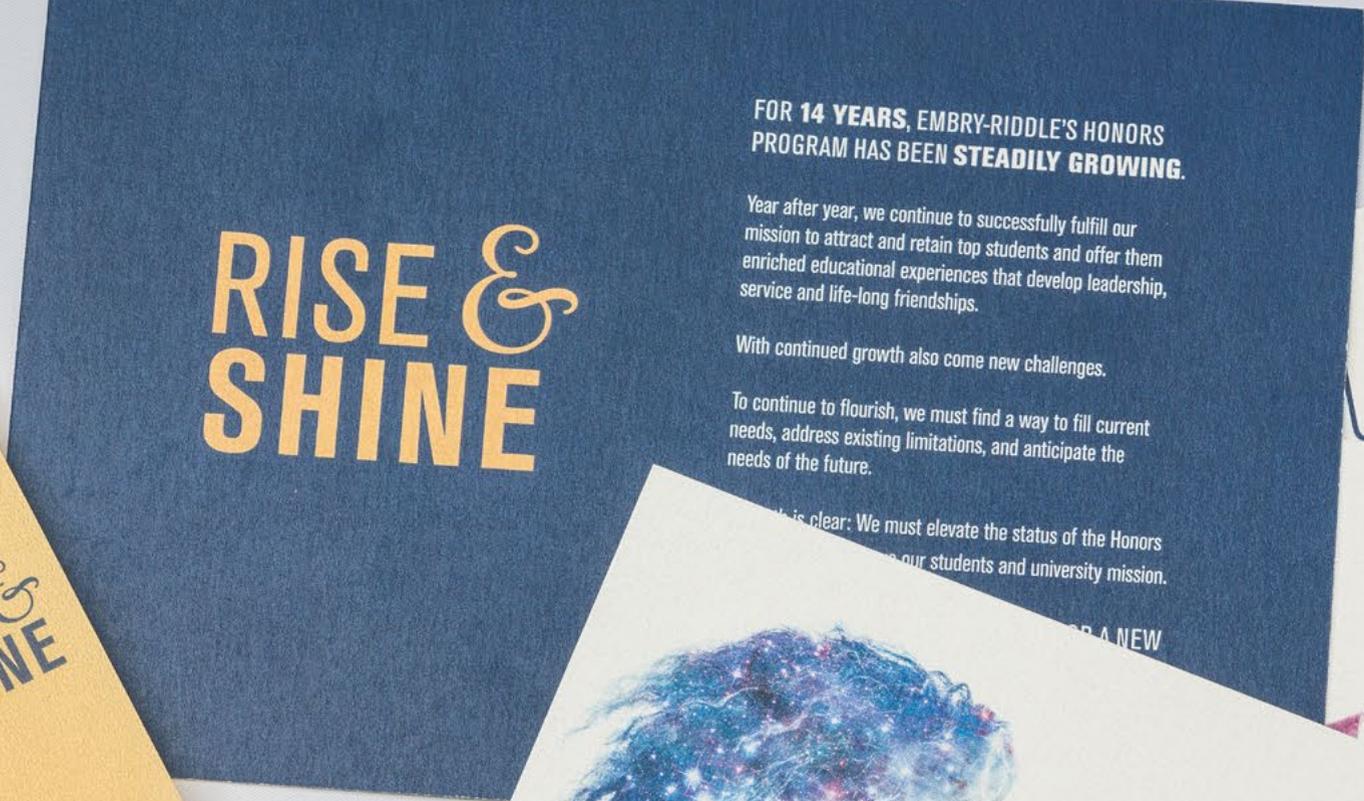




Gold ADDY Award  
Honors Program Invitation



Gold ADDY Award  
Rise & Shine Brochure

# COLLEGE OF ENGINEERING

ENGINEERING THE FUTURE

**EMBRY-RIDDLE**  
Aeronautical University  
DAYTONA BEACH, FLORIDA

Silver ADDY Award  
Engineering the Future

**Civil Engineering Student Wins \$1.2 Million Grant to Turn His Research Into Reality //**

"Since the first day I saw the Aquaponics Laboratory in the College of Engineering, I wanted to learn more," said Muhammad Gahwaj (pictured below), graduating senior of the civil engineering program. And learn more he did. In Dr. Peter Merkle's lab, Gahwaj learned how to turn an aquaponics experiment into a profitable business. But he didn't stop there. Gahwaj recently entered the Saudi Student Entrepreneur competition and placed fourth out of over 200 entries with his proposal for a sustainable aquaponics food factory to be built in Saudi Arabia. He has received a promise of up to \$1.2 million in funding from the country to implement his vision. "I still have a lot of work to do," Gahwaj expressed. "My plan is to start big with a one-acre aquaponics farm in Saudi Arabia."



**Food for the New Frontier**

Technological advances in every industry are moving the possibility of space colonization from science fiction to science fact. But what will we eat in outer space? Aquaponics may have an answer.

For environmental engineering researcher and Associate Professor of Civil Engineering, Dr. Peter Merkle, life on Mars is entirely conceivable — with a few specific conditions. "If I were living there, I wouldn't want to rely on anything that I couldn't grow myself, make myself or build myself," he said.

At the student-run Aquaponics Laboratory, Dr. Merkle and his research assistants are developing systems that do just that: grow food and sustain themselves with minimal dependence on any external resources — or distant planets. In their aquaponic garden, several edible, nutritious trees and plants grow suspended in water. The water is populated by tilapia, which produce waste rich in nitrogen. Beneficial bacteria transform the waste into nitrate and essential trace element nutrients, nourishing the plants. As the plants use these nutrients, they purify the water for the fish. Other than fish food, water, and supplemental iron and potassium, the system recycles waste water and generates oxygen.

Such regenerative food systems will be essential for space colonization and NASA has been searching since the 1990s for viable solutions. The earliest efforts focused on aeroponic (mist) systems. In 2002, scientists at the International Space Station began growing vegetables in a greenhouse-like chamber. In 2007, students participating in a NASA Engineering Design Challenge developed an aquaponic garden that could theoretically grow plants on the moon. Today, Dr. Merkle and his students are pushing aquaponic systems to the next level — not just making them work, but work more efficiently.

**Food for Thought //** Fish can grow from small fry to market size in 30 weeks.

**Growing Media //** Expanded clay pebbles retain moisture for rooted crops and provide habitat for beneficial microbes.

**Interesting Fact //** Unlike Earth, substantial changes in the obliquity (or tilt) of Mars occur on timescales of hundreds of thousands to millions of years and result in long-term climate change.

**Aquaponics //** A system that combines raising fish with plants in a symbiotic relationship. In traditional aquaculture, fish wastes must be treated or released, and plant nutrients and water are lost. In aquaponics, the waste water is recirculated for growing crops, with fish wastes broken down by bacteria into nitrate and other nutrients taken up by the plants.

**Dr. Peter Merkle, Associate Professor of Civil Engineering**

**Bjorg Olaus checking the pH of the samples**

**Muhammad Gahwaj, Civil Engineering '12**

**12 //** "Detailed Mars Fact, NASA's Mars Exploration Program" NASA, vol. 396, 10 Mar. 2016.



**MECOMING WEEKEND EVENTS**  
**THURSDAY, OCT. 6**

12 - 4 P.M. | INDUSTRY/CAREER EXPO  
 12 CENTER

4:30 P.M. | DEPARTURE LOUNGE - HAPPY HOUR  
 CONNOLLY QUADRANGLE

6 - 8 P.M. | EAGLE NIGHT ALUMNI RECEPTION  
 HENDERSON WELCOME CENTER

6:30 P.M. | MOVIE ON THE LAWN (FINDING DORY)  
 CONNOLLY QUADRANGLE

- CLOSE | EAGLES ON DECK  
 OCEAN DECK, TOP DECK, LIVE

**FRIDAY, OCT. 7**

11 - 1 P.M. | ALUMNI TOWN HALL LUNCH WITH  
 THE PRESIDENT  
 HENDERSON WELCOME CENTER

1 - 4 P.M. | CLUB SHOWCASE SHOWDOWN  
 LEGACY WALK & WEST LAWN

3 - 5 P.M. | CDB CELEBRATES 50 YEARS OF  
 MANAGEMENT  
 COLLEGE OF BUSINESS, ERAU

7 P.M. | SINGLE FAMILY PROPS  
 RED  
 OR DECK  
 AY  
 GAME  
 (SINGH)

DAYTONA PLACE  
**HOMECOMING**  
 EMORY-RIDDLE

Wireless  
 Connectivity  
 Building

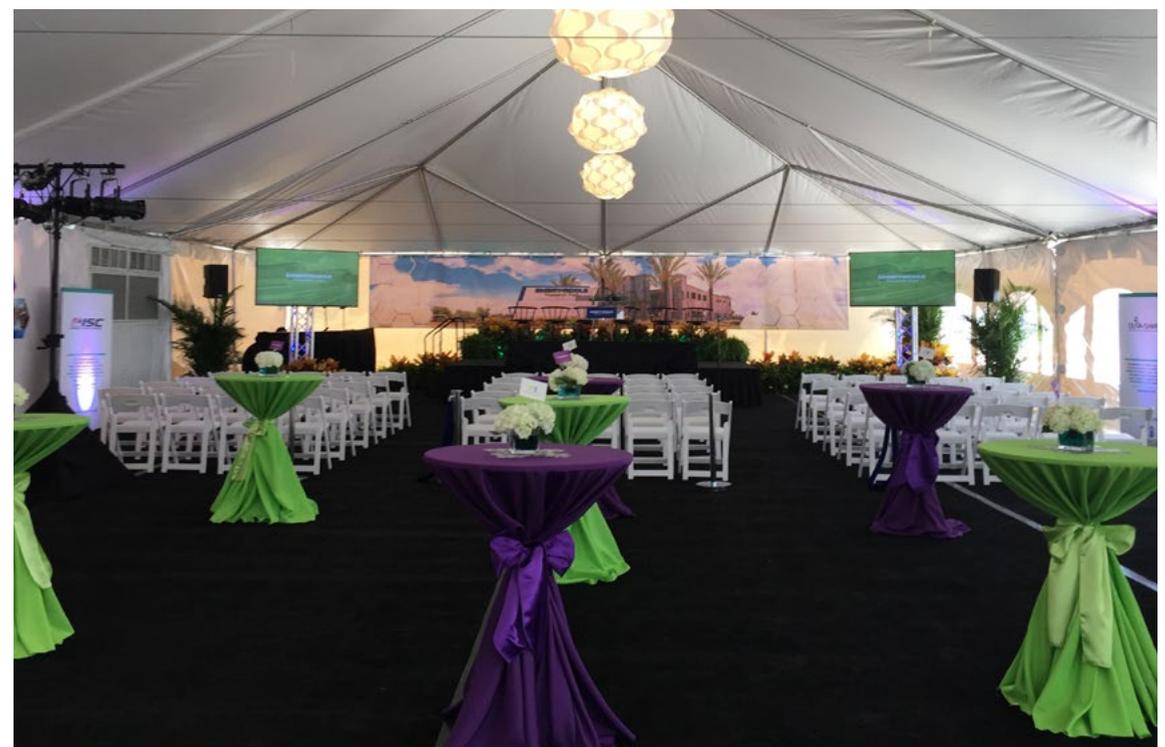
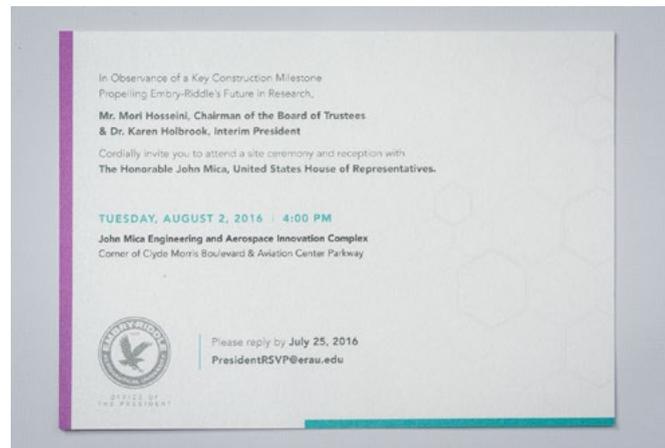
**DAN + SHAY**

This area may  
 be subject to video  
 and/or audio recording

Touch-N-Go Productions  
 @ERAUTouchNGo



Silver ADDY Award  
 Dan + Shay Window Wrap



Silver ADDY Award  
MicaPlex Event



## Give the shirt off your back.

Okay, not literally, but you can still give back.

### Before You Go, Donate.

Donating new and gently used items helps our local community. Reducing the amount of trash is also good for the environment. Suggested donations - non-perishable food, small household/kitchen items and appliances, clothing, bedding. Look for the big blue bins!

Questions? Contact Housing & Residence Life at 323-8000 or [daytona.housing@erau.edu](mailto:daytona.housing@erau.edu).

Look for the big blue bins!



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An Embury-Riddle Environmental Initiative



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Gold ADDY Award  
Before You Go, Donate!

# IT ALL STARTED WITH AN IDEA.

July 16, 1946. F. WHITTLE 2,404,334  
 AIRCRAFT PROPULSION SYSTEM AND POWER UNIT  
 Filed Feb. 19, 1941 3 Sheets-Sheet 1



WHAT'S YOUR BIG IDEA?

**Present your idea at the TREP Expo!**  
 Tuesday, April 11, 2017 | Embry-Riddle Flight Deck | 9:00am



**TREP**  
 ENTREPRENEURSHIP EXPO

EMBRY-RIDDLE Center for Aeronautical University Entrepreneurship

U.S. PATENT NO. U.S. 2404334 A  
 Inventor: Frank Whittle  
 Aircraft propulsion System  
 PUBLICATION NUMBER: US 2404334 A  
 PUBLICATION TYPE: Grant  
 PUBLICATION DATE: July 16, 1946  
 FILING DATE: Feb. 19, 1941

# IT ALL STARTED WITH AN IDEA.

(No Model.) S. WHEELER. 459,516.  
 WRAPPING OR TOILET PAPER ROLL.  
 Patented Sept. 15, 1891.



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 Tuesday, April 11, 2017 | Embry-Riddle Flight Deck | 9:00am



**TREP**  
 ENTREPRENEURSHIP EXPO

EMBRY-RIDDLE Center for Aeronautical University Entrepreneurship

erau.edu/TREPexpo

U.S. PATENT NO. U.S. 459516 A  
 Inventor: Seth Wheeler  
 Wrapping or Toilet Paper  
 PUBLICATION NUMBER: US 459516 A  
 PUBLICATION TYPE: Grant  
 PUBLICATION DATE: Sept. 15, 1891  
 FILING DATE: June 10, 1891

# IT ALL STARTED WITH AN IDEA.

May 16, 1944. H. FORD ET AL 2,349,157  
 INTERNAL COMBUSTION ENGINE  
 Filed April 20, 1942 2 Sheets-Sheet 1



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**TREP**  
 ENTREPRENEURSHIP EXPO

EMBRY-RIDDLE Center for Aeronautical University Entrepreneurship

erau.edu/TREPexpo

U.S. PATENT NO. U.S. 2349157 A  
 Inventor: Henry Ford  
 Internal Combustion Engine  
 PUBLICATION NUMBER: US 2349157 A  
 PUBLICATION TYPE: Grant  
 PUBLICATION DATE: May 16, 1944  
 FILING DATE: April 20, 1942

Silver ADDY Award  
 Trep Expo



**EMBRY-RIDDLE**  
Aeronautical University™  

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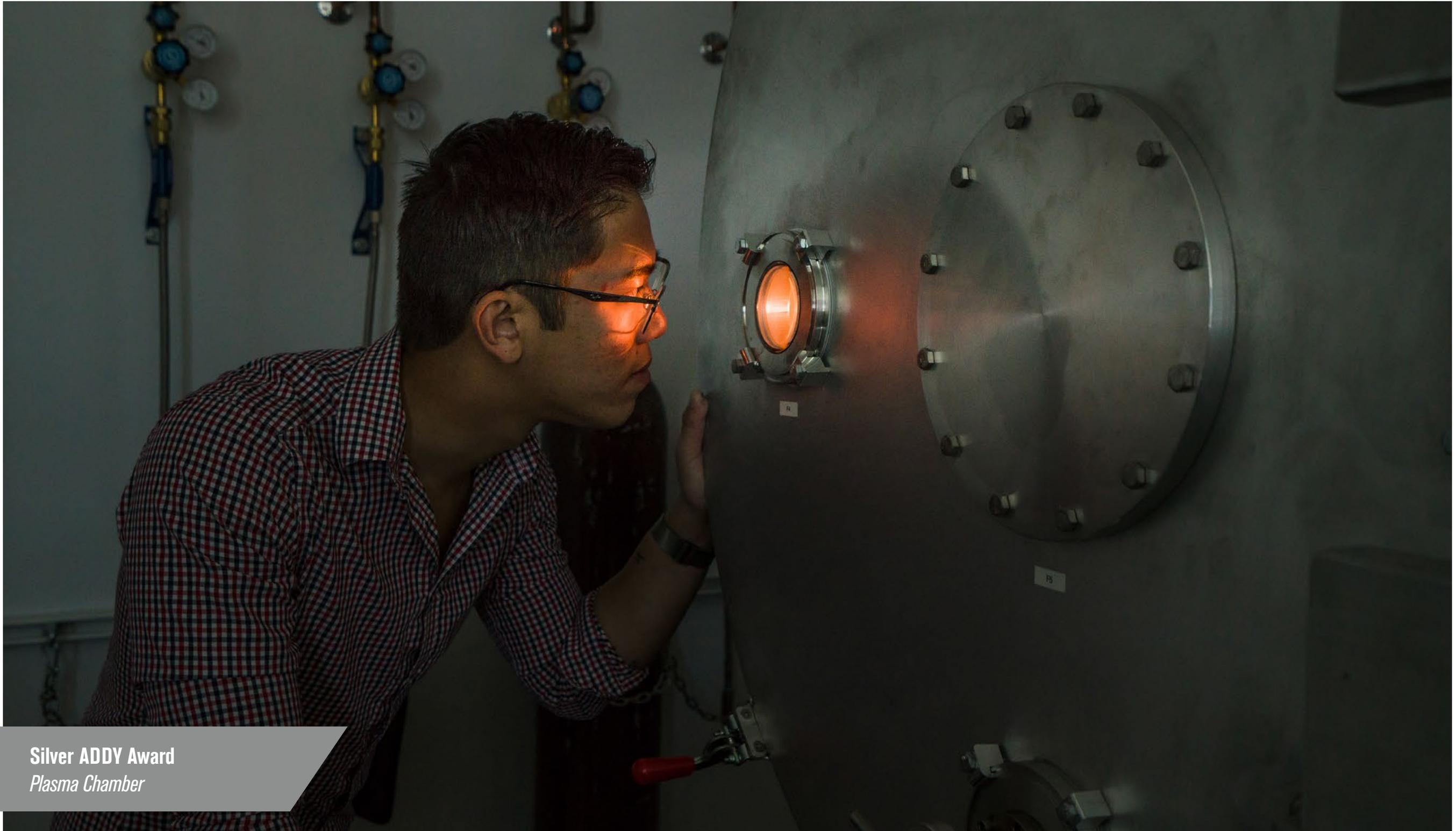
**HONORS COLLEGE**

Gold ADDY Award  
*Honors College Logo*



**Silver ADDY Award**

*Bring Your Child To Work Day Logo*



**Silver ADDY Award**  
*Plasma Chamber*



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**JUDGES' CHOICE**

*Before You Go, Donate!*



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**IMPACT AWARD**  
*Before You Go, Donate!*