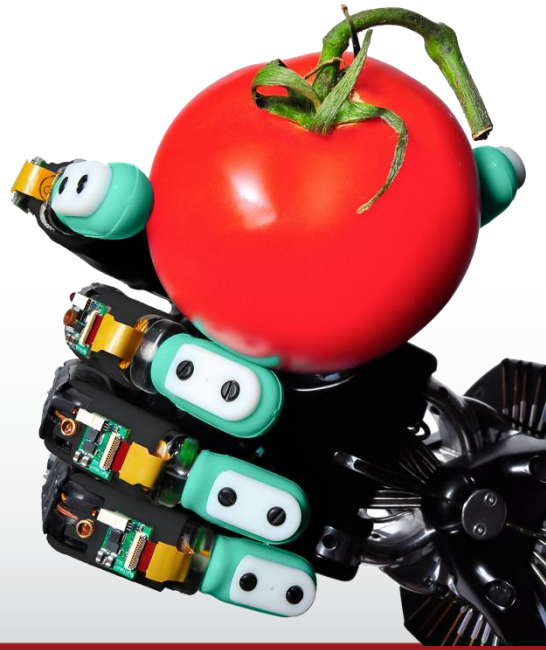
# USC Stevens

## Center for Innovation



**Camilo Ansarah-Sobrinho, PhD**
University of Southern California
Licensing Associate, Life Sciences

# Our Mission

Our **mission** is to maximize the translation of **USC research** into products for public benefit through **licenses**, **collaborations** and the promotion of **entrepreneurship** and **innovation**.

University-wide resource for USC innovators

Manages technology commercialization of inventions resulting from the university's $702 million research portfolio

Fosters innovation through startups, corporate collaborations, sponsored events & programs

# USC Stevens Success Stories: Licenses

## Organic Light-Emitting Diodes (OLED)

- Most advanced TV technology to date over LCD & plasma TVs with thinner, lighter & more efficient flat panel displays
- Developed by Dr. Mark Thompson and researchers from USC Dornsife College of Letters, Arts & Sciences and Princeton University
- Clearer & brighter colors for smart phones, TVs and digital screens
- Used in screens for **over 50 different phones, including the Samsung Galaxy**
- USC Stevens completed patent license agreement for Universal Display Corporation for suite of technology (includes over 120 issued U.S. patents)

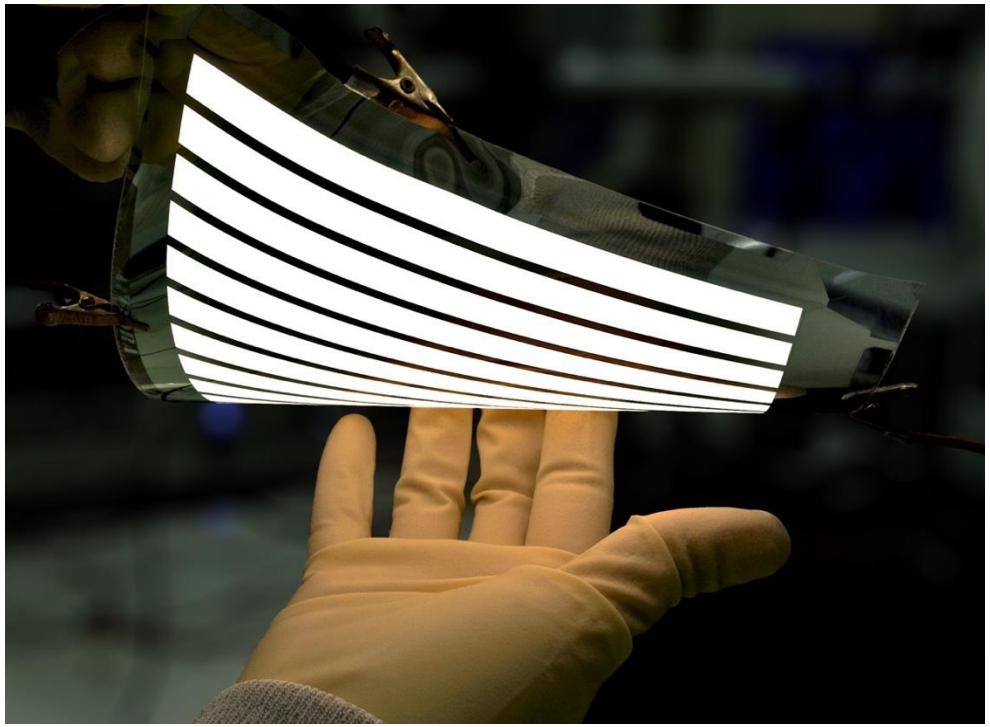


Photo courtesy of Universal Display Corporation

# USC Stevens Success Stories: Licenses

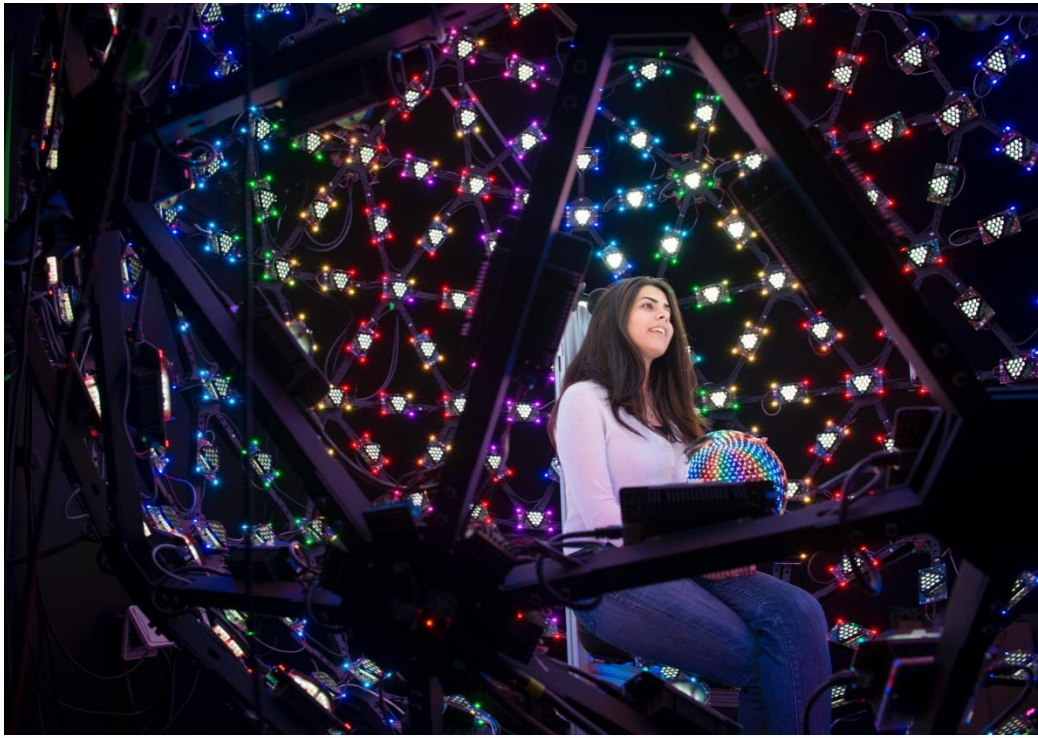
## Bravemind

- Clinical, interactive, virtual reality (VR) based exposure therapy tool to assess and treat posttraumatic stress disorder
- Created by Dr. Albert “Skip” Rizzo, Director of Medical Virtual Reality at USC’s Institute for Creative Technologies and Computer Scientist Arno Hartholt, head of Integrated Virtual Humans & Art Production Group
- USC Stevens completed patent license agreements for Bravemind to be used by several universities and hospitals, as well as private companies

# USC Stevens Success Stories: Licenses

## Light Stage

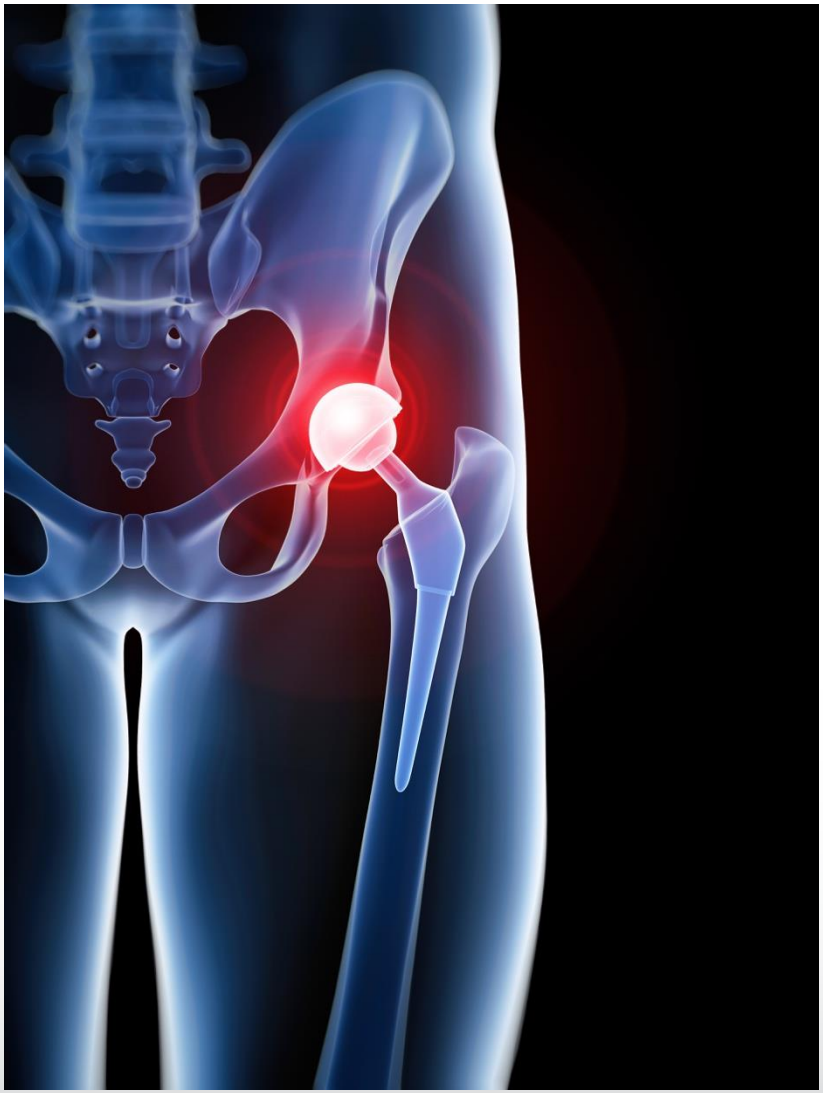
- Movie-making technology to create photo-real digital actors for film, TV, videogames and immersive simulations
- Paul Debevec and team at USC's Institute for Creative Technologies developed various forms and versions of the Light Stage technology
- Technology used in films such as Spider-Man 2 (2004 Academy Award for Visual Effects), Avatar, The Curious Case of Benjamin Button, Furious 7, The Jungle Book
- USC Stevens licenses all of the Light Stage technologies



# USC Stevens Success Stories: Licensing

## Polyethylene Technology for Artificial Human Joints

- High performing and long lasting polymer materials for artificial human joints
- Dr. Ronald Salovey of the USC Viterbi School of Engineering developed
- Improves hip reconstruction for patients, more wear resistant without compromising mechanical integrity over traditional hip replacement materials



# USC Stevens Success Stories: Licensing

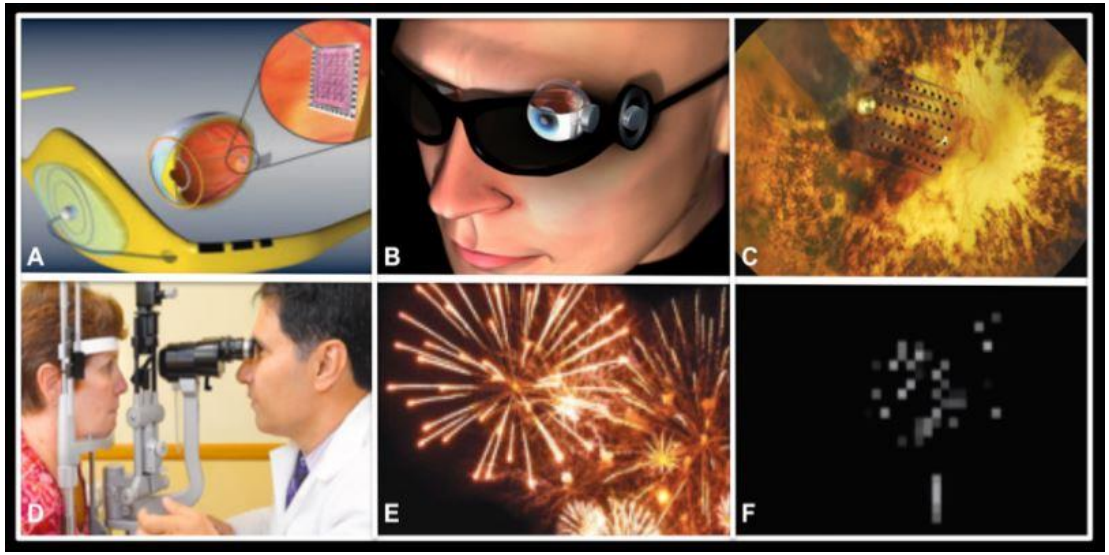
## Argus II Retinal Prosthesis

- First FDA-approved implanted device to re-establish sight in blind patients
- Dr. Mark Humayun and his teams from USC Neuroscience and the Doheny Eye Institute contributed to the development of the underlying hardware and software platform
- Manufactured by Second Sight Medical Products and is the result of a close collaboration by Keck School of Medicine of USC, the USC Eye Institute and the USC Viterbi School of Engineering
- USC Stevens completed exclusive patent license agreement for the technology with Second Sight

Photos courtesy of Second Sight Medical Products

# USC Stevens Success Stories: Licensing

## Argus II
## The Technology




The Argus II device restores the sense of sight with advanced bioelectronic technology.
Argus II is a retinal implant system (Images A & C) that consists of an eyeglass mounted camera and an implanted 60 electrode retinal stimulator.

The stimulator, implanted on the eye and interfacing directly to the retina, relays signals from the external camera to the retina via small electrical impulses, which triggers signals in the retina that are passed to the brain via the optic nerve. The brain is then able to process the signals into a visual picture (Image F).

# USC Stevens Success Stories: Licensing

## USC Roski Eye Institute

First Ever Argus I and II Implant Recipient:

https://www.youtube.com/watch?time_continue=1&v=RXDUQ-Xcx6I

# Invention of the World's First FDA-Approved Artificial Retinal Prosthesis

After witnessing his grandmother slowly loosing vision due to complications from diabetes, Dr. Humayun devoted his scientific career to finding solutions for devastating conditions that cause blindness.

Dr. Humayun and Dr. James Weiland assembled a team of world experts to create a revolutionary retinal prosthesis system known as Argus II.

The Argus II 30-patient trial launched in 2007 at sites in the U.S. and Europe. It was approved by the U.S. Food and Drug Administration (FDA) in February 2013.

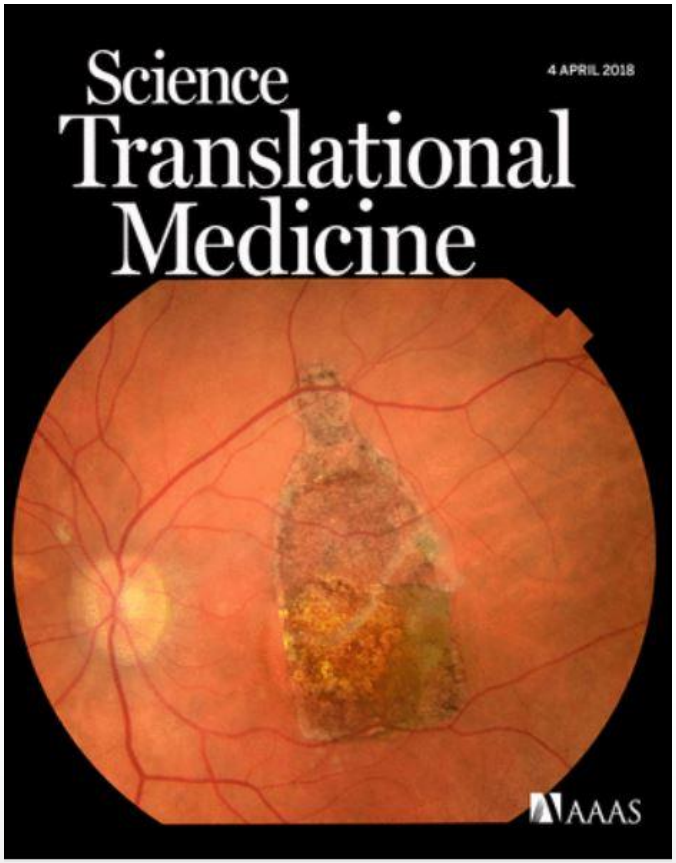
The project was funded by the National Institutes of Health (NIH), Office of Science at U.S. Department of Energy, National Science Foundation (NSF), W.M. Keck Foundation, Research to Prevent Blindness, and Second Sight Medical Products, Inc (SSMP).

SSMP launched Argus II worldwide and is available at more than 25 centers worldwide. 37 new units have been implanted during the first 2 quarters of 2018.

# President Obama honors USC Eye Institute's Dr. Mark Humayun in White House ceremony

# A Novel Stem Cell Therapy for Treatment of Dry Age Related-Macular Degeneration

Dr. Mark Humayun, in collaboration with David Hinton, MD, received a $19 million grant from the California Institute for Regenerative Medicine (CIRM) to lead a stem cell initiative. The research team has developed a unique procedure by which a scaffold of stem-cell derived retinal pigment epithelium cells may be surgically implanted into the back of the eye, replacing diseased tissue to treat those suffering from Age-Related Macular Degeneration (AMD).

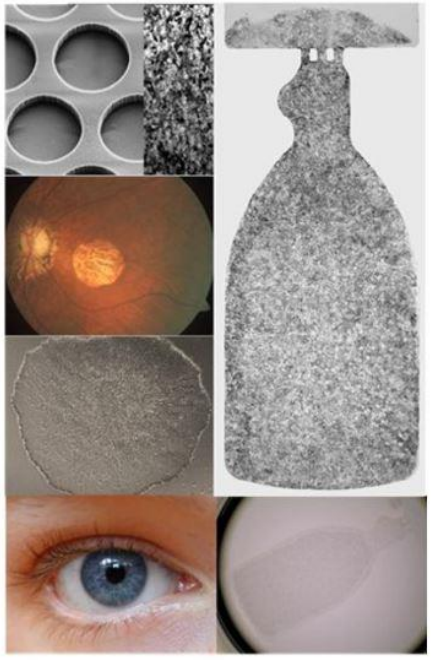


# USC Stevens Success Stories: Licensing

## A Novel Stem Cell Therapy for Treatment of Dry Age Related-Macular Degeneration

RPT was founded by Drs. Mark Humayun and David R. Hinton from the University of Southern California and Dr. Dennis O. Clegg from UC Santa Barbara. The technology to produce the CPCB-RPE1 implant is exclusively licensed to RPT from the University of Southern California, the California Institute of Technology and UC at Santa Barbara.

Regenerative Patch Technologies™



**Santen Pharmaceuticals Announces Strategic Investment in Regenerative Patch Technologies LLC**

# Shrikanth (Shri) Narayanan

## Leading Expert in Speech, Natural Language Processing and Behavioral Informatics

- Automatic speech recognition
- Linguistic analysis of speech interactions
- Extraction of emotion and behavioral patterns from speech

## Behavioral Informatics:

Quantify and interpret human interaction and communication through the use of engineering and computing innovations.

**Niki and C. L. Max Nikias Chair in Engineering**

**Professor of Electrical Engineering and Computer Science,** *Viterbi School of Engineering*
**Professor of Linguistics, Psychology and Neuroscience,** *Dornsife College of Letters, Arts and Sciences*
**Professor of Pediatrics,** *Keck School of Medicine*

**Distinctions**

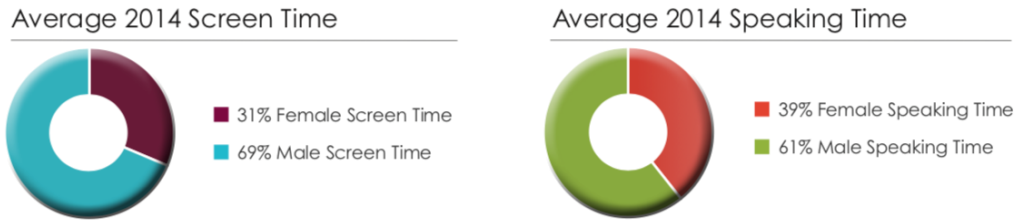
Fellow of: National Academy of Inventors (NAI), Acoustical Society of America (ASA), Institute of Electrical and Electronics Engineers (IEEE), International Speech Communication Association (ISCA), Association for Psychological Science (APS) and American Association for the Advancement of Science (AAAS).

# USC Research: AI

## Linguistic Analysis of Media Content

USC's technology uses automated analysis of media content to analyze massive amounts of data in films in record-breaking time.

Results for entire movie catalog of a specific studio:




Linguistic analysis of media content with an emphasis on studying indications of unconscious biases (differences in portrayal of gender, race and age).

-> Allows for identification of imbalance of representation of demographics and stereotypes in media. Content creators across film, television, advertising, digital and more will be able to identify and recognize issues contributing to problems and correct course.

# USC Research: Press coverage

The New York Times

**Look Who's Still Talking the Most in Movies: White Men**

VARIETY

**Women and Non-White Characters Are Speaking More in Recent Star Wars Movies**

Los Angeles Times

**USC study finds that movies are still dominated by men, on- and off-screen**

Study, conducted by USC's Signal Analysis and Interpretation Lab, used AI and machine learning to do a linguistic analysis of nearly 1,000 popular film scripts.

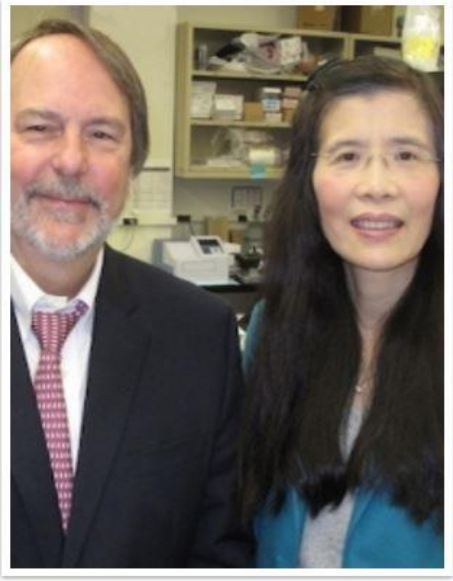
Used automated software to analyze the sophistication of language and character interaction in over 53,000 dialogues between 7,000 characters.

# USC Stevens Success Stories: Startups

## A Recent USC Success Story

LOTUS TISSUE REPAIR

From a small academic laboratory to a potential therapy for a life- threatening human disease



Human rCollagen-7: Candidate treatment for Dystrophic Epidermolysis Bullosa (DEB)

- Rare Genetic Disease: fragile blistering skin, deformed limbs, widespread skin wounds, early death
- Young patients with DEB are often referred to as “butterfly children” because their skin is as frail as butterfly’s wings
- Aberrant function /absence of C7 at dermal-epidermal junction affect attachment of epidermis to dermis

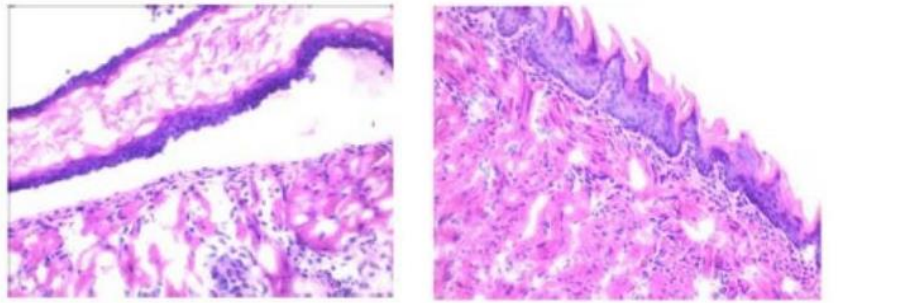
# USC Stevens Success Stories: Startups

## A Recent USC Success Story

LOTUS TISSUE REPAIR

From a small academic laboratory to a potential therapy for a life- threatening human disease

- No disease modifying treatment available; only recurrent, symptomatic treatments; painful and costly diseases
- Product being developed: IV recombinant C7 as a protein replacement therapy
- Mice treated with a single injection of recombinant Collagen 7 Lived Longer



DEB (Control) DEB (Shire Collagen 7)

# USC Stevens Success Stories: Startups

## A Recent USC Success Story

Drs. Woodley and Chen partnered with the USC Stevens Center for Innovation to seek companies interested in licensing various aspects of the C7 work.

USC Stevens helped connect the USC researchers to external entrepreneurs best suited to develop and commercialize a protein replacement therapy.


Drs. Woodley and Chen partnered with entrepreneurs to form Lotus Tissue Repair.

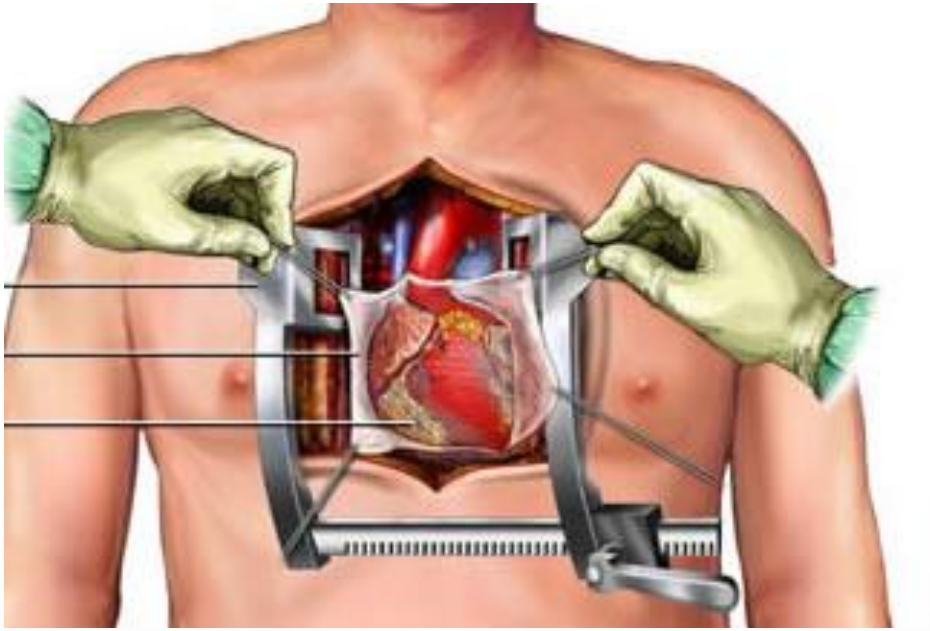
Lotus went on to secure a total of $26 million in milestone-driven funding from Third Rock Ventures and was acquired by Shire Plc, a global specialty biopharmaceutical company.

Shire purchased Lotus Tissue Repair in 2013 for approximately $50 million, with added potential success milestones totaling an additional $275 million.

# 6.8 Million suffer from **Mitral Valve Regurgitation** in U.S.

Challenge: Current treatment requires open heart surgery

- Large 6-8” incision
- Sternotomy
- Heart bypass
- Arrested heart
- 1-2% stroke risk
- 3-6 hour procedure
- 4-7 day hospital recovery
- Return to work > 1 month



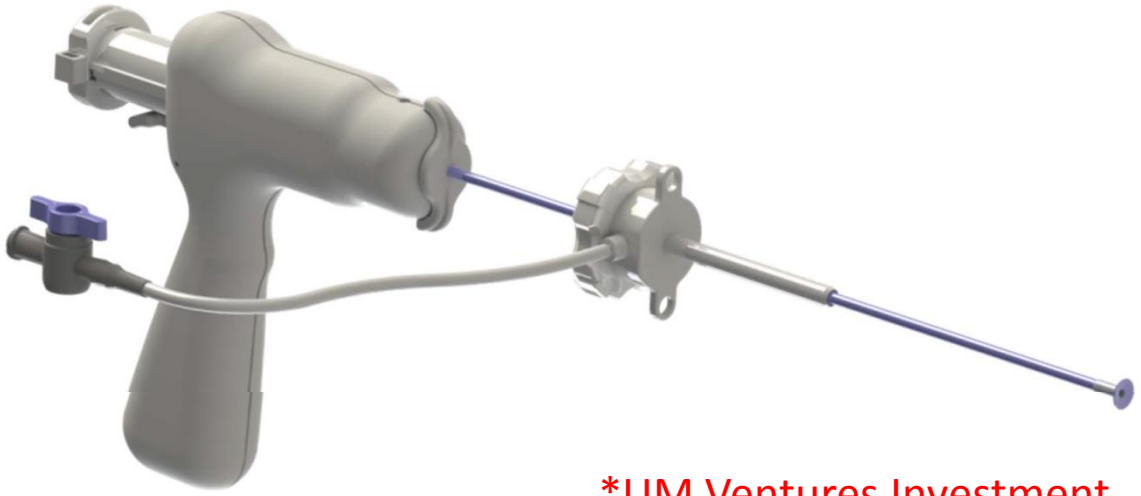
- Over 100,000 MV operations per year
- Only 20% of patients who could benefit get open heart surgery

HARPOON MEDICAL

**Harpoon Solution:** Minimally invasive surgery device

- 1-2” incision
- No sternotomy. No bypass.
- Beating heart
- Negligible stroke risk
- 45-60 minute procedure
- 1-2 day hospital recovery
- Return to work in 5-7 days

2014: Raised $3.6 Million*
2015: Clinical Trial



*UM Ventures Investment

UMB Inventor:
James Gammie, MD
SOM, Surgery

**Why some companies succeed while others fail?**

**What can we do to increase our startups' chance of success?**

# A Tale of Two Companies

# Company 1


**Technology**

A university scientist discovered that a natural compound (found in certain types of fish) had anti-cancer activity

The invention was disclosed to the university technology transfer office

He continued his academic career until his funding ran out and he had no choice but to leave the university

He eventually opened a small biotech company with the money he had left, and started applying for funding to run the company

# Company 1


**The technology was licensed from the university in less than a month**

Inventor, who had no experience in biotech, negotiated an exclusive, worldwide license with the University

License terms: small upfront, backloaded, equity-based, strict diligence milestones

**Weak IP Portfolio**

A single US utility application was licensed from the university

Methods of use patent

Narrow claims

# Company 1


**Product(s)**

A single product based on the recombinant version of a natural protein

Recombinant protein had never been tested

**Initial Funding**

Application for State of MD seed funding pending when license was negotiated

Inventor's personal savings, friends and family

**Goal**

To develop treatments for cancer and fibrotic diseases

**CHANCES OF SUCCESS**

VERY small

# Company 2


**Technology**

University scientist discovered a faster, more efficient, cheaper method to modify glycosylation patterns of antibodies

Multiple inventions were disclosed to the university, including new compositions (Mabs) and methods

University scientist has several high profile publications and is on his way to become a tenured professor

Scientist continues to improve the technology

Inventor was approached by an experienced biotech entrepreneur and the two started a company

# Company 2


**The technology was licensed from the university**

Company negotiated an exclusive, worldwide license with the University

Inventor's role in the company was mainly related to scientific activities

License terms: small upfront, backloaded, equity-based, strict diligence milestones – terms are more favorable to the company than those of Company 1.

**<u>Strong</u> IP Portfolio**

Company licensed a strong portfolio of patents, including several US provisional applications and a PCT application, covering new compositions and methods of modifying antibodies.

## Company 2


**Product(s)**
Company will initially operate as a service provider, modifying existing antibodies. First contracts were negotiated right after license was signed

Eventually, company will develop its own proprietary antibody.

**Initial Funding**
Application for State of MD seed funding pending when license was negotiated

**Goal**
- Service provider to existing pharma and biotech companies
- To develop an improved version of an existing monoclonal antibody

**CHANCES OF SUCCESS**
HIGH

# What was the outcome (so far)?


**Company 1**

Received $100k seed funding from state of MD
Started operations at a local incubator
Inventor partnered with 2 experienced entrepreneurs (became advisors)
Lead inventor participated in the iCorp program
Received a total of ~$150k SBIR phase 1
High likelihood of receiving a Phase 2 SBIR award
CHANCE OF SUCCESS: HIGH

**Company 2**

Company was not able to secure seed funding
Service provider portion never took off
Product Development project has not started yet
Company is still virtual and has no operations
CHANCE OF SUCCESS: LOW

# What happened?


**Company 1**

Science risk still exists, but they are building a real company.
There are good chances that they will develop a product even if the first technology proves to not have the therapeutic effect they expected
Chances of continued funding is very high
Great chemistry between the team
Great focus:

- Scientific founder is fully dedicated to make this work
- Full support from advisors/mentors

**Company 2**

Bad chemistry between founders
Lack of focus

# Thank you!