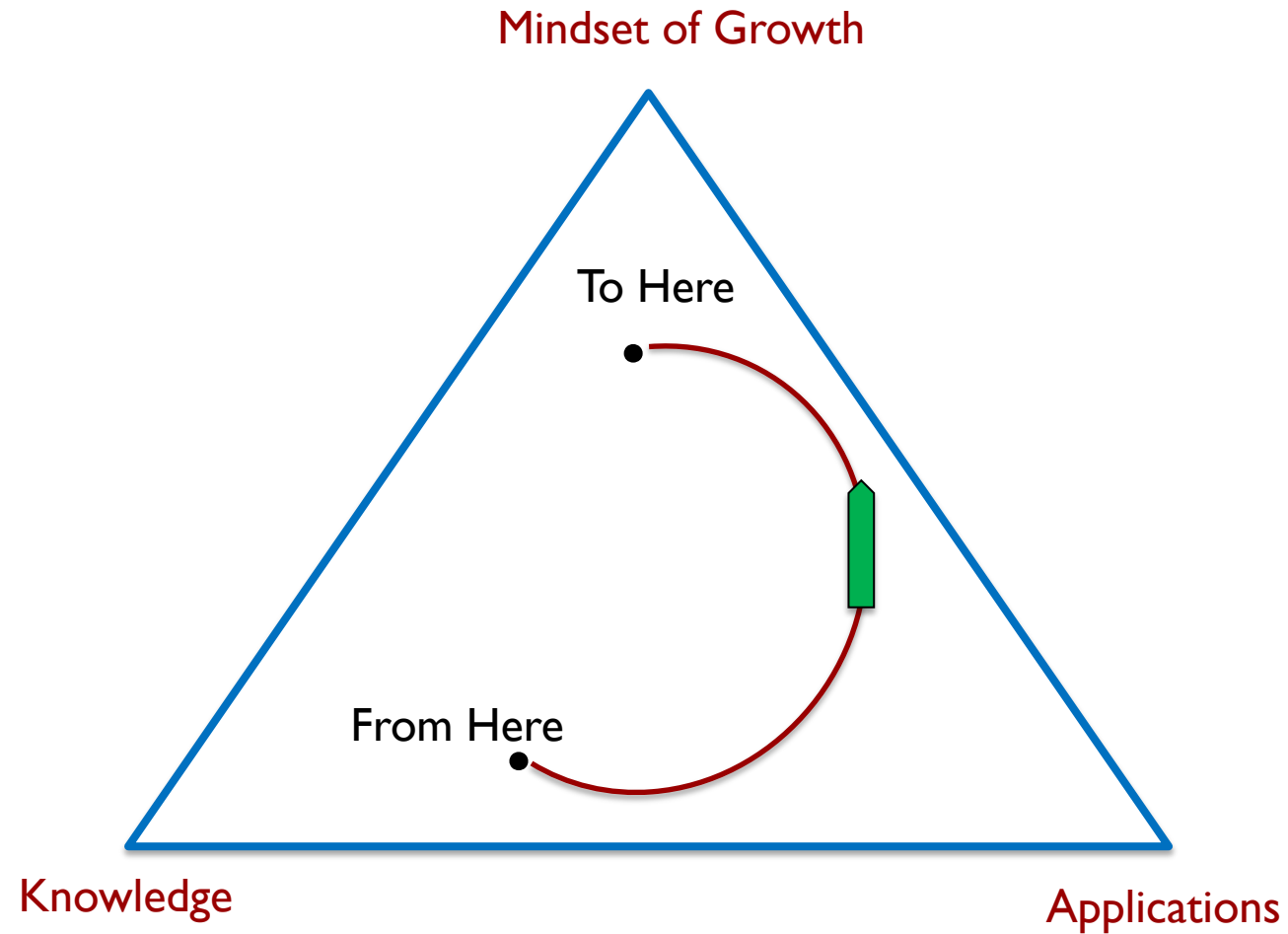




# WHY A GRAND CHALLENGES SCHOLARS PROGRAM?

*The need to cultivate mindsets in addition to  
Skills and Knowledge*







Conceived in 2009 (USC, Duke, Olin):  
Adopted by > 80 schools nationwide: Now an NAE signature program

Consistent with WEF report on added skills for the 21<sup>st</sup> century:  
Creativity, Leadership, Perseverance  
Consistent with the *Engineer of 2020*

## **CULTIVATES FIVE MINDSETS**

- 1. Research/creative**
- 2. Multidisciplinary**
- 3. Entrepreneurial**
- 4. Cultural**
- 5. Society conscious**



**EXPONENTIAL TECHNOLOGY BRINGS DISRUPTION  
REQUIRES AGILITY AND ADAPTABILITY – AND *NEW MINDSETS***



**THE FIVE MINDSETS OF CHANGE TO THRIVE IN TODAY'S WORLD**

And to Solve Grand Challenges

- 1 HUG THE EXPONENTIAL**  
Superb Technical Skills and Knowledge to Lead the Exponentially Changing Technology
- 2 ENGINEERING +: CHANGE THE CONVERSATION ABOUT ENGINEERING**  
Engineering + X where X is anything (particularly, human-centric)  
Who we are, what we do and what we look like.
- 3 INNOVATION IN THE BROADEST SENSE**  
Innovation and Entrepreneurship, to help create the new markets,  
the new jobs and to design the new self.
- 4 THE CULTURAL MIND**  
Cultural Awareness (with culture broadly interpreted), to help thrive in  
today's fast changing world.
- 5 HEROIC ENGINEERING**  
Awareness of the Impact of Engineering to Society  
(and the importance of technology ethics).



# CONVERGENCE CHALLENGES

*“Culture wants to be enduring and prevailing”*

*from Antonio Damasio’s “The strange world of things” (2018)*

