A SSEBE Welcome

Ram M. Pendyala, PhD
Professor, Transportation Systems
Director, TOMNET – A USDOT-Sponsored Tier 1 University Transportation Center
Interim Director, School of Sustainable Engineering and the Built Environment

ASU is a **comprehensive public research university**, measured not by whom we exclude, but rather by **whom we include 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.**


ASU ARIZONA STATE UNIVERSITY
new american university
ASU's design aspirations
Leverage Our Place
Transform Society
Value Entrepreneurship
Conduct Use-Inspired Research
Enable Student Success
Fuse Intellectual Disciplines
Be Socially Embedded
Engage Globally


#1 in innovation
Four Two years in row, U.S. News and World Report

We build engineers and inspire innovators.

OUR TRANSDISCIPLINARY PARTNERS AT ASU

School of Arts, Media and Engineering
Herberger Institute for Design and the Arts

School of Earth and Space Exploration
College of Liberal Arts and Sciences

The Biodesign Institute

College of Integrative Sciences and Arts

Global Security Initiative

School for the Future of Innovation in Society

Julie Ann Wrigley Global Institute of Sustainability

School of Sustainability

W. P. Carey School of Business

School of Biological and Health Systems Engineering

Marco Santello, Director

918 students
759 undergraduate
159 graduate

Biomedical Engineering
Biological Design

School of Computing, Informatics, and Decision Systems Engineering

Sandeep Gupta, Director

6,735 students
5,276 undergraduate
1,459 graduate

Computer Engineering
Computer Science
Computer Systems Engineering
Engineering Management
Industrial Engineering
Informatics
Robotics
Software Engineering

School of Electrical, Computer and Energy Engineering

Steve Phillips, Director

3,324 students
2,340 undergraduate
984 graduate

Electrical Engineering
Computer Engineering
Robotics

School for Engineering of Matter, Transport and Energy

Lenore Dai, Director

3,820 students
3,154 undergraduate
666 graduate

Aerospace Engineering
Chemical Engineering
Materials Science and Engineering
Mechanical Engineering
Robotics
Solar Energy Engineering and Commercialization

School of Sustainable Engineering and the Built Environment

Ram Pendyala, Interim Director

1,743 students
1,321 undergraduate
422 graduate

Civil Engineering
Construction Engineering
Construction Management
Environmental Engineering
Sustainable Engineering

The Polytechnic School

Ann McKenna, Director

5,454 students
5,088 undergraduate
366 graduate

Aviation programs
Engineering programs
Environmental and Resource Management
Global Technology and Entrepreneurship
Graphic Information Technology
Human Systems Engineering
Information Technology
Robotics
Management of Technology
User Experience

Fall 2018 Enrollment (estimated)

25 undergraduate programs ▪ 41 graduate programs ▪ 2 campuses+online

FSE Progress since 2009

Investment fuels growth and success

Graduation rates have doubled over the last six years.

Freshman retention rate increased from 85% to 90% in the same time frame.

One in five ASU students is enrolled in the Ira A. Fulton Schools of Engineering.

Total enrollment

6,407	22,367
Fall 2009	Fall 2018 est.

Undergraduates

4,253	17,940
Fall 2009	Fall 2018 est.

Graduates

2,154	4,427
Fall 2009	Fall 2018 est.

Degrees granted

1,391	4,197
2008-2009	2017-2018

Research expenditures

$73M	$104M
FY2009	FY2018

T/TT faculty

214	350
Fall 2010	Fall 2018

SSEBE Progress since 2009

Total enrollment

1,091
Fall 2009

1,734
Fall 2018 est.

Undergraduates

886
Fall 2009

1,321
Fall 2018 est.

Graduates

206
Fall 2009

422
Fall 2018 est.

Degrees granted

205
2009-2010

440
2017-2018

Research Expenditures

$7.4M
FY 2009

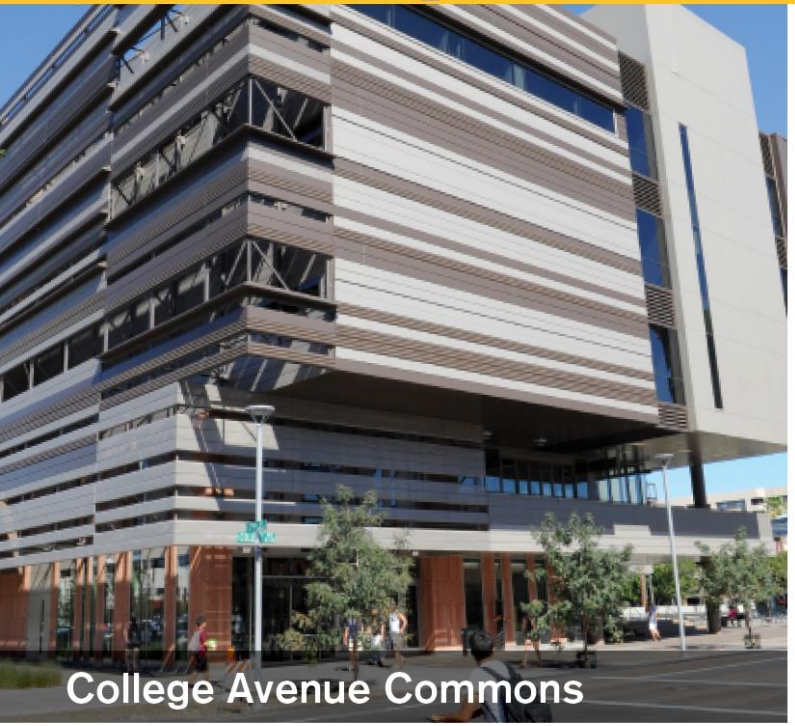
$18.2M
FY 2018

T/TT faculty

30
Fall 2009

52
Fall 2018

use-inspired research


College Avenue Commons

New facilities 3-D Print Lab, New Tutoring Center, Generator Labs, College Avenue Commons, New residential community under construction

$98.3M research awards

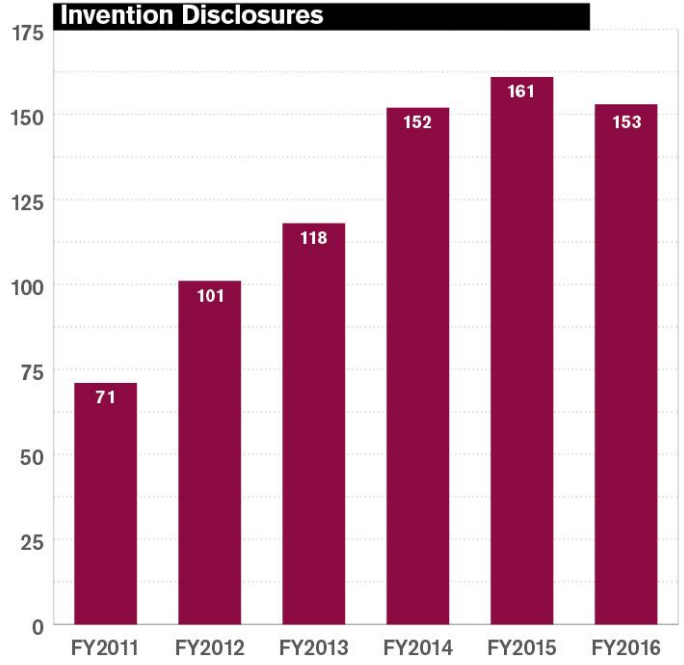
$99.4M research expenditures FY2016

1,000+ students conducting research

7 startups

26 patents

22 major agreements




school of
sustainable engineering
and the built environment
CASE
CASE
GEHL

school of sustainable engineering and the built environment

- del e. webb school of construction
- civil, environmental and sustainable engineering
- construction engineering
- environmental engineering

Ranking of programs in US

US News and World Report

civil engineering (UG=24; Grad=30)
construction management (top 3)
construction engineering (top 5)
environmental engineering (Grad=13)

data snapshot

enrollment

1702 total enrollment

1285 undergraduate students

417 graduate students

278 M.S./139 Ph.D.

faculty

47 **tenured and tenure-track** faculty

6 lecturers

8 research faculty

3 professor of practice

student profile

25/1157 ACT/SAT

11% Barrett Honors students

21% female

22% international

31% underrepresented minority

69 Accelerated Bachelor's plus Master's Program students (4+1)

Scholars: Udall, Fulbright, Eisenhower

Global Engagement
Engineers Without Borders, Bridges to Prosperity, US/Mexico Border Water Training Program

22% of FTF first generation

our vision

To be an acknowledged, world-wide innovator in producing leaders, pioneering solutions, and new knowledge for the betterment of human-kind.

We will be the leading source of Civil, Sustainable, Environmental and Construction engineers and managers in the U.S. Southwest.

our mission

To educate students and develop new knowledge and understanding in order to advance engineering and construction processes to achieve sustainability in the built environment.

We do this by focusing on five thematic thrust areas:

- Sustainability
- Energy
- Health
- Security
- Education

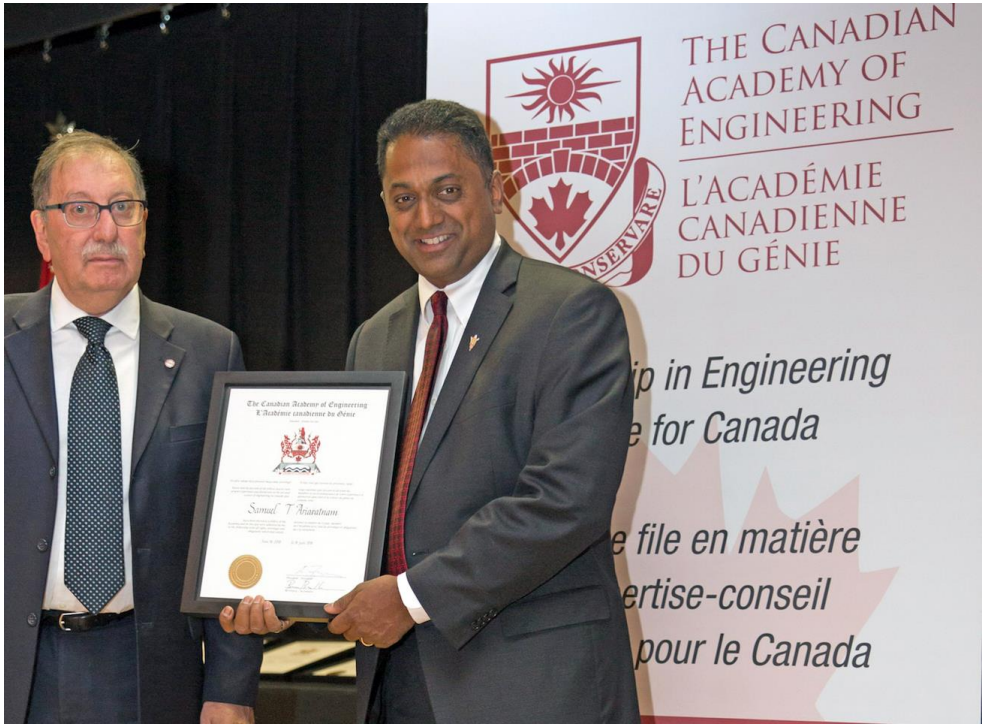
Acting locally, thinking globally

Evvan Morton has spent the past four summers in Belize creating a sustainable waste management system and working with local school teachers.

Award Winning Faculty

Bruce Rittmann wins 2018 Stockholm Water Prize for pioneering wastewater treatment

Sam T. Ariaratnam inducted into the Canadian Academy of Engineering as Fellow



NSF Engineering Research Centers (SSEBE)

- Ed Kavazanjian and his team, leading a project entitled: **"NSF Engineering Research Center for *Bio-Mediated and Bio-Inspired Geotechnics*"**
  - $18.5 million over five years
  - Partners: ASU, UC-Davis, NMSU, Ga Tech
  - https://engineering.asu.edu/cbbg/

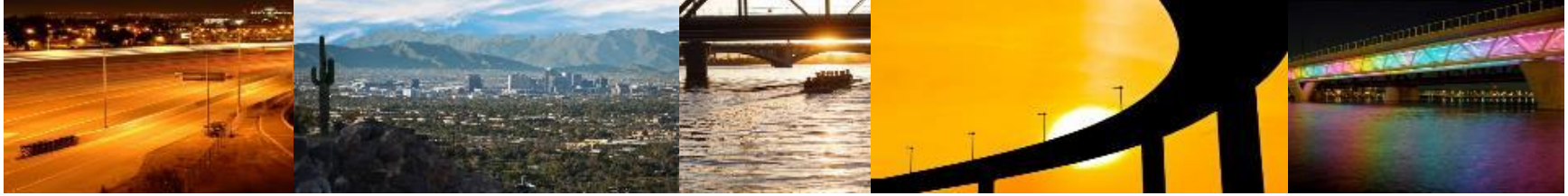
- Paul Westerhoff and his team, subcontracting with a Rice-led initiative entitled: **"NSF Engineering Research Center for *Off-Grid Nanotechnology Enabled Water Treatment (NEWT)*"**
  - ~$3.2 million over five years
  - Partners: Rice, ASU, Yale, UTEP
  - http://www.newtcenter.org

Examples of Centers in SSEBE - a Wide Variety of Engineering Research Activites

- Ram Pendyala and his team lead the **USDOT Tier 1 Transportation Center "Teaching Old Models New Tricks (TOMNET)"**
  - Partners: ASU, Georgia Tech, U of Washington, Univ of South Florida
  - https://www.tomnet-utc.org/

- Kamil Kaloush and his team lead the **"National Center of Excellence on SMART Materials for Urban Climate and Energy"**
  - Impact: Technology, Material, Business and Policy Innovations
  - https://ncesmart.asu.edu/

- Rolf Halden and his team lead **"ASU's Biodesign Center for Environmental Health Engineering"**
  - Impact: Ban Triclocarbon and Triclosan



Welcome to TOMNET

Some Insights on Traveler Behavior and Values

TOMNET Transportation Center
Teaching Old Models New Tricks

MARG

http://tomnet-utc.org

http://mobilityanalytics.org

Ira A. Fulton Schools of Engineering
Arizona State University

What is TOMNET?

- US Department of Transportation sponsored research center (2016-2022)
- Funding provided for five years ($7 million with $3.5 million cost share)
- First University Transportation Center (UTC) led by a university in Arizona
- First University Transportation Center (UTC) dedicated to *travel behavior* research
  - Data collection, assembly, and curation
  - Research and publications
  - TOMNET Scholar initiative
  - Training and technology transfer – partnerships with agencies and industry
  - Education and workforce development

Georgia Tech
Georgia Institute of Technology
Atlanta, GA

USF
UNIVERSITY OF SOUTH FLORIDA
University of South Florida
Tampa, FL

UNIVERSITY of WASHINGTON
University of Washington
Seattle, WA

TOMNET Mission

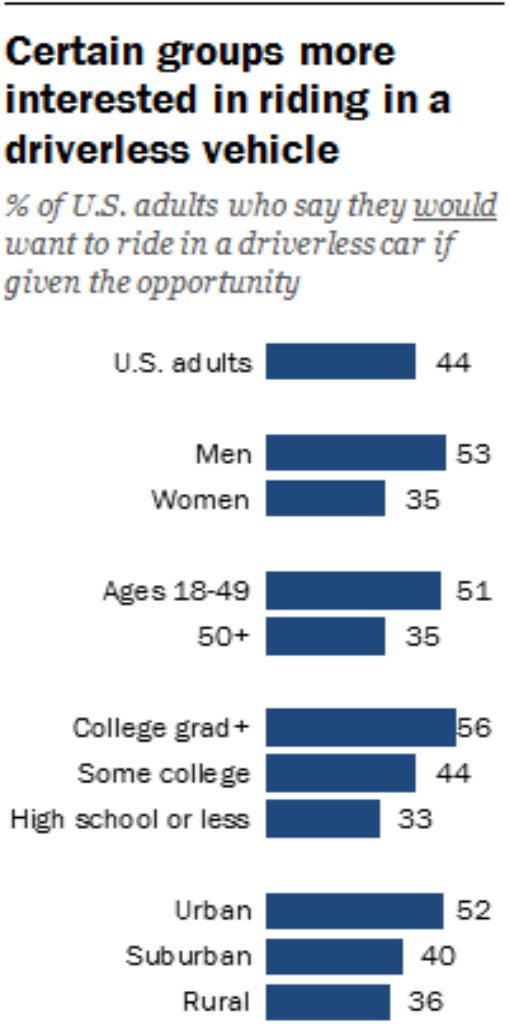
- Identify the most promising approaches for integrating attitudes, values, and perception variables in regional transportation planning and forecasting models
- Enhance behavioral realism in travel demand models, recognizing heterogeneity in the population
- Exploration of various machine learning and statistical data fusion approaches, involving application topics such as
  - Vehicle ownership and use
  - Adoption of autonomous vehicles and ride-hailing services
  - Safety
  - Resilience
  - Active transportation and built environment choices
  - Pricing policies
  - Long distance travel

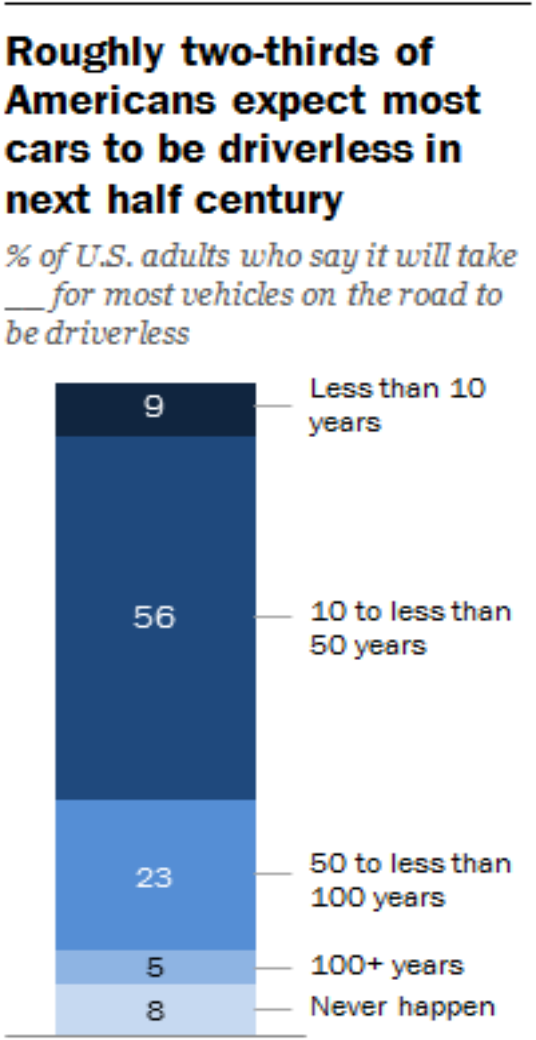
Workforce Development: High School Students Summer Activity at ASU

Ira A. Fulton Schools of Engineering
Arizona State University

"Just over half of Americans would not want to ride in a driverless vehicle if given the opportunity; a lack of confidence/trust in robotic decision-making and general safety concerns lead their list of worries"

Sources:
http://www.pewinternet.org/2017/10/04/americans-attitudes-toward-driverless-vehicles/

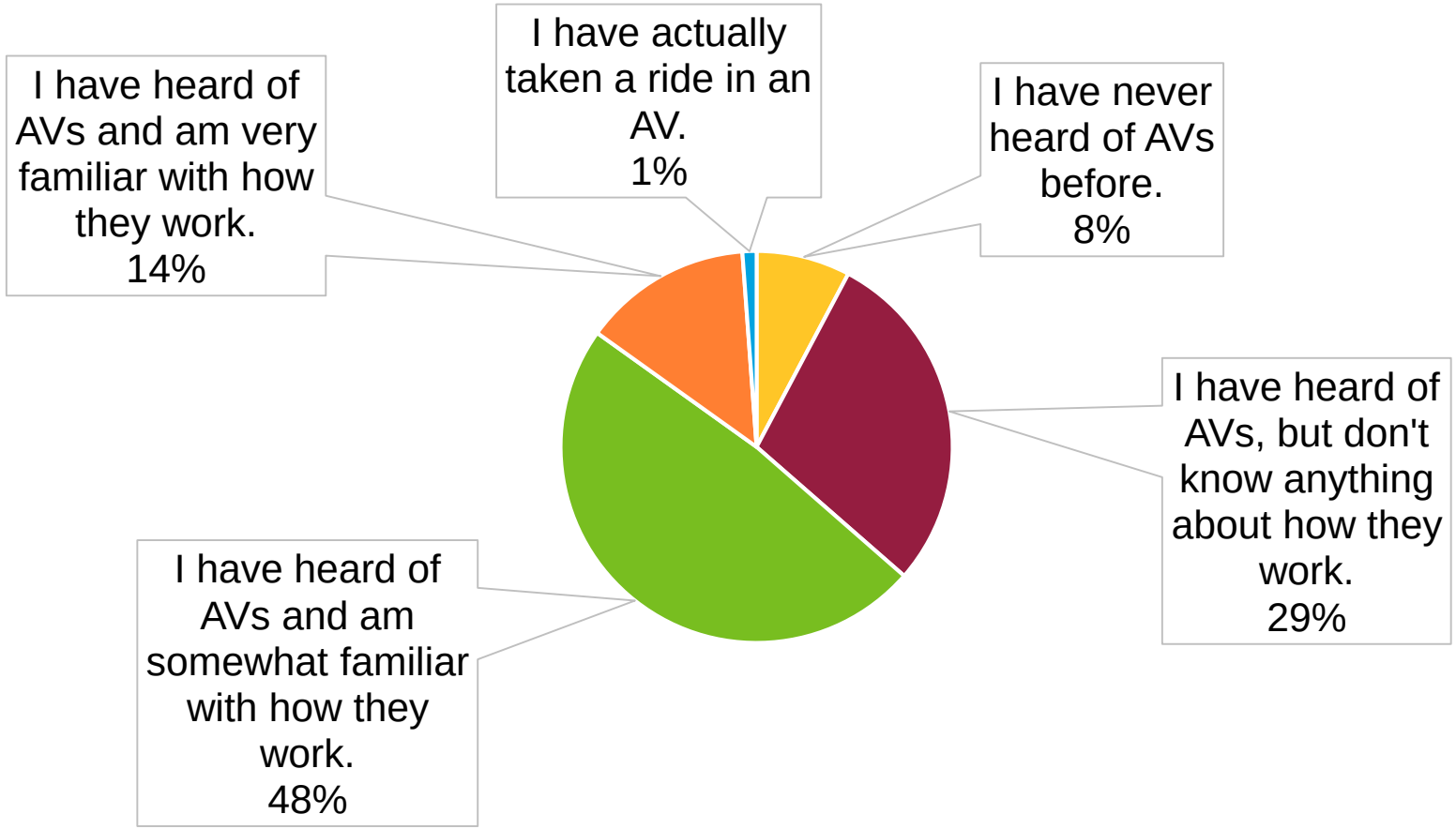


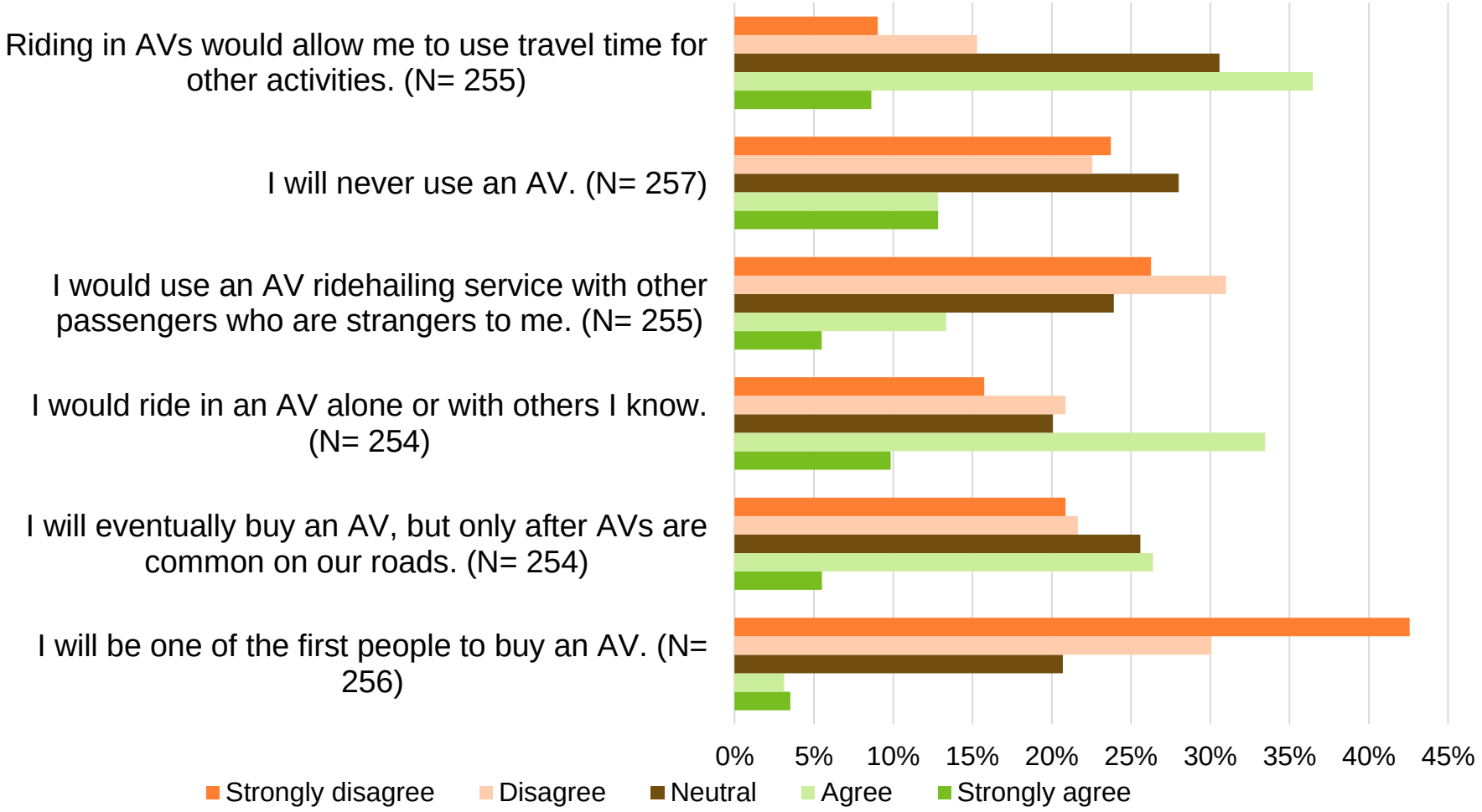


Pilot Survey Underway

- Detailed survey on ride-hailing services and autonomous vehicles
  - 2500 paper surveys mailed out
    - Can return via mail
    - Can go online to complete survey
  - 3500 e-mail addresses received invitation to participate
    - Can click on link to complete survey
  - Received 260 responses to date

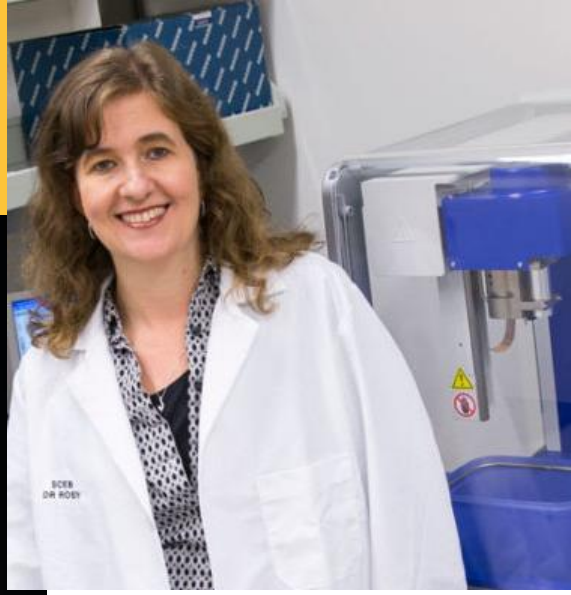
Familiarity with AVs (N=258)




Riding in AVs would allow me to use travel time for other activities. (N= 255)
I will never use an AV. (N= 257)
I would use an AV ridehailing service with other passengers who are strangers to me. (N= 255)
I would ride in an AV alone or with others I know. (N= 254)
I will eventually buy an AV, but only after AVs are common on our roads. (N= 254)
I will be one of the first people to buy an AV. (N= 256)
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%
Strongly disagree
Disagree
Neutral
Agree
Strongly agree

Oceans: How One Life Powered by ASU Can Change the World

The key to fighting autism might lie not in the mind, but in the gut



Microbiota Transfer Therapy Schedule
(under medical supervision)

Vancomycin + bowel cleanse (2 weeks), fecal microbiota transplant (8 weeks), and post-treatment (8 weeks)

~80% reduction of GI symptoms (constipation, diarrhea, abdominal pain) and ASD symptoms improved significantly

A recent study by ASU Biodesign researchers Rosa Krajmalnik-Brown, Dae-Wook Kang, and James Adams (Engineering) evaluated the impact of Microbiota Transfer Therapy (MTT) on gut microbiota composition and gastrointestinal (GI) and Autism Spectrum Disorders (ASD) symptoms of 18 ASD-diagnosed children. Material used for the transfer was screened for infectious diseases and highly purified.

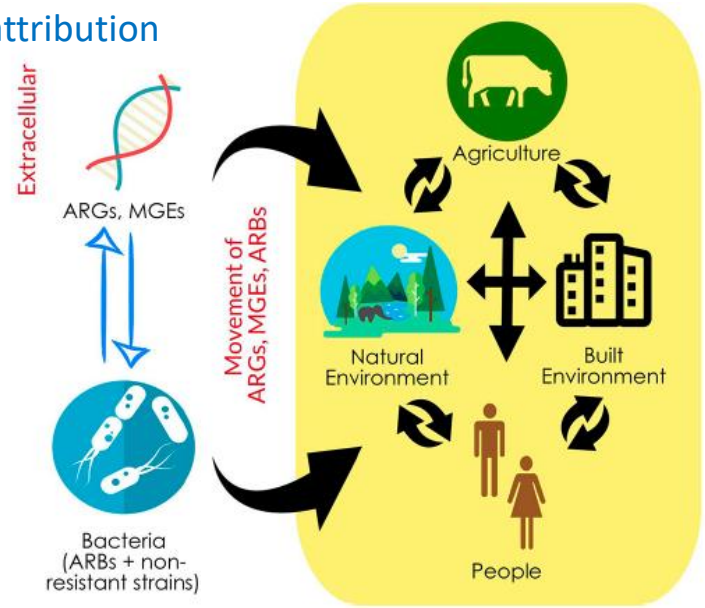
This novel therapy appears to be a promising approach to alter the gut microbiome and virome and improve GI and behavioral symptoms of ASD.

Microbiota Transfer Therapy Improves gastrointestinal (GI) and Autism Spectrum Disorders (ASD) symptoms

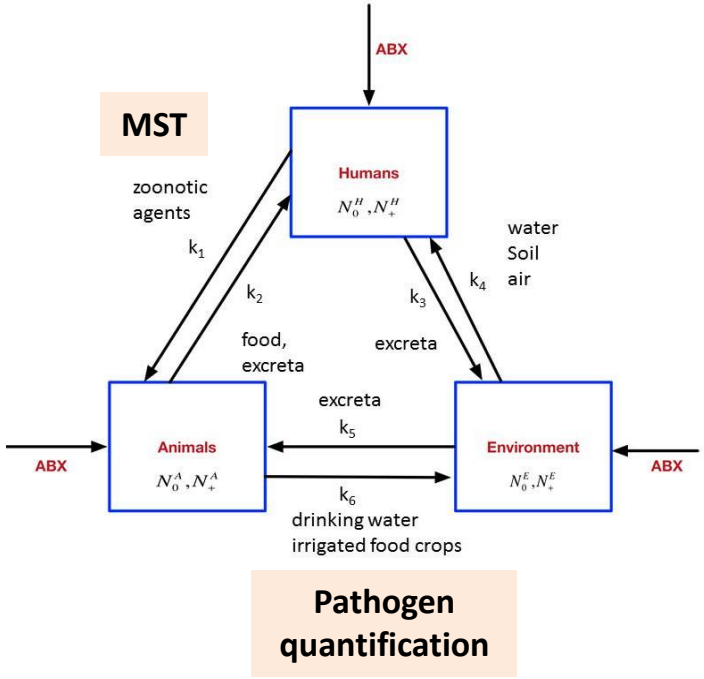
ASU Biodesign Institute
Arizona State University

Advancing Human Health by Mitigating Effects of Antibiotic Resistance

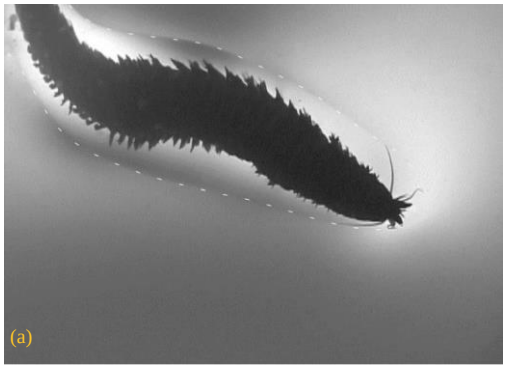
- Risk prediction
- Treatment assessment
- Source attribution

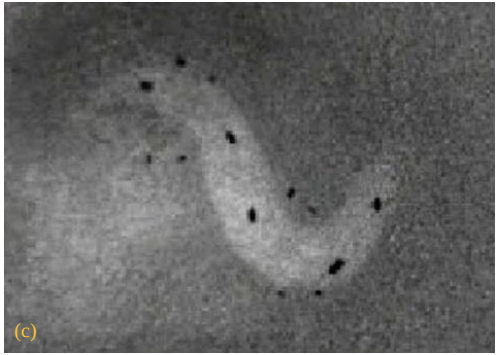


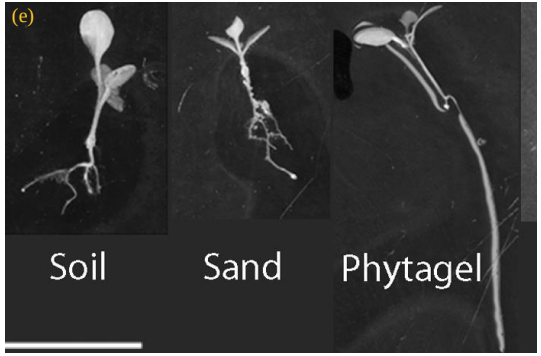
Vikesland et al. 2017



Bioinspired Self-boring Robots







(a) *Nereis virens* , a Polychaeta, burrows in gelatin using fracturing (Dorgan et al. 2006); (b) earthworm uses peristaltic movements when burrowing (Kuhn, 2016); (c) a sandfish swims in sand (Goldman 2014); (d) a bean clam, *Donax gouldi*, is burying itself into sand (Anderson 2016). (e) Root grows in transparent soil (Downie et al. 2012); (f) An awn of the seed of *Pelargonium carnosum* unwinds and digs into the ground (Jung et al. 2017)

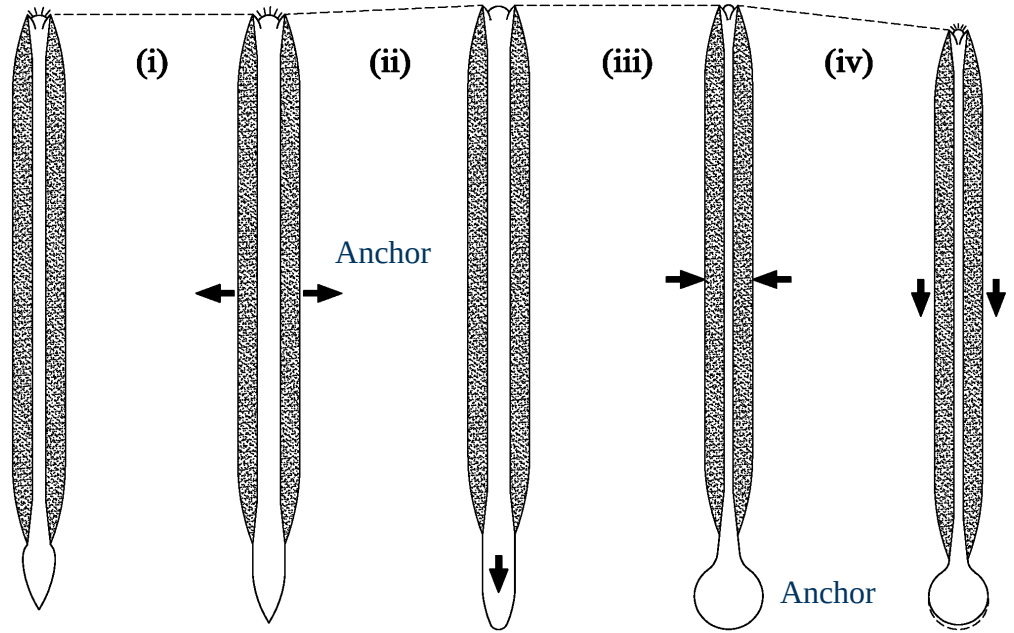
Features: motile, changing shape, multidirectional, high efficiency

Bioinspired Self-boring Robots

A burrowing razor clam

https://www.francoischarron.com/connaissezvous-ce-surprenant-mollusque/-/neTCIgC0y8/

http://www.wildsingapore.com/wildfacts/mollusca/bivalvia/solenidae/solenidae.htm



- ✓ Fast (~1cm/s)
- ✓ Deep (up to 70 cm)
- ✓ Maximum body drag (~10N)
- ✓ Efficient (~0.21J/cm) (Winter 2016)

- ✓ Simple Structure: foot and shell
- ✓ Rhythmic and coordinated movement

Entrepreneurship and Innovation

#3 Licenses and options

Behind only Purdue and Carnegie Mellon

#4 IP disclosures

Behind only Carnegie Mellon, Caltech and Purdue

#4 Startups

Behind only Purdue, Carnegie Mellon and Stanford

Comparative data per $10 million in research expenditures, based on the Association of University Technology Managers annual report of top national engineering schools.

Academy of Alumni

Stephen Basila
'77 BS, Construction, Arizona State University

Mr. Basila has over 39 years of heavy civil infrastructure construction experience. He is the AGC Arizona Chapter Chairman and Lifetime Director. Mr. Basila is the Owner and Manager of Infrastructure Mavens LLC which provides executive management support and advisory services to support transportation infrastructure. He served as a Faculty Associate for seven years at Del E. Webb School of Construction.

Kent Dibble, P.E.
'75 BS, Construction Engineering, Arizona State University

Mr. Dibble serves as President of Dibble Engineering, an engineering firm that has served clients for 54 years. Mr. Dibble is a founding member of Friends of Civil Engineering at ASU and is on the Steering Committee. Recognized for his commitment and service to the industry he was presented with the AzSCE's John C. Park Outstanding Civil Engineer Award in 2016.

Michael Fann
'80 BS, Construction, Arizona State University

Mr. Fann is the President of Fann Contracting, a heavy construction contractor company established in 1960. Mr. Fann is a respected leader in the Prescott, AZ community for his impact and philanthropic efforts. The company has received many awards such as the National Asphalt Pavement Association (NAPA) for Quality in Construction Award for excellence in construction of an asphalt pavement.

Enamul Hoque, P.E., D.GE, F. ASCE
'85 MS, Civil Engineering, Arizona State University

Mr. Hoque has over 40 years civil engineering experience in three continents. In 1997, he started Hoque & Associates, Inc. and provides innovative and cost-effective engineering and sustainable solutions to Arizona's projects. Mr. Hoque is a recipient of numerous awards including the Distinguished Achievement Award from the Ira Fulton College of Engineering at ASU and also served as Adjunct Faculty. School of Construction.

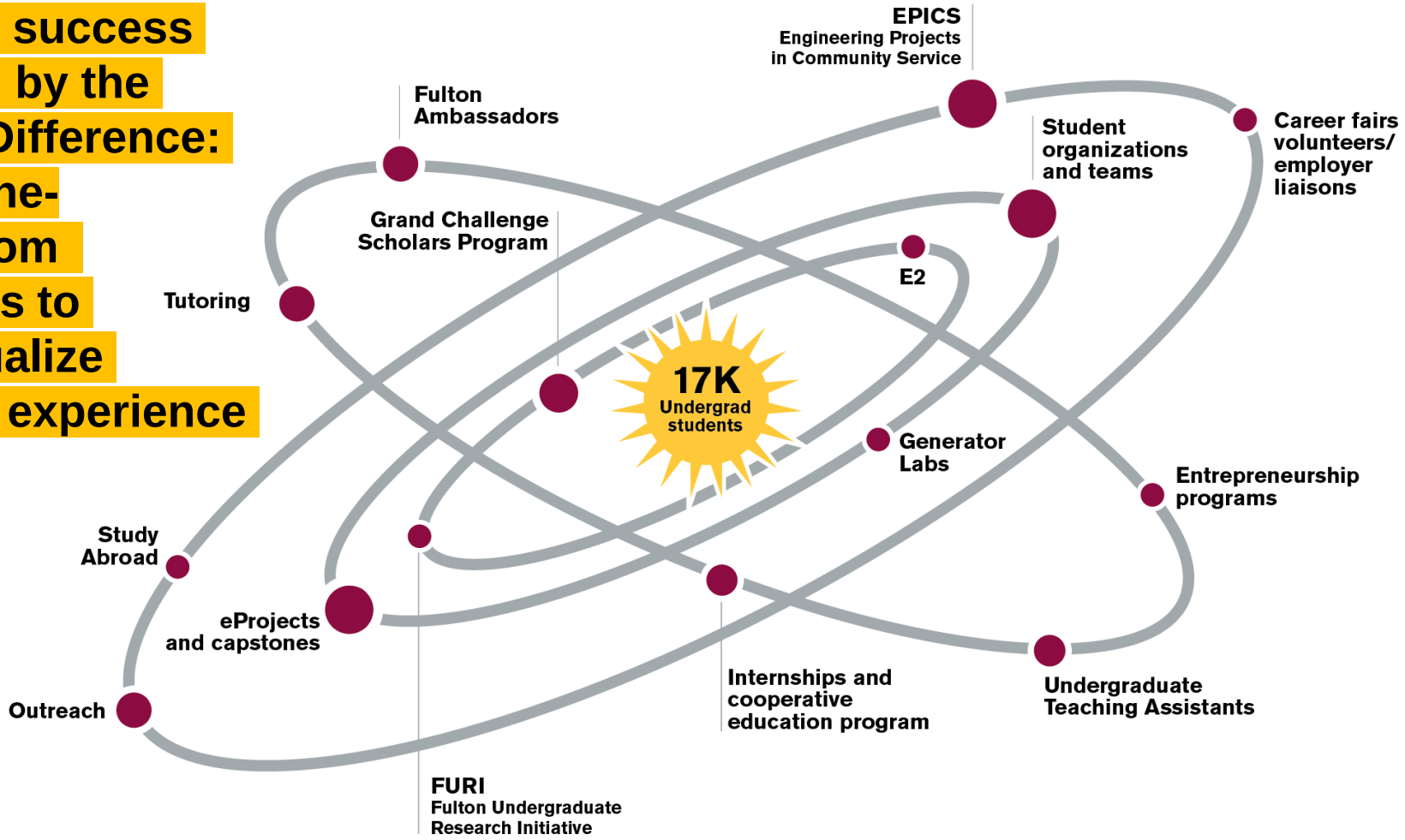
Hisham Mahmoud, PhD, P.E.
'89 MS, Civil Engineering, Arizona State University

'91 PhD, Civil Engineering,

HOQUE & ASSOCIATES

Enamul Hoque, P.E., D.GE., F.ASCE, President

Student success enabled by the Fulton Difference: out-of-the-classroom activities to individualize student experience



world-class facilities


school of
sustainable engineering
and the built environment
GRADUATE
AHEAD
http://ssebe.engineering.asu.edu