A SSEBE Welcome

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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.
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 years in row, U.S. News and World Report
We build engineers and inspire innovators.
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.

<table>
<thead>
<tr>
<th>FSE Progress since 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total enrollment</strong></td>
</tr>
<tr>
<td>6,407</td>
</tr>
<tr>
<td>Fall 2009</td>
</tr>
<tr>
<td>22,367</td>
</tr>
<tr>
<td>Fall 2018 est.</td>
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<tr>
<td><strong>Undergraduates</strong></td>
</tr>
<tr>
<td>4,253</td>
</tr>
<tr>
<td>Fall 2009</td>
</tr>
<tr>
<td>17,940</td>
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<tr>
<td>Fall 2018 est.</td>
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<tr>
<td><strong>Graduates</strong></td>
</tr>
<tr>
<td>2,154</td>
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<tr>
<td>Fall 2009</td>
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<tr>
<td>4,427</td>
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<tr>
<td>Fall 2018 est.</td>
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<tr>
<td><strong>Degrees granted</strong></td>
</tr>
<tr>
<td>1,391</td>
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<tr>
<td>2008-2009</td>
</tr>
<tr>
<td>4,197</td>
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<tr>
<td>2017-2018</td>
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<tr>
<td><strong>Research expenditures</strong></td>
</tr>
<tr>
<td>$73M</td>
</tr>
<tr>
<td>FY2009</td>
</tr>
<tr>
<td>$104M</td>
</tr>
<tr>
<td>FY2018</td>
</tr>
<tr>
<td><strong>T/TT faculty</strong></td>
</tr>
<tr>
<td>214</td>
</tr>
<tr>
<td>Fall 2010</td>
</tr>
<tr>
<td>350</td>
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<tr>
<td>Fall 2018</td>
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<tr>
<td>2009</td>
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<tr>
<td>2018 est.</td>
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<tr>
<th></th>
<th>Degrees granted</th>
<th>Research Expenditures</th>
<th>T/TT faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-2010</td>
<td>205</td>
<td>$7.4M</td>
<td>30</td>
</tr>
<tr>
<td>2017-2018</td>
<td>440</td>
<td>$18.2M</td>
<td>52</td>
</tr>
<tr>
<td>2018 est.</td>
<td></td>
<td></td>
<td>Fall 2018</td>
</tr>
</tbody>
</table>
use-inspired research

$98.3M  $99.4M  FY2016
research awards  research expenditures

1,000+
students conducting research

7  startups
26  patents
22  major agreements

Invention Disclosures

New facilities
3-D Print Lab, New Tutoring Center, Generator Labs, College Avenue Commons, New residential community under construction
school of sustainable engineering and the built environment
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
- **Total enrollment**: 1702
- **Undergraduate students**: 1285
- **Graduate students**: 417
- **278 M.S./139 Ph.D.**

## 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)

## Faculty
- **47** tenured and tenure-track
- **6** lecturers
- **8** research faculty
- **3** professor of practice

**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, worldwide 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
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/](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](http://www.newtcenter.org)
Examples of Centers in SSEBE - a Wide Variety of Engineering Research Activities

- 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

http://tomnet-utc.org
http://mobilityanalytics.org
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
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
“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
I will be one of the first people to buy an AV. (N= 256)

I will eventually buy an AV, but only after AVs are common on our roads. (N= 254)

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 never use an AV. (N= 257)

Riding in AVs would allow me to use travel time for other activities. (N= 255)
Oceans: How One Life Powered by ASU Can Change the World

https://youtu.be/ILA5lvzv84A
The key to fighting autism might lie not in the mind, but in the gut

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.
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

- 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

A burrowing razor clam
https://www.francoischarron.com/connaissez-vous-ce-surprenant-mollusque/-/netCigCOyB/

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.
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

http://ssebe.engineering.asu.edu