ASU and Fulton Schools of Engineering Resources

Bringing those resources to an SBIR/STTR collaboration

Collaboration models
People
~ 102,000 students
~ 16,000 graduate students

Programs
> 150 undergraduate majors
> 75 doctoral programs
$2+ billion total revenue
$350M state support (<20%)

Research
$350M total awards (research, gifts)
Looking to grow to $700M by 2020
Focused on Student Success

20,366 fall 2016 enrollment

2,843 fall 2016 first-time freshmen

3,536 degrees granted 2015-2016

30% of Barrett, the Honors College students are in the Fulton Schools

23 undergraduate programs • 39 graduate programs • Two campuses plus online
Increasing access while increasing student success

4-year graduation rates in engineering nearly tripled between 2003 and 2010 (entering classes)

Degrees awarded increased more than 260% between 2005-2006 and 2014-2015.
College Avenue Commons

New facilities College Avenue Commons, eSpaces, Brickyard Mezzanine and Interdisciplinary Science and Technology Building 4

$98 million research awards
$99 million research expenditures
1,000+ students conducting research
In 2013 the Fulton Schools launched the first ABET-accredited, fully online undergraduate program in electrical engineering in the world. This program is defining a new educational approach that combines the convenience of an online format with experienced faculty and innovative technology designed to make education more suited to remote learning.

Nontraditional learners such as transfer students, veterans, active military, working professionals and other distance learners can easily access higher education thanks to a thoughtful and appropriate use of technology.

We don’t try to mimic the effect of traditional lecturing; instead we use technology to extend and improve traditional lecturing.
Bringing those resources to an SBIR/STTR collaboration
Risk assessment

Topic fit for long term commercialization strategy

Agency fit

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<thead>
<tr>
<th></th>
<th>Phase 1</th>
<th>Phase 2</th>
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<tbody>
<tr>
<td>Win rate</td>
<td>~15-17%</td>
<td>~40%</td>
</tr>
<tr>
<td>Partner</td>
<td>Solo</td>
<td>Partner</td>
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<tr>
<td>Solo</td>
<td></td>
<td>Solo</td>
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</table>

SBIR/STTR
Success rates - ~ 12 - 17%
Academic partner assessment

- Collaborative
- Domain expertise
- Market knowledge
- Agency knowledge
- Rotation program and review panels
- Availability & Bandwidth
- Postdocs
- Proposal capability
- Overhead rates

- Return emails, calls
- Google Scholar citations
- Discussion
- Summers off?
- PI candidate
- Win rates

Know how they are calculated
Overhead rates  
Know how they are calculated

50% overhead rate example

$10,000 direct costs

Plus 50% overhead = $15,000

Overhead is 1/3 of total

F&A Rate
Academic partner assessment
Pick a stock or pick a mutual fund

**Institutional risk reduction**

**Inherit all the risks/reward for PI performance**

**Search and select PI Collaborator**

**Limited institutional risks**

**Spread the risk/reward across many PIs**

**Search and select for a Center**

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**Individual PI**

**Research Center**

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“Working with a research center is like buying a mutual fund vs. an individual stock.”

Fortune 100 CTO
Academic partner assessment
Pick a stock or pick a mutual fund

~ 500 Individual PI

34 Research Centers
QESST Engineering Research Center - Consortium of 8 universities

Thirty faculty 120 grad students
Help address the Terawatt Challenge

Richard Smalley – 1996 Nobel Prize Winner

“Find enough clean energy to raise the living standards of people around the globe”

1.5 Billion people in the dark (21%)
QESST Engineering Research Center
Quantum Energy and Sustainable Solar Technology

Lightweight, high efficiency, radiation-hardened solar cells
Nanosystems Engineering Research Center for Nanotechnology-Enabled Water Treatment

Thirty faculty

- Drinking Water Treatment
- Industrial Wastewater Reuse

Institutions:
- RICE
- Arizona State University (ASU)
- UTEP
- Yale University
ASU NewSpace leads the integration of academic and commercial space enterprises using ASU’s core strengths in space science, engineering, and education.
240+ Space Investigators
University-wide number of principal investigators

School of Earth and Space Exploration

Ira A. Fulton Schools of Engineering
The Polytechnic School
School for Engineering of Matter, Transport and Energy
School of Arts, Media + Engineering
School of Biological and Health Systems Engineering
School of Computing, Informatics, and Decision Systems Engineering
School of Electrical, Computer and Energy Engineering
School of Sustainable Engineering and the Built Environment

Other
ASU Origins Project
Barrett, The Honors College
Beyond: Center for Fundamental Concepts in Science
Biodesign Institute
Center for Meteorite Studies
College of Letters and Sciences
Consortium for Science and Policy Outcomes
Department of Biomedical Informatics
Department of Management
Department of Physics
Department of Psychology
Disability Resource Center
Division of Educational Leadership and innovation
Julie Ann Wrigley Global Institute of Sustainability
School of Geographical Sciences and Urban Planning
School of Human Evolution and Social Change
School of Life Sciences
School of Mathematical and Natural Sciences
School of Mathematical and Statistical Sciences
School of Molecular Sciences
School of Transborder Studies

as of May 2017
Arizona State University has been chosen to lead a new site that will provide the **Southwest a regional infrastructure** to advance nanoscale science, engineering and technology research.

Brings together world-class research labs: LECSS, Nanofab and PV Laboratory
Materials Characterization Facility

The Arizona State University LeRoy Eyring Center for Solid State Science provides academic and industry researchers with open access to advanced facilities and equipment for materials characterization; surface, optical and structural analysis; and high resolution electron microscopy. We have been training researchers for over 40-years.

le-csss.asu.edu
ASU NanoFab

A flexible nano-processing facility at Arizona State University that offers state-of-the-art device processing and characterization tools for university research and for external company prototype development. Established companies and innovative start-ups especially can benefit from using this advanced facility to accelerate their prototype development.
Solar Power Labs

INDUSTRIAL COLLABORATION
In the Solar Power Lab, we work with academic and industrial partners across the U.S. and around the globe

Largest academic solar power lab in the United States
Welcome to the Arizona State University Shared Resources site - a portal to tools and services available through more than 100 core facilities, labs, shops, clinics, museums, and collections that support ASU research. A vast selection of resources is just a click away...
ASU selected nation's most innovative school for third straight year
We support entrepreneurial faculty.

We are building a culture that enhances the translation of faculty innovations and the impact of their creative activities.

Entrepreneurial activities are recognized in our Promotion & Tenure process.

Recognition of the Fulton Schools as an innovation engine for the region and state.

An opportunity to build research resources in the short term and a longer-term impact in key relationships with industry and philanthropy.

The Fulton Entrepreneurial Professors Program is intended to support the translational efforts of its faculty, particularly as they relate to technology and product commercialization and the start-up of new companies.

38 startups 2007-2016
Innovation infrastructure

**Entrepreneurship Catalysts**
Entrepreneurship Catalysts are current ASU students who educate and support other students, faculty, and staff who want to get involved in entrepreneurship opportunities. Catalysts can help you navigate ASU’s entrepreneurial resources, refer you to relevant opportunities and provide coaching if you are beginning to develop your own venture idea.

**Entrepreneurship Experts**
Entrepreneurship Expert mentors provide expertise in finance, marketing, legal, operations/scaling, business development/sales, manufacturing/rapid prototyping, and more. Entrepreneurship Experts may meet one-on-one with aspiring entrepreneurs or startup founders. Appointments are available to all.

*Mentor Networks*
Venture Funding
Take your existing high-potential startup to the next level.

Venture Devils
ASU Venture Devils supports student, faculty and community entrepreneurs who are launching ventures within a wide range of developmental stages from ideation through commercialization. Venture Devils aims to catalyze the entrepreneurial success of founders by connecting them with Venture Mentors who provide regular, ongoing support.

Venture Support
Ideation Funding
Do you have a great idea that you’d like to develop? Ideation funding can help you get it off the ground.

Startup Funding
More than $1 million in startup funding is available to Venture Devils founders. Find out how to join and get your share.

Venture Funding
Take your existing high-potential startup to the next level.

Funding Networks
1951 @ SkySong

SkySong, the ASU Scottsdale Innovation Center, offers local entrepreneurs a collaborative space for their ideas and innovation to thrive. Named for the year Scottsdale was incorporated, 1951 @ Skysong is a co-working space that combines 1950s décor with the latest collaboration and communication technologies. The resulting, vibrant atmosphere is infused with the daring visions of the past while equipped to advance today’s entrepreneurial innovation.

ASU Chandler Innovation Center (ACIC)

ACIC is an engineering and technology-based education and research hub located in the heart of downtown Chandler. The facility is used to host classes for ASU students and workshops and events for the community. ACIC is a partnership among the City of Chandler and ASU, located at 249 E. Chicago Street, Chandler, Arizona 85225.

Spaces Networks
Milken Institute ranks ASU 21st for best universities for tech transfer – 6th among institutions without a medical school.
Measuring Technology Transfer Excellence

The Association of University Technology Managers (AUTM) prepares an annual report covering hundreds of universities and research hospitals.

AUTM’s FY16 licensing survey has just been released. ASU / Skysong Innovations continues to post strong results.

Among all institutions with more than $300 million in research, ASU is in the top 20 for outputs per $10 million in research expenditures across:

- Startups (8th overall / 2nd with no medical school)
- Intellectual Property Disclosures (9th / 4th)
- Licenses & Options (16th / 5th)
- Issued U.S. Patents (20th / 4th)
Economic Impact

Seidman Research Institute Study of ASU’s tech transfer impact in 2016-2017:

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<tbody>
<tr>
<td>Gross State Product</td>
<td>$251.4MM</td>
<td></td>
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<tr>
<td>Employment</td>
<td>1,212 in FY16</td>
<td>1,391 in FY17</td>
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<tr>
<td>Labor Income</td>
<td>$171.3MM</td>
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<tr>
<td>State / Local Tax Revenues</td>
<td>$23MM</td>
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Future economic impacts (2018-2022) projected to be:

- $862 million contributed to Gross State Product
- $582 million in additional wages
- $78 million in additional state and local tax revenue
- 2,162 jobs (peak employment in 2022)
Congratulations
FY18 was a Record Year!

<table>
<thead>
<tr>
<th></th>
<th>FY08</th>
<th>FY09</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
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<th>FY15</th>
<th>FY16</th>
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<tr>
<td>Invention Disclosures</td>
<td>146</td>
<td>164</td>
<td>187</td>
<td>170</td>
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<td>250</td>
<td>261</td>
<td>270</td>
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<tr>
<td>New Patents filed</td>
<td>87</td>
<td>126</td>
<td>99</td>
<td>93</td>
<td>106</td>
<td>168</td>
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<tr>
<td>US Patents Issued</td>
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<td>18</td>
<td>17</td>
<td>18</td>
<td>26</td>
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<td>56</td>
<td>62</td>
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<tr>
<td>Licenses/Options</td>
<td>61</td>
<td>58</td>
<td>63</td>
<td>72</td>
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<td>90</td>
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<td>Other Major Agreements</td>
<td>78</td>
<td>53</td>
<td>108</td>
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<td>186</td>
<td>162</td>
<td>151</td>
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<td>261</td>
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<tr>
<td>Start-ups</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>10</td>
<td>9</td>
<td>11</td>
<td>12</td>
<td>12</td>
<td>13</td>
<td>15</td>
</tr>
</tbody>
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Working with industry - case in point

Our Mission

Develop cutting-edge technologies and deliver high value solutions for government and industry

CFDRC Inc.
Top 10% of all SBIR grantees
Now at ASU SkySong
Collaboration models conclusion
Identifying individual faculty could be hard with ~500 faculty

Identify a relevant center

Center participation
   become part of an ecosystem
   get to know faculty and postdocs

engineering.asu.edu/research/industry/centers-and-labs/

John.J.Mitchell@asu.edu for Fulton Schools of Engineering
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research centers

Adaptive Intelligent Materials and Systems
Arizona Initiative for Renewable Energy
Arizona Institute for Nano-Electronics
Advanced Photovoltaics
Adaptive Neural Systems
Applied Nanoionics
Bioelectronics and Biosensors
Biomolecular Integrated Circuits
Biosignatures Discovery Automation
Cognitive Ubiquitous Computing
Computational Nanoscience
Connection One

Consortium for Embedded Systems
Construction Research and Education for Advanced Technology Environments
Decision Theater
Earth Systems Engineering and Management
Environmental Biotechnology
Environmental Fluid Dynamics
Flexible Display Center
High Performance Computing Initiative
Housing Research Institute
Information Assurance
LeRoy Eyring Center for Solid State Science

National Center of Excellence on SMART Innovations
Partnership for Research in Spatial Modeling
Photonics Innovation
Power Systems Engineering Research Center
QESST Engineering Research Center
Renewable Energy Electrochemistry
Research on Education in Science, Mathematics, Engineering and Technology
Solid State Electronics Research
Sensor Signal and Information Processing
Sustainable Health
Water and Environmental Technology
What is a NSF Center?

National Science Foundation covers all engineering and scientific fields - $8B budget

Provide ~ 20 percent of all federally funded university research

These centers provide an environment where academe and industry together can focus on next-generation advances in complex engineered systems important for the Nation's future.  
- National Science Foundation
**What is an NSF ERC?**

- 20 Engineering Research Centers in the country
  - 3 at ASU
    - Quantum Energy and Sustainable Solar Technology (solar)
    - Center for Bio-mediated & Bio-inspired Geotechnic
    - Nanotechnology-Enabled Water Treatment
What is an NSF IUCRC

• 59 IUCRCs in the nation
  – 7 at ASU
    • SenSIP (sensors)
    • Arizona Water Quality Center
    • Power Systems Engineering Research Center
    • Center for Embedded Systems
    • Water and Environmental Technology Center
    • Center for Excellence in Logistics and Distribution
    • Connection One (IC power management)
    • Building Reliable Advances and Innovation in Neurotechnology (BRAIN)
Center Value Proposition

• For industry:
  – Access faculty, student, industry peers, knowledge
  – Indirect access to lab resources from top-tier universities
  – Provides a mechanism to investigate a gap in technology roadmaps
  – An excellent recruiting channel for workforce development

80% of employers claim IUCRC graduates are more productive than peers due to their IUCRC experience – NSF
Center Value Proposition

- Financially leveraged research
  - NSF core funding
  - Reduced F/A rates
  - Other industry funding
- Use research to position your company for other grants
- Build your workforce
- Library access

The cost for one bad hire $140,000 - ADP