Fiscal Year 2017 Annual Report

Office of Technology Transfer

UCF

Content

TOP 25
Best Universities for Technology Transfer

The University of Central Florida ranks 22nd in the country for its success in technology transfer in a report from the Milken Institute, a nonprofit think tank. UCF is ranked in the top 25 alongside institutions such as Columbia University, MIT and Carnegie Mellon University.

MILKEN INSTITUTE

Welcome
From the Director

Dear Colleagues,

Fiscal year 2017 was a banner year for research and innovation at UCF.

Achievement
The Florida Board of Governors recognized UCF as an "Emerging Preeminent Research University". Faculty and staff brought in $148.8 million in research funding in 2017, an institutional record. Nonprofit think tank Milken Institute ranked UCF 22nd in the country for its success in technology transfer (Inside Cover). The National Academy of Inventors and the Intellectual Property Owners Association ranked UCF 41st in the world (21st in the nation among public universities) for the number of U.S. patents issued in 2016 (page 5). These achievements are a credit to university researchers who are developing critical solutions with global impact and creating opportunities for meaningful collaborations. Our team in the Office of Technology Transfer brings these solutions to the marketplace through intellectual property protection, marketing and licensing.

We partner with companies and entrepreneurs to transform innovative ideas into successful products. To facilitate partnerships with these collaborators, our office executed 40 license and option agreements in FY 2017. Twenty-eight companies and organizations partnered with us to evaluate and commercialize the powerful research results developed at UCF (page 13). In FY 2017, our office brought in $3.44 million in licensing income, another new record for our university. The first step in transforming promising research results into commercial products is disclosure of discoveries and innovations to the Technology Transfer team. One hundred thirty-seven UCF faculty, students and staff contributed to the 100 invention disclosures received by our office (page 9). Disclosures received over the past several years resulted in 57 U.S. patents issued to UCF in FY 2017.

To celebrate innovation, UCF established a chapter of the National Academy of Inventors (NAI) (page 7). In its inaugural year, the chapter inducted 29 UCF faculty, who had contributed at least eight U.S. issued patents to become members of the local chapter. I am proud to share with you that one of these prolific inventors, Nazim Muradov, Ph.D., research professor at the Florida Solar Energy Center (FSEC), was also elected as a Fellow of the National Academy of Inventors. Muradov is a lead inventor on 44 U.S. patents and six international patents. He is the tenth UCF professor elected to be an NAI Fellow.

Resources
Every year, our team pursues opportunities to promote university-developed intellectual property, to build relationships that lead to partnerships and to stay current on trends in research, industry and academia through attending, exhibiting and presenting at events nationally and internationally (page 14). In addition to these targeted outreach efforts, our team generates interest in our intellectual property and research capabilities by advertising technologies available to potential partners on our website and through other technology portals. Because university startup companies play a significant role in bridging the gap between basic research and commercial products, we highlighted the entrepreneurial support available at UCF (page 31) in our blog series "Startups, Start Here" (page 15). The blog is a great resource for faculty, staff, and students with interest in launching a company. In closing, the Technology Transfer team is honored to work with our dedicated researchers who are expanding the frontiers of science. We are committed to harnessing the benefits of the world-class research conducted at UCF for the betterment of our community and our world.

Sincerely,

Svetlana Shtrom, Ph.D., M.B.A.
Director, Office of Technology Transfer

College of Engineering and Computer Science
Assistant Professor Shawn Putnam

Research Funding

UCF faculty brought in $148.8 million in research funding in 2017, a year that was also marked by national recognition for the number of patents issued to UCF, technology transfer excellence and overall innovation. Of all the research funding received, $74 million came from federal sources, $41.1 million from private industry and $33.7 million from state and local government agencies.

Professors are working on projects that could revolutionize industries and save lives.

Engineering Professor Shawn Putnam is working to change the way electronic devices use and dissipate heat. His work is designed to help keep up with the global demand for faster, more powerful and smaller devices such as computers, radars and lasers. He was awarded a $510,000 grant from the National Science Foundation to support this work.

The Department of Energy this past year supported UCF researchers at the Florida Solar Energy Center and the College of Engineering and Computer Science with almost $4 million of funding to expand their work in solar energy, energy efficiency and improving air quality in homes.

UCF researchers from the College of Medicine, the NanoScience Technology Center, the College of Science and the College of Engineering & Computer Science received more than $1.3 million from the state to come up with ways to combat the Zika virus.

To learn more about UCF research, visit https://www.ucf.edu/research/.

At A Glance
Fiscal Year 2017

100
Disclosures

114
U.S. Patent Applications

57
U.S. Patents Issued
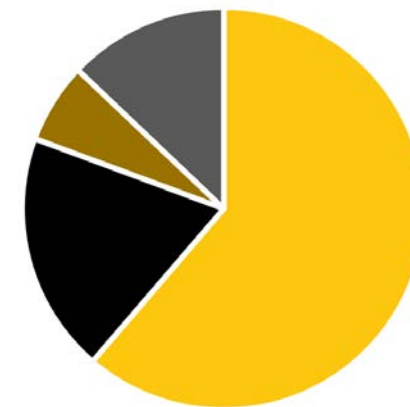
1
Startup

40
Licenses & Options

$3.44 Million
LICENSING INCOME

At A Glance
Five Year History

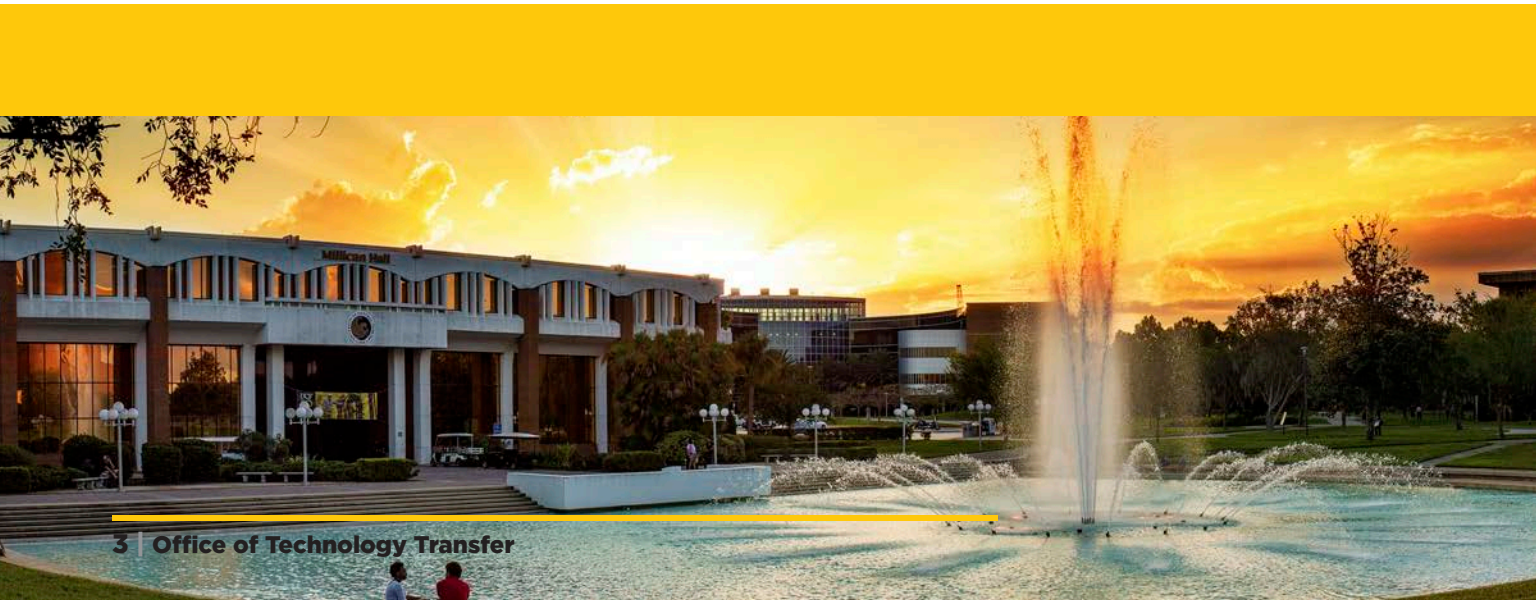|	FY 13	FY 14	FY 15	FY 16	FY 17
Invention Disclosures	124	98	96	99	100
Licenses & Options	17	23	38	34	40
Licensing Income	$800K	$1M	$1.5M	$1.8M	$3.4M
U.S. Patent Applications Filed	197	132	118	98	114
U.S. Patents Issued	71	57	62	68	57
No. of Startups	3	8	14	9	1

Funding Sources
for Disclosed Innovations

We appreciate the support from federal, industry, non-profit and state and local government research sponsors. Many discoveries that impact people's lives are realized because of their investment. This chart shows the funding support (as a percentage of the total number of funding sources) behind the inventions received by the Office of Technology Transfer.

■ Federal ■ Industry ■ Non-Profit ■ State and Local
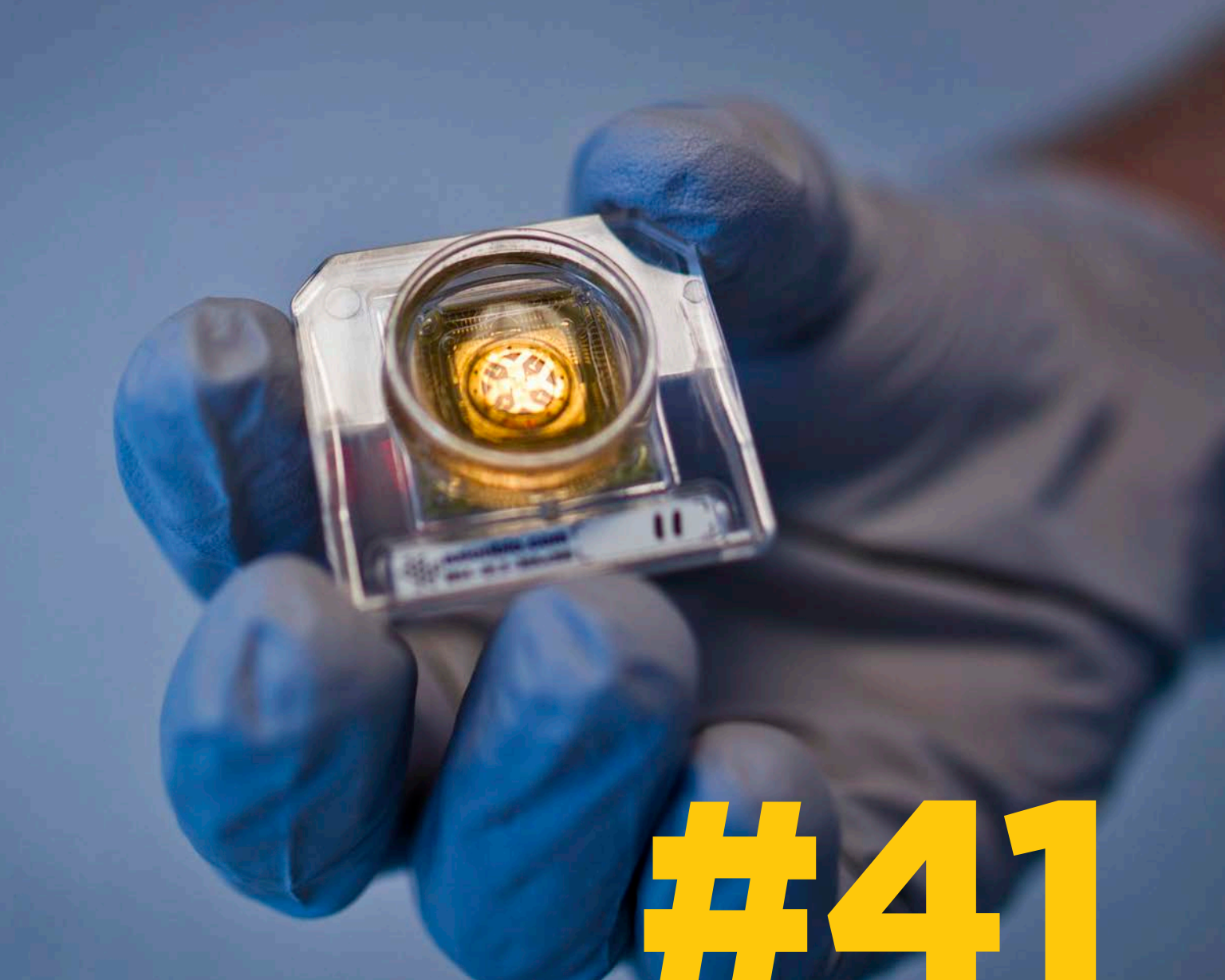
Issued US Patents
By Industry Category

- Healthcare: 40%
- Optics: 23%
- Software: 10%
- Energy: 9%
- Materials: 9%
- Sensors: 7%
- Other: 2%

#41
Patent Ranking
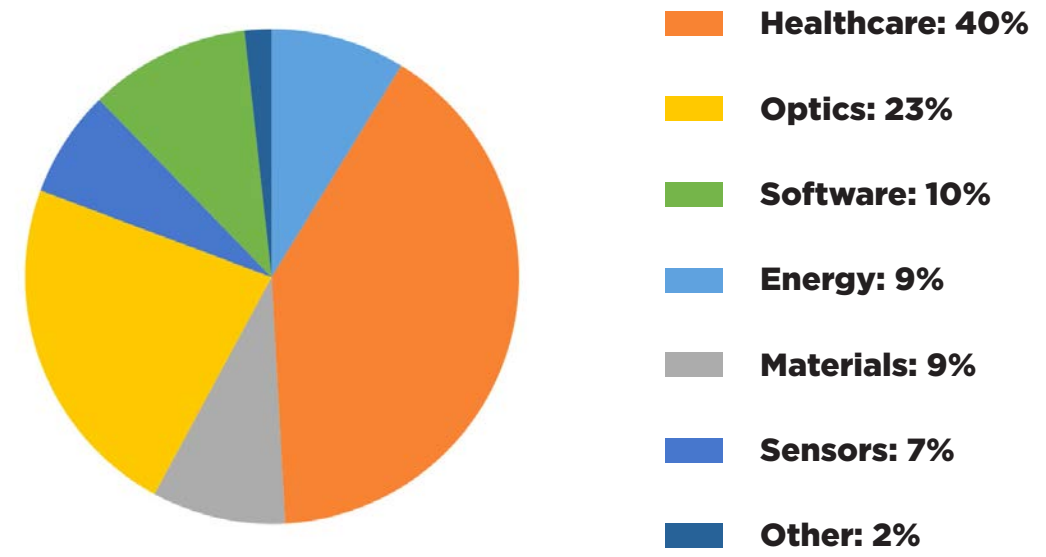
UCF ranks 41st in the world for the number of U.S. patents issued in 2016, as published in 2017 by the National Academy of Inventors and the Intellectual Property Owners Association. Among public universities in the nation, UCF ranks 21st.

Fifty-six U.S. issued patents were awarded to UCF in 2016.

ipo
Intellectual
Property
Owners®
Association

NAI
NATIONAL ACADEMY OF INVENTORS

National Academy of Inventors

UCF Celebrates Innovation with Opening of National Academy of Inventors Chapter

On November 7th, at a gala focused on innovation and technology, UCF inducted 29 researchers into its new chapter of the National Academy of Inventors (NAI). The NAI has more than 200 U.S. and international institution members that support their faculty, staff and students in creating innovative and groundbreaking technologies.

"Our past success, in combination with our ever-expanding potential to impact areas as diverse as engineering, education and health, is growing our reputation as a change agent," said Elizabeth Klonoff, vice president for research and dean of the College of Graduate Studies. "This NAI chapter will play an important role in growing that reputation and spurring on more innovation, which will benefit our community here and beyond."

Issa Batarseh, professor of electrical engineering, and Tom O'Neal, associate vice president for commercialization and innovation, will lead UCF's chapter. UCF has routinely ranked among the top universities in the country for the strength of its patents. Together, the inaugural class holds 501 of the 925 patents the university has claimed since 1989.

For more information on the local chapter, visit **https://tt.research.ucf.edu/nai**.

2016 UCF NAI Fellow
Nazim Muradov

Election to the National Academy of Inventors Fellow status is a high professional distinction given to academic inventors who have demonstrated a prolific spirit of innovation in creating or facilitating inventions that have made a tangible impact on quality of life, economic development and the welfare of society.

Nazim Z. Muradov, Ph.D., exemplifies such spirit of innovation. Muradov is a research professor at the Florida Solar Energy Center (FSEC) at UCF, where he focuses on alternative fuels technologies (hydrogen, biofuels), chemical conversion of solar energy and nanostructured carbon materials.

Muradov is a lead inventor on 44 U.S. patents and 6 international patents. Five of these U.S. patents describe two foundational technologies used to create a product that passively detects hydrogen. This product was licensed to a university startup company and successfully commercialized.

He is also the founder and president of a technology startup company H2Litmus LLC, which works to develop other reusable hydrogen sensing tape technology.

Nazim Muradov is the 10th UCF professor elected to be an NAI Fellow.
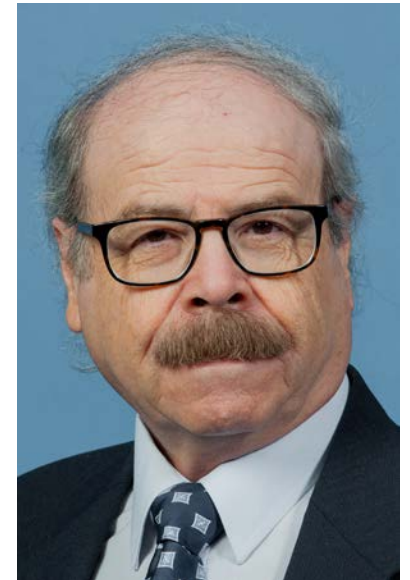
2016 Inducted Chapter Members

John Ballantyne, Ph.D.	James Hickman, Ph.D.	Ali Raissi, Ph.D.
Michael Bass, Ph.D.*	Qun Huo, Ph.D.	Martin Richardson, Ph.D.
Issa Batarseh, Ph.D.*	Aravinda Kar, Ph.D.	Swadeshmukul Santra, Ph.D.
Richard Blair, Ph.D.	Alexander Katsevich, Ph.D.	Sudipta Seal, Ph.D.*
Hyoung Cho, Ph.D.	Annette Khaled, Ph.D.	Marwan A. Simaan, Ph.D.*
Lee Chow, Ph.D.	Guifang Li, Ph.D.*	M. J. Soileau, Ph.D.*
Kevin Coffey, Ph.D.	Juin Liou, Ph.D.	Kiminobu Sugaya, Ph.D.
Peter Delfyett, Ph.D.*	Nazim Muradov, Ph.D.*	Martin Wanielista, Ph.D.
Aristide Dogariu, Ph.D.	Danny Parker	Shin-Tson Wu, Ph.D.*
Leonid Glebov, Ph.D.*	Otto Phanstiel, Ph.D.	

*Denotes NAI Fellow

Summary of Intellectual Property Activity
By Academic Unit Fiscal Year 2017

The following table represents the stages of technology commercialization: disclosure, patent application, issued patent and license (or option). Foreign patent filings have been omitted, as these are typically made in addition to U.S. filings for the same subject matter.

Due to interdisciplinary research on campus, inventions can be associated with more than one college, department or unit. As a result, the activity reported in the table may be attributed to multiple colleges, departments or units and may exceed the total number of unique cases per college or research center.

College / Research Center / Department	Disclosures *	U.S. Patent Applications Filed	U.S. Utility Patents Issued	Licenses & Options
Totals without duplicates	100	114	57	40
Administration & Finance	**1**	**-**	**-**	**1**
Facilities & Safety	1	-	5	1
Advanced Materials Processing & Analysis Center	**4**	**5**	**5**	**2**
Advanced Materials Processing & Analysis Center	4	5	1	2
Center for Research in Computer Vision	**1**	**2**	**-**	**-**
College of Education and Human Performance	**1**	**1**	**1**	**1**
Child Family & Community Sciences	1	-	-	1
Educational & Human Sciences	-	-	1	-
College of Engineering and Computer Science	**25**	**24**	**7**	**4**
Center for Advanced Transportation Systems Simulation	1	-	-	-
Civil, Environmental, and Construction Engineering	3	2	-	1
Computer Science	6	5	2	3
Electrical & Computer Engineering	8	8	5	-
Industrial Engineering & Management Systems	-	1	-	-
Materials Science & Engineering	4	1	-	-
Mechanical and Aerospace Engineering	3	5	-	-
Stormwater Management Academy	3	2	-	-
College of Health & Public Affairs	**1**	**2**	**-**	**-**
Health Management and Informatics	1	2	-	-
College of Medicine	**11**	**20**	**11**	**5**
Clinical Sciences	1	-	-	-
Faculty & Academic Affairs	-	1	-	-
Internal Medicine	1	-	-	-
Medicine Administration & Finance	-	-	-	1
Medical Education	1	2	1	-
School of Biomedical Science - Director Office	8	18	10	4

College / Research Center / Department	Disclosures *	U.S. Patent Applications Filed	U.S. Utility Patents Issued	Licenses & Options
College of Nursing	**1**	**-**	**-**	**-**
College of Optics and Photonics	**18**	**22**	**12**	**1**
College of Sciences	**8**	**10**	**6**	**1**
Chemistry	4	10	7	-
Mathematics	3	2	1	1
National Center for Forensic Science	-	1	-	-
Physics	4	2	1	-
Florida Solar Energy Center	**5**	**-**	**1**	**2**
Advance Energy Research	-	-	1	-
FSEC	5	-	-	2
Florida Space Institute	**2**	**-**	**-**	**-**
Information Technologies and Resources	**5**	**-**	**-**	**16**
Course Development and Web Services	5	-	-	16
Information Technologies and Web Services	5	-	-	16
Institute for Simulation & Training	**4**	**1**	**3**	**1**
E2i Creative Studio	1	-	-	-
IST	4	1	2	1
SREAL	-	-	1	-
NanoScience Technology Center	**12**	**28**	**11**	**6**
NanoScience Technology Center	15	29	11	6
Office of Research & Commercialization	**1**	**-**	**-**	**-**
Office of Research & Commercialization	1	1	-	-

* This list includes copyright and trademark disclosures

UCF Innovators
All Lead and Co-Lead

UCF INNOVATOR 2017

We thank and congratulate all UCF faculty, students and staff who began the commercialization process by submitting invention disclosures to our office.

Ayman Abouraddy, Ph.D.

Haitham Al-Deek, Ph.D.

Rodrigo Amezcua Correa, Ph.D.

Ulas Bagci, Ph.D.

Issa Batarseh, Ph.D.

Pradipta Biswas

Daniel Britt, Ph.D.

Robert Brown

Gerd Bruder, Ph.D.

Michael Carney

Karl X. Chai, Ph.D.

Debopam Chakrabarti, Ph.D.

Debashis Chanda, Ph.D.

Ni-Bin Chang, Ph.D.

Zenghu Chang, Ph.D.

Haiwei Chen

Li-Mei Chen, Ph.D.

Hao Chen

Leonid Chernyak, Ph.D.

Nitin Choudhary, Ph.D.

Demetrios Christodoulides, Ph.D.

Alisha Colon

Carlos Colon

Alicja Copik, Ph.D.

Smruti Das, Ph.D.

Dennis Deppe, Ph.D.

Yajie Dong, Ph.D.

Matthew Emond

Sasan Fathpour, Ph.D.

Daniel Franklin, Ph.D.

Christopher Fredricksen

Riley Gentry

Scott Giacomin

Amir Golshani

Xun Gong, Ph.D.

Ethan Gorham

Fangwang Gou

Francisco "Frank" Guido-Sanz, Ph.D.

Varadraj Gurupur, Ph.D.

Juan "Rachel" He

James Hickman, Ph.D.

Seyed Hossein Hodaeiesfahani

Amirmahdi Honardoost

Kien Hua, Ph.D.

Ziyang Huang

Sarfaraz Hussein

Travis Janzen

Sumit Jha, Ph.D.

Yeonwoong "Eric" Jung, Ph.D.

Alexander Katsevich, Ph.D.

Joshua Kaufman

Mercedeh Khajavikhan, Ph.D.

Saeed Khan

Saiful Khondaker, Ph.D.

Eda Koculi

Bradley Kovacs

Jason Kuhns

Glenn Lambie, Ph.D.

Marc Alaric Georges Lamothe

Joseph LaViola II, Ph.D.

Jonathan Lee

Yun-han Lee

Guifang Li, Ph.D.

Kun Liang, Ph.D.

Fluvio Lobo Fenoglietto

Matthew Logan

Arkadiy Lyakh, Ph.D.

Zhao Ma

Lam Mach

Andres Machado

Donald Malocha, Ph.D.

Kyle Marcus

William Martin

Philip Metzger, Ph.D.

Soroush Mokhtari

Morgan Monroe

Michael Morales Otero

Shivkumar Kaushik Murthy

Janardan Nath

Steven Nichols

Nina Orlovskaya, Ph.D.

Jeremiah Oyer

Sudeshna Pal

Shuo "Sean" Pang, Ph.D.

Danny Parker

Griffith Parks, Ph.D.

Sumanta Pattanaik, Ph.D.

Robert Peale, Ph.D.

Fenglin "Maple" Peng

Otto Phanstiel, Ph.D.

Rajneesh Kumar Prajapati

Swaminathan Rajaraman, Ph.D.

Parthiban Rajasekaran, Ph.D.

Richard Raustad

Xiaoming Ren, Ph.D.

C. Kyle Renshaw, Ph.D.

Bracken Roberts

John Rogers

Kyle Rohde, Ph.D.

Edward Ross, M.D.

Bahaa Saleh, Ph.D.

Swadeshmukul Santra, Ph.D.

Axel Schülzgen, Ph.D.

Sudipta Seal, Ph.D.

Hubert Seigneur, Ph.D.

William Self, Ph.D.

Shea Silverman

Judith Simms-Cendan, M.D.

Shane Singh

Dinender Singla, Ph.D.

Eileen Smith

Sang-Eun Song, Ph.D.

Jack Stubbs

Guanjun Tan, Ph.D.

Felix Tan

Guang-Ming "Derek" Tao, Ph.D.

Seyed Milad Tayebi

Anthony Terracciano

Jayan Thomas, Ph.D.

Fernando Uribe-Romo, Ph.D.

Rajan "Raj" Vaidyanathan, Ph.D.

Alvaro Velasquez

Robin Vieira

Konstantin Vodopyanov, Ph.D.

Thomas Wan, Ph.D.

Arthur Weeks, Ph.D.

Greg Welch, Ph.D.

Yishi Weng

Elizabeth Williams

Shin-Tson Wu, Ph.D.

Yang Yang, Ph.D.

Yanchun Yin, Ph.D.

Francisca Yonekura, Ph.D.

Hae-Bum Yun, Ph.D.

Tao Zhan

Shihao Zhang

Qun Zhou, Ph.D.

Partnerships
Commercialization Partners

Our industry partners are integral to the process of transforming the discoveries made at UCF into commercial products that benefit society. These 28 companies, organizations, and entrepreneurs have partnered with us to evaluate and license innovative materials, drugs, and methods in order to improve existing products or to create new ones.

The startup company is shown in **gold.**

Adventist Health System	iTomography Corporation
Amirah Mathin	Pasco eSchool (PeS)
Capacitech Energy, LLC	Santa Monica College
Composites One, LLC	Seminole State College
Cyto-Sen Therapeutics, Inc.	SlimStream, LLC
Data Transfer Solutions	Southern Research Institute
Dominion Aesthetic Technologies, Inc.	Spectra Systems Corporation
Dr. Rock Clapper	Sun Innovations, Inc.
Driving Safety Interactive	Tevara
eSoma Limited	The School Board of Seminole County
FAMU	University of Maryland
Florida International University	University of Texas at El Paso
Gowan Company	University of Wyoming
Green Recycling Technologies, LLC	Vanderzyl Woodworking, Inc.
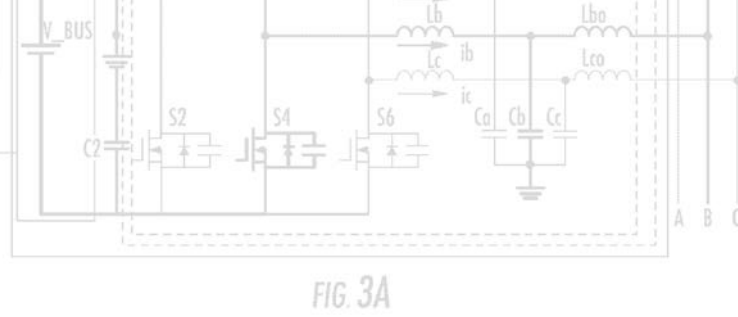
Events
Advancing University Intellectual Property

Our team attended events throughout the year to promote university-developed technology, support faculty, facilitate industry partnerships and stay current on industry trends and best practices. The events attended are listed below.
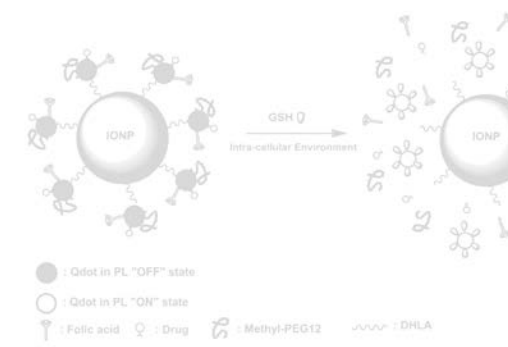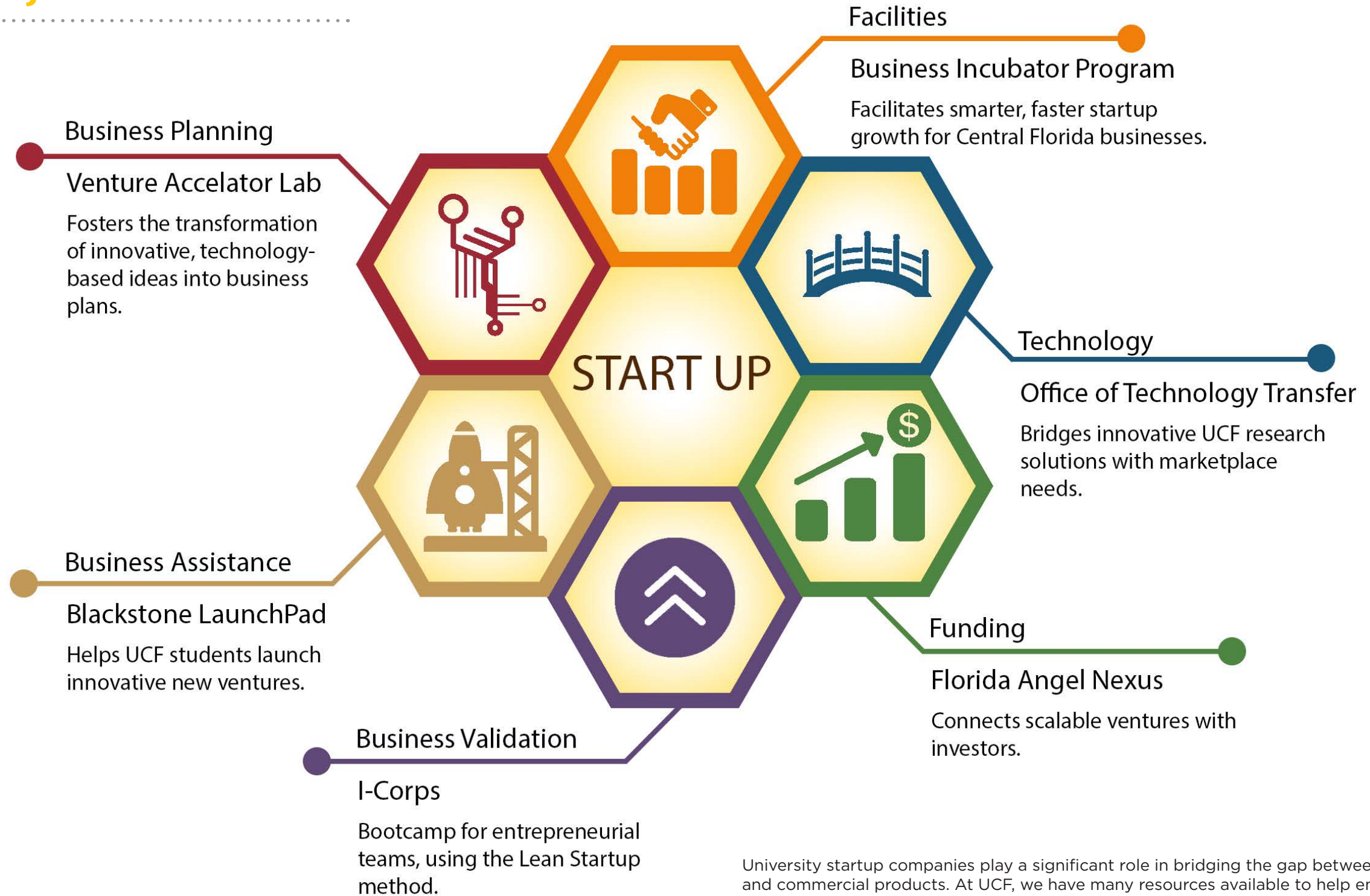
2016 - 2017

JUL	●	American Institute of Aeronautics and Astronautics (AIAA) Jet Propulsion Conference
SEP	●	2016 XXV International Congress of Entomology
OCT	●	Materials Innovation for Sustainable Agriculture (MISA) Conference
	●	Campus Connection
NOV	●	NASA Kennedy Space Center Innovation Expo
	●	R&D 100 Awards
	●	UCF Chapter of NAI Inauguration Gala
	●	BioFit International Conference
DEC	●	BioFlorida Conference
JAN	●	Southeastern Medical Device Association (SEMDA) Pitch Rounds Road Show
FEB	●	CREOL Industry Affiliates Day Symposium
MAR	●	Association of University Technology Managers (AUTM) Annual Meeting
APR	●	Southeastern Medical Device Association (SEMDA) Conference
	●	Federal Laboratory Consortium for Technology Transfer
MAY	●	National Grants Management Association Annual Training

● Promote / Support University Technology and Partnerships

● Resource to Faculty and Students

● Continuing Education

FIG. 3A

Startups, Start Here

START UP

Business Planning
Venture Accelator Lab
Fosters the transformation of innovative, technology-based ideas into business plans.

Facilities
Business Incubator Program
Facilitates smarter, faster startup growth for Central Florida businesses.

Technology
Office of Technology Transfer
Bridges innovative UCF research solutions with marketplace needs.

Business Assistance
Blackstone LaunchPad
Helps UCF students launch innovative new ventures.

Funding
Florida Angel Nexus
Connects scalable ventures with investors.

Business Validation
I-Corps
Bootcamp for entrepreneurial teams, using the Lean Startup method.

University startup companies play a significant role in bridging the gap between basic research and commercial products. At UCF, we have many resources available to help entrepreneurs hurdle that gap. We explored these entrepreneurial resources in our Startups, Start Here blog series. Each compartment on this figure represents a different need that entrepreneurs have, and the UCF department with the tools to assist. You can learn about each of these compartments starting on the next page.

Startups Continued

### Launching a Tech Company Based on University Research
January 13, 2016
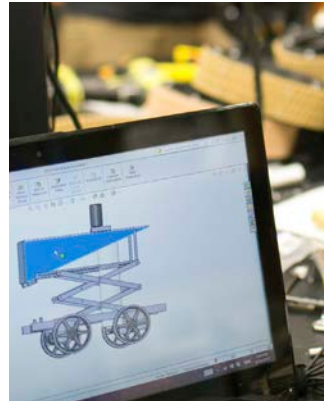
Before the Bayh-Dole Act was enacted on December 12, 1980, the federal government owned the rights to the intellectual property created as a result of research funded with federal dollars. The Bayh-Dole Act enabled universities to retain ownership of inventions arising from federally funded research and to facilitate commercialization of the inventions through licensing agreements with the private sector. The universities took on the responsibility of examining the commercial impact of new intellectual property and ensuring that innovations moved from the lab to the marketplace, so they could make a positive impact on our everyday lives. Since then, technology transfer offices blossomed across the country and can be found in over 230 academic institutions. More and more universities are invested in the process of protecting and commercializing inventions created on their campuses.

Although there is a growing trend in conducting applied research with defined commercialization plans, traditionally, federal research dollars (for example, funding from organizations such as the National Science Foundation and the National Institutes of Health) were primarily awarded for basic research—to expand our knowledge of science and technology. Thus, most of the discoveries that come through a university technology transfer office are quite nascent for the marketplace.

This is why university startups are important. They can help to develop and then sell the technology, which may eventually become acquired by a larger company that can incorporate the new technology into existing products or processes or create a new product line.

The key difference between an industry startup and a university startup is that the former typically begins with solving a problem in the marketplace. The latter starts with an idea based on research results and then looks to identify applications of the idea and what problems it could solve. Technology transfer offices in universities must examine the viability of these ideas in the marketplace. Put simply, an idea may work in the lab, but it could be too expensive or cumbersome to develop into a marketable product.

As America's Partnership University™, UCF provides a variety of resources and services to faculty and students to support them in their entrepreneurial endeavors.
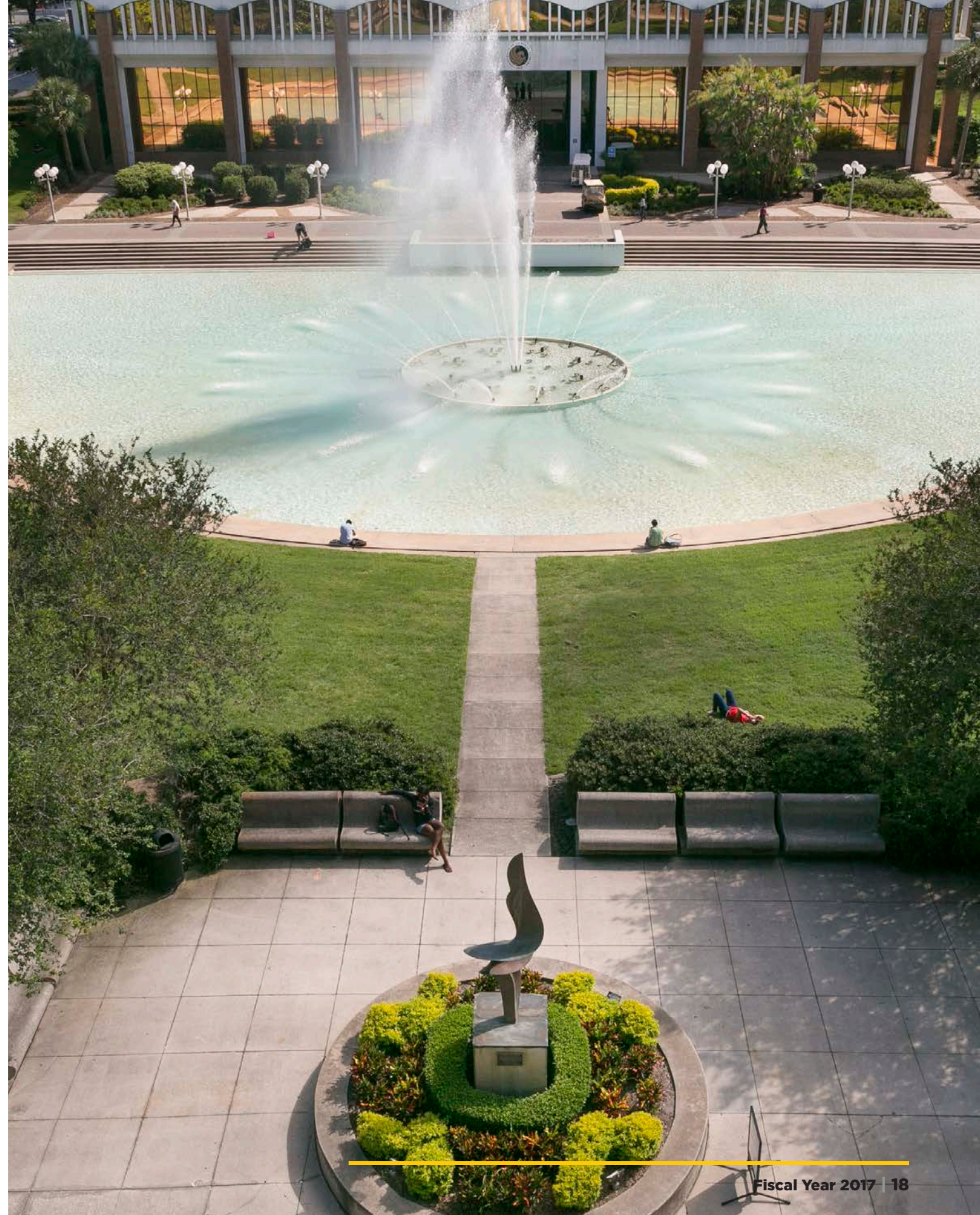
Startups Continued

Startup-Friendly Innovations in the UCF Tech Transfer Technology Locator

January 27, 2016

Technologies available for licensing from the Office of Technology Transfer (OTT) are an opportunity to turn potential into profit. When taking any technology to market—whether defense or diagnostics, photovoltaics or photonics—you'll need a few resources to make this happen such as time, capital, and know-how. The OTT Technology Locator is an online database featuring novel technologies developed at UCF. Within this database, we've curated a collection of special startup-friendly technologies called Startups, Start Here.

These technologies are ready for implementation and can be developed into products with fewer resources—namely, capital. Technologies highlighted for their accessibility in the Startups, Start Here collection are just as impactful as others you'll find in the Technology Locator database and are suitable for new business formation. If you're ready to disrupt an industry with UCF technology, contact us to start the conversation.

An Introduction to University Accelerators—Supporting the Earliest-Stage Ventures

March 16, 2016

To help clarify the distinction between accelerators and business incubators, the former supports entrepreneurs that are in the early idea or prototype stage and the latter supports entrepreneurs once a product or service has been defined and the company has been established. Accelerators help 'accelerate' ideas to a point where they are ready to secure initial grants and/or early seed investment. They typically have access to databases, financial modeling tools, and other resources that can be useful for market and competitor analysis, financial forecasting, and preparing for investor pitches.

Incubators are a logical next step for startups and early-growth companies. Companies are chosen through an application process and the selected companies can take advantage of a variety of discounted or free services including leased office space, mentorship, workshops, legal counsel, marketing, and more.

The university opened its first business incubator in 1999, an initiative that has grown into the UCF Business Incubation Program (BIP) with seven [updated since first publication to nine] community-supported incubators throughout Central Florida. In 2004, UCF launched the UCF Venture Lab, now known as the UCF Venture Accelerator Lab (VAL). Team members provide Florida researchers and startup companies with coaching services to transform innovations into scalable businesses.

What Happens to the Research? I-Corps Teaches Teams How to Take Research to Market

May 25, 2016

So how can individuals explore the worth of patented research to bring innovations to market? UCF I-Corps. Funded by the National Science Foundation (NSF), UCF I-Corps teaches the process of starting a business through the Business Model Canvas (BMC). The BMC focuses on conducting a series of hypothesis tests to validate assumptions before building a prototype or starting a business.

In FY 2017, a group of UCF student researchers decided to patent their innovative discovery—a hydrophobic and self-cleaning nanostructure material. The team, Feynman Nano, believed that sheets of the nanostructures could reduce the cleaning time of solar panels and increase panel efficiency. To determine the business viability, they participated in the 5-week UCF I-Corps program, conducting more than 40 face-to-face interviews to gather data and validate their assumptions.

With the I-Corps training, Feynman Nano now has "NSF lineage," so they can apply for exclusive NSF grants and have a 60 percent increased chance of obtaining SBIR/STTR funding. They were also accepted into one of the most prestigious accelerators in the world with a 2 percent acceptance rate, Y-Combinator.

Three Tips for Raising Investment Capital for Your Technical Innovation

September 8, 2016

It can be difficult for highly technical founding teams without business backgrounds to capture an investor's interest and communicate in understandable terms. Here are three tips for effectively communicating with investors:

1. Properly frame your investment pitch. Explain how your plan fills a marketplace gap and a customer need. Investors also want to see if you know how to scale the company, make a profit and that you have a rewarding exit opportunity.

2. Traction is king. Traction refers to any early commitments received, such as sales, purchase orders, LOIs (letters of intent), contracts—any way that stakeholders show a commitment of time, money, interest or resources into your project.

3. Have a thoughtful plan for use of funds. Lay out a plan that includes both company and cash milestones over the next few years.

Florida's early-stage companies with high-growth potential can access individual investors, funds, family offices, and other investment networks through one application by applying to the UCF partner, NEXUS. UCF's Venture Accelerator Lab can provide guidance on raising capital for technology-based small businesses.

Startup Success Stories

Interview with Successful Entrepreneur, CEO of Tech Startup, Darren Engle
February 10, 2016

Darren Engle, an entrepreneur and a UCF alumnus, has launched two successful startups. The first, Acudyn, Inc., a research, design, and development corporation that specialized in the advancement of energy and automation technologies, was successfully acquired by FAZ Technology in 2014. Engle's current company, Multicore Photonics, Inc., develops fiber optic sensors and instrumentation for industrial applications.

Both of Engle's endeavors have direct connections with UCF. Acudyn, Inc. was a client of UCF's Business Incubation Program (BIP), where Engle received services such as coaching, access to networking events, as well as education and support in areas such as finance and accounting, intellectual property protection, public relations, and marketing. Multicore Photonics has licensed technology through UCF's Office of Technology Transfer.

According to Engle, leveraging university technology is one of the most stable ways to launch a technology-based corporation. "It provides a solid foundation to build upon and offers instant credibility. A startup founded on university technology can [more easily] approach an investor or potential customer by leveraging the startup's connection with the university to establish a known point of trust to further develop."

⬣ Business Incubator Program   ⬣ Office of Technology Transfer

Student Entrepreneurship at UCF is on the Rise with the Blackstone LaunchPad
June 29, 2016

Created in 2013, the Blackstone LaunchPad at UCF is a part of the Center for Entrepreneurial Leadership (CEL), the university's campus-wide academic entrepreneurship center for students. The Blackstone LaunchPad enterprise, which began at the University of Miami in 2008, now includes 20 elite research universities.
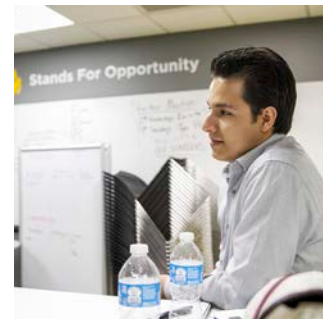
According CEL's executive director, Cameron Ford, Ph.D., Blackstone LaunchPad offers free, confidential one-on-one coaching for students who want to see if their ideas are worth developing into startup proposals. The program also offers workshops about startup skills, industry insights, and successes to further educate and inspire student starters, and connects students to just-in-time resources that can help them take their next steps. The program is open to all UCF students from any discipline. The LaunchPad clients are made up of about 35 to 40 percent business students, 30 to 35 percent STEM students, and 30 percent from all other colleges. To learn more about CEL's initiatives, contact them at **https://cel.ucf.edu/**.

⬣ Blackstone LaunchPad

UCF Students and Faculty Team Up to Commercialize Their Invention
July 20, 2016

FeynmanNano, a student-run, B2B startup company, creates nanostructures that two of its co-founders developed: UCF Associate Professor Jayan Thomas, Ph.D., and UCF graduate Brandon Carpenter (Feynman's Chief Operating Officer). Jonathan Wachob, also a UCF graduate, is the third co-founder. The team used several UCF entrepreneurial resources, including the Blackstone LaunchPad, I-Corps, and the Office of Technology Transfer.

When asked about the value of Blackstone LaunchPad, Carpenter said that the team "went from knowing nothing about business and only having an idea to securing our first round of investment and having four or more partnerships with hospitals including Florida Hospital." Carpenter said, "It was an intense program in terms of the amount of work," but I-Corps taught them the importance of customer discovery. "We used customer feedback to pivot from marketing the technology to solar panel companies to the medical industry."

He also said that using university technology has a clear advantage. "Even if you're talking with investors, pitching a funding proposal—when you're able to say that UCF, one of the largest universities in the U.S., has their hand in the honey pot, it makes a difference as far as credibility.

⬣ Blackstone LaunchPad   ⬣ I-Corps   ⬣ Office of Technology Transfer

Launch a Startup or Apply for Jobs After Graduation? One Ph.D. Student's Story
August 3, 2016

Helicon Chemical Company is a B2B startup co-founded by President and CEO David Reid, Ph.D., a materials scientist and engineer. Reid was a doctoral student under UCF Professor Sudipta Seal, Ph.D., when he became an entrepreneur. "I had to make a decision about my future: am I going to apply to jobs within academia or within industry?" Reid decided to take a course on technology entrepreneurship. "I really enjoyed it and decided to look into UCF's patent portfolio [available at: technologies.tt.research.ucf.edu] and start a real company."

Helicon licensed a number of UCF patents and intellectual property [through the Office of Technology Transfer] related to nanocomposites and nanotechnology. "When you license a technology from a university versus trying to come up with something similar on your own, you have a huge leg up," Reid said, pointing out advantages, such as several years of R&D from top experts in the field. "That level of work, and the money that is invested into research, is something that a startup company really can't replicate," he said.

Reid found the early stage mentoring advice from the Venture Accelerator Lab extremely helpful. "Venture Accelerator not only introduced me to SBIR [Small Business Innovation Research] funding, but also helped me write my first proposal." His advice to student entrepreneurs? Learn about everything outside of their area of expertise. "From day one, learn about accounting, how to read a general ledger, how to understand a legal agreement," he said. "The earlier you get started, the better."

⬣ Office of Technology Transfer   ⬣ Venture Accelerator Lab

Featured Faculty
And Technologies

The articles that follow are highlights of the Faculty Feature articles published in fiscal year 2017 combined with the corresponding technology-focused Patent Trending Blog. To read the full articles and corresponding technology blogs, visit:

https://tt.research.ucf.edu/archives.

Hae-Bum "Andrew" Yun and Civil Engineering
July 2016

Growing up around his father's construction business, Associate Professor Hae-Bum "Andrew" Yun, Ph.D., was inspired to become a civil engineer. So he earned a master's degree from Carnegie Mellon University and received a doctorate degree and completed a post-doctoral fellowship at the University of Southern California in Los Angeles. Now, as the director of the UCF Structural Health Monitoring Laboratory, Yun researches challenging issues regarding large structures, such as bridges, dams, buildings, nuclear power plants and roads. The lab focuses on three main research areas: 1) sensor-based smart monitoring technology, 2) computer vision-based defect quantification technology, and 3) spectroscopy-based Nondestructive Evaluation and Test (NDE&T) technology.
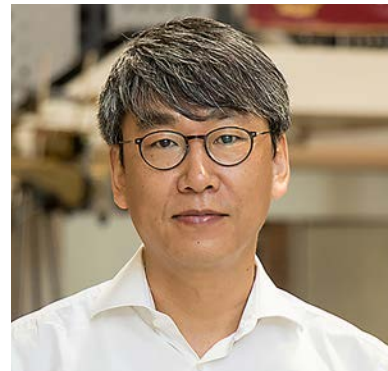
Monitoring the Stress on Bridges, Buildings, Dams and Tunnels Can Prevent Tragedy

One of Yun's inventions is a highly accurate structural health monitoring system that tracks incremental changes in a variety of structures (such as buildings, bridges, tunnels, walls and dams). Structural integrity risks and failures are a result of incremental changes over time, such as cracks forming in walls and ice forming on roads. They occur at a slow, seemingly imperceptible rate. Other environmental factors, such as temperature and precipitation can hide these slight changes and hamper monitoring. Such changes usually occur in patterns, and if left unchecked, can eventually lead to fatalities and catastrophes. Using an auto-modulating pattern (AMP) detection system, Yun's structural health monitoring method cuts through the "noise" of the other environmental factors to effectively detect and monitor subtle changes more accurately. The system does this by detecting tiny but important changes in sensor readings, which are directly related to structural health. It can use several types of sensors (such as acceleration, displacement, slope, strain, temperature and velocity) to measure the risk of structural stress. Easily adaptable, the system functions independently or within a larger detection unit to trigger alerts of possible structural failure.
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Nazim Muradov Advances Hydrogen Energy Research
April 2017

In 2017, both UCF and the National Academy of Inventors (NAI) honored Nazim Muradov, Ph.D., of UCF's Florida Solar Energy Center (FSEC), for his work in hydrogen and alternative fuel sources. Muradov received the Excellence in Research Award from UCF, and became Fellow of the NAI.
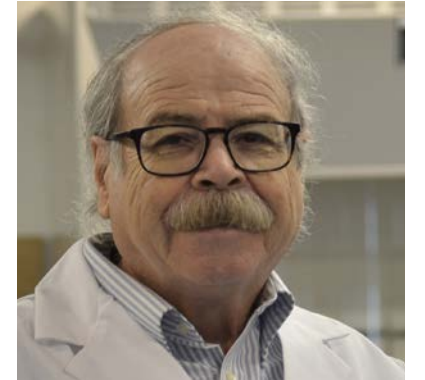
A research professor in the Advanced Energy Research group at FSEC since 1990, Muradov has focused on thermocatalytic and photocatalytic hydrogen production systems, solar-powered water-splitting cycles, advanced biofuels, fossil fuel decarbonization, hydrogen sensors, and radiant detoxification of hazardous wastes—all work related to hydrogen energy technology.

Clean Hydrogen: An Abundant Alternative to Fossil Fuels

Hydrogen, the most abundant element in the universe, is odorless, colorless, non-toxic and non-corrosive. It is an alternative fuel with worldwide focus from many organizations, including NASA, Toyota and Honda. A hydrogen-powered fuel cell vehicle produces zero GHG emissions; the only byproducts are water vapor and warm air. Thanks to scientists like Muradov, research in hydrogen production systems continues to advance.

Muradov's current research centers on the production of hydrogen and oxygen powered by solar energy using hybrid photo-thermochemical water-splitting cycle technology. The technology is unique in that it facilitates the storage of thermal energy, enabling round-the-clock operation. He is working jointly with Texas A&M University under an award from the Qatar National Research Fund. The project's technical approach builds upon an FSEC invention that enables companies to produce hydrogen fuel from water using solar energy.

He also recently led a project funded by the U.S. Office of Naval Research. The project investigated the development of compact power generators for unmanned undersea vehicles (UUV). Muradov won the ONR funding by presenting a novel idea to produce hydrogen from seawater and then link it to a fuel cell to form a power generator.

Peter Delfyett and Using Light to Improve the Diagnosis of Cervical and Skin Cancer

May 2017

Peter Delfyett, Ph.D., shows his graduate students how photonics is in every aspect of their lives. "Photonics is basically the science and understanding of light and how we interact with the universe, and how by using this light, we can come up with technologies to make the lives of all humanity better," said Delfyett, a University Trustee Chair & Pegasus Professor of Optics & Photonics, ECE & Physics. Delfyett joined CREOL, the College of Optics & Photonics, in 1993. He is the director of the Townes Laser Institute and leads the Ultrafast Photonics research group.

He calls his approach to research an "application pull" approach (which he imparts to his students). Delfyett looks at the different real-world applications related to areas such as communications, computing or signal processing and asks, "What are the bottlenecks that are preventing this technology from working faster, more cost-effectively or in a more energy-efficient way?"

Imaging and Sensing Cervical and Skin Cancers

Delfyett has contributed to 42 issued U.S. patents, which span many areas, including medical diagnostics. One of those inventions was the first to combine the use of optical coherence tomography with spectral interferometry to help improve and speed up the diagnosis of cervical and skin cancer. The all-in-one imaging probe developed by Delfyett and UCF colleague Jannick P. Rolland, Ph.D., offers a real-time three-dimensional colposcopy diagnosis using low-coherence laser light to conduct spatial imaging and spectral sensing for tissue diagnosis. The new technology eliminates the old cervical cancer screening techniques, assuring efficiency and a better chance of recovery for patients, including pregnant patients. Physicians can view not only the surface of skin tissue, but also discern whether the cells are normal or abnormal by looking at how they absorb different colors of light. Thanks to the UCF team's groundbreaking work, many other researchers across the country now combine the use of optical coherence tomography with spectral interferometry.

Rodrigo Amezcua Correa and Microstructured Fibers and Devices

March 2017

At UCF, teams of researchers work to advance the field of fiber optics. One scientist, Rodrigo Amezcua Correa, Ph.D., leads a team that specializes in designing and fabricating optical fibers and different components that are made of optical fibers. Amezcua's Microstructured Fibers and Devices research group at the College of Optics and Photonics works to improve high-power lasers, to create new light sources, and to increase the capacity of optical communications.

Breaking New Ground in Optical Fiber Laser Power

Since joining CREOL (The College of Optics and Photonics) 6 years ago, Amezcua has collaborated on several inventions. For instance, Amezcua is working with CREOL researchers Lawrence Shah, Ph.D., Joshua Bradford, Ph.D., and Jose Enrique Antonio-Lopez, to increase a high-power laser's output with an unprecedented degree of intensity and phase control. One design that the collaborators developed incorporates a new device that can control the spatial distribution of the light that propagates through an optical fiber. For their part, Amezcua's research group actually designed all of the optical fiber components, including a unique photonic lantern, made entirely of glass. The lantern connects several fiber lasers and allows users (manufacturers) to control the output optical field in intensity and phase. Though photonic lanterns have been used in astronomy and telecommunications, this is the first time that such devices have been designed for high-power, solid-state lasers.

In another area of optical fiber research, Amezcua collaborated with Axel Schülzgen, Ph.D. and Antonio-Lopez to develop a new class of fiber optic sensors that are ideal for use in harsh environments. The technology can be used to sense temperature, pressure, strain, acoustic vibration, mechanical vibration or a combination of sensing applications. Multicore Photonics has licensed the new technology for commercialization.
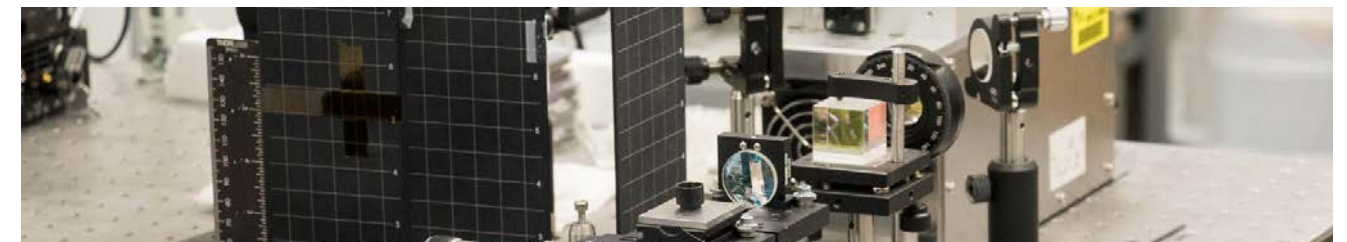
News
Research and Researchers

Celebrating the Anniversary of the ADA with an Innovation That Adds Space for Restrooms with Disability Access
July 26, 2016

Before the Americans with Disabilities Act (ADA) became law in 1990, UCF's Barbara O'Hara conceived an idea for a shelf that safely stores the belongings of people with disabilities while in a restroom. The Health Sciences Operations Director at the College of Medicine holds two patents for the shelf. O'Hara got the idea after her husband's cousin, Eddie, visited their home. Eddie was paralyzed from the neck down after a tragic biking accident. "I had to remove some doors in order for him to get in and out of the bathroom. So he had no privacy when he visited us. That experience stuck with me," O'Hara said.
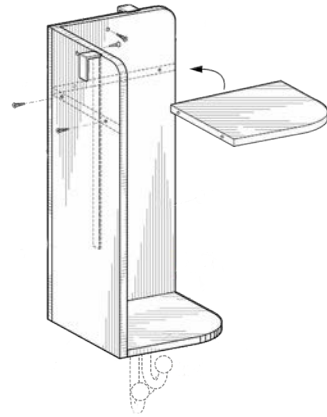
Patent drawing of hanging corner shelf designed by Barbara O'Hara

Years later, the shelf is now in all bathrooms that provide access for people with disabilities in the College of Medicine. The shelf is wide and deep enough to hold a laptop or a purse and supports up to 50 pounds. O'Hara hopes to see the shelf used in airport restrooms and beyond. Although this was her idea, O'Hara sees her invention as a group effort, crediting the College of Medicine, as well as Brion Berman from the Office of Technology Transfer for his guidance through the IP protection process.

Space-Tech Turned Bio-Tech: How UCF Technology Developed for NASA Is Making the Leap to Healthcare
August 31, 2016

UCF's relationship with healthcare diagnostics startup company Aviana Molecular Technology, LLC (AMT) began with the licensing of sensors developed for NASA by Donald Malocha, Ph.D., Pegasus Professor of Electrical Engineering. From there, AMT received funding from the Florida Institute for Commercialization of Public Research to commercialize the sensors. The company is now a tenant at the UCF Business Incubation Program's tech incubator.

"We plan to expand these sensors into use for monitoring human health," says Dr. Vanaja V. Ragavan, president and CEO of AMT. The portable, cost-effective and versatile biosensors function in both highly sophisticated health systems and in resource-limited environments where point-of-care diagnosis can impact human health. Ragavan expects to make the technology available for military, space travel and even veterinary use.

The Pegasus device

"I have worked with many offices of technology transfer around the world," Ragavan says. "I found UCF to be the most cooperative, the most interested. They have been really wonderful to work with."

'Back to the Future' Inspires Solar Nanotech-Powered Clothing
November 14, 2016

UCF nanotechnology scientist Jayan Thomas, Ph.D., has developed filaments that harvest and store the sun's energy — and can be woven into textiles. Thomas' breakthrough technology was featured in the "Nature Communications" November 2016 issue. His research team developed filaments in the form of copper ribbons that are thin, flexible and lightweight. With a solar cell on one side and energy-storing layers on the other, the ribbons can be woven into clothing to harvest and store energy for cell phones and other gadgets.

"That movie was the motivation," Associate Professor Jayan Thomas, a nanotechnology scientist at the University of Central Florida's NanoScience Technology Center, said of the film "Back to the Future" released in 1989. "If you can develop self-charging clothes or textiles, you can realize those cinematic fantasies—that's the cool thing." Thomas' idea for the invention came after thinking: "We make energy-storage devices, and we make solar cells in the labs. Why not combine these two devices?" One use would be for the military. "Some soldiers carry more than 30 pounds of batteries on their bodies," he said. If woven into a lightweight garment, the technology could ease a soldier's load while providing a way to recharge equipment.

Global Agricultural Company Licenses UCF Scientist's Tech to Fight Crop Disease
January 24, 2017

International agricultural company Gowan Co. obtained exclusive rights to an anti-fungal and anti-bacterial formulation for fighting crop disease developed by researcher Swadeshmukul Santra, Ph.D., an associate professor in UCF's NanoScience Technology Center and the Department of Chemistry.

Under the agreement, Gowan will market the UCF technology for use on a wide range of fruits and vegetables and will work to obtain regulatory approval from the EPA and at the state level. Through UCF's Office of Research & Commercialization, the agreement will bring royalties from future sales to the university and its inventors.

The formulation couples a centuries-old agricultural practice with cutting-edge nanoscience. It includes copper nanoparticles about 100,000 times smaller than the width of a human hair. Copper was first used in agriculture in 1761 to protect seeds from soil-borne fungal attack. Compared to other formulas, Santra's invention is safer for the environment and prevents disease more effectively than the industry standard.

Endangered Tiny Bird Has Big Ally in UCF

February 13, 2017

The future of the tiny, endangered Florida grasshopper sparrow may rest on a hot-water blaster that safely fends off fire ants. Associate Professor Joshua King, Ph.D., received $15,500 from the U.S. Fish and Wildlife Federation to use his invention against ant mounds that threaten sparrow-nesting sites. The birds nest exclusively on the floors of the dry prairie ecosystem of central and south Florida. Only about 100 of the birds remain in the wild.

An ecologist and entomologist at UCF, King said that once fire ants detect a hatched, vulnerable sparrow chick, "they will attack incessantly until the parent birds are overwhelmed and give up trying to pick ants off their chicks." King's system, with its 450-gallon hot-water tank, pumping system, and dousing wand, is an ideal deterrent in environmentally sensitive areas. He hopes that the apparatus offers a low cost, non-toxic remedy to the fire ant problem throughout the southeastern U.S.

Endangered Florida grasshopper sparrow

UCF Ranked Among Best in Nation for Research Leading to New Tech and Spinoffs

April 21, 2017

UCF ranks 22nd in the country for its success in "technology transfer"—the practice of developing academic research into new technologies, products and companies, according to a report released in April 2017 by the Milken Institute, a nonprofit think tank. The authors of "Concept to Commercialization: The Best Universities for Technology Transfer" ranked each university based on four indicators of technology transfer success: patents issued, licenses executed, licensing income and start-ups formed, relative to research expenditures. UCF ranked particularly high for the number of patents granted—fifth out of 225.

"This ranking illustrates that we are creating innovation that not only elevates the pursuit of knowledge, but also solves real-world problems," said Elizabeth Klonoff, UCF's vice president for research and dean of the College of Graduate Studies. "We are proud to be able to deliver on a central part of our mission and will continue to seek opportunities to make a collective impact."

Programs for Entrepreneurs
And Innovators

The Office of Technology Transfer works with other entrepreneurial support units to assist startups in advancing university research.

Venture Accelerator Lab

The Venture Accelerator Lab is a place for technology entrepreneurs to transform innovative ideas and intellectual property into businesses with high growth potential. Entrepreneurs receive assistance with strategic research, market and competitive analysis, industry trends, financial modeling and more.
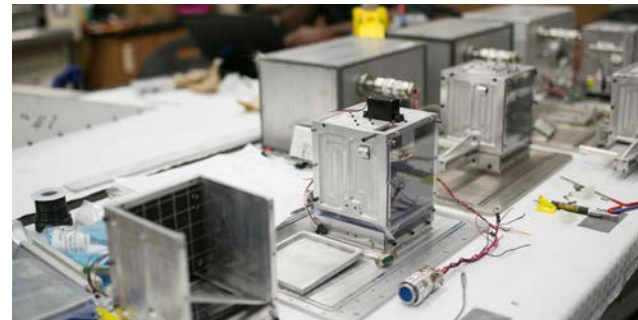VentureLab.ucf.edu

Florida Angel Nexus

The Florida Angel Nexus powers angel investment groups statewide to provide investors the efficiencies of a large entity and the flexibility of niche interests. Selected entrepreneurs have access to a large base of investors with expertise in their respective industries.
PoweredbyNexus.com

I-Corps

Faculty and students selected to participate in the I-Corps program learn about entrepreneurship first-hand while they explore and validate the commercial landscape surrounding their innovation.
ICorps.cie.ucf.edu

GrowFL

Created in 2009 by the Florida legislature, GrowFL is an economic development program focused on assisting second-stage growth companies to prosper in the state of Florida by providing strategic research, peer learning, and leadership development.
GrowFL.com

Business Incubation Program

Since 1999, the UCF Business Incubation Program has helped hundreds of early-stage businesses develop into financially stable companies by providing the tools, training, and infrastructure that help facilitate smarter, faster startup growth.
Incubator.ucf.edu

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