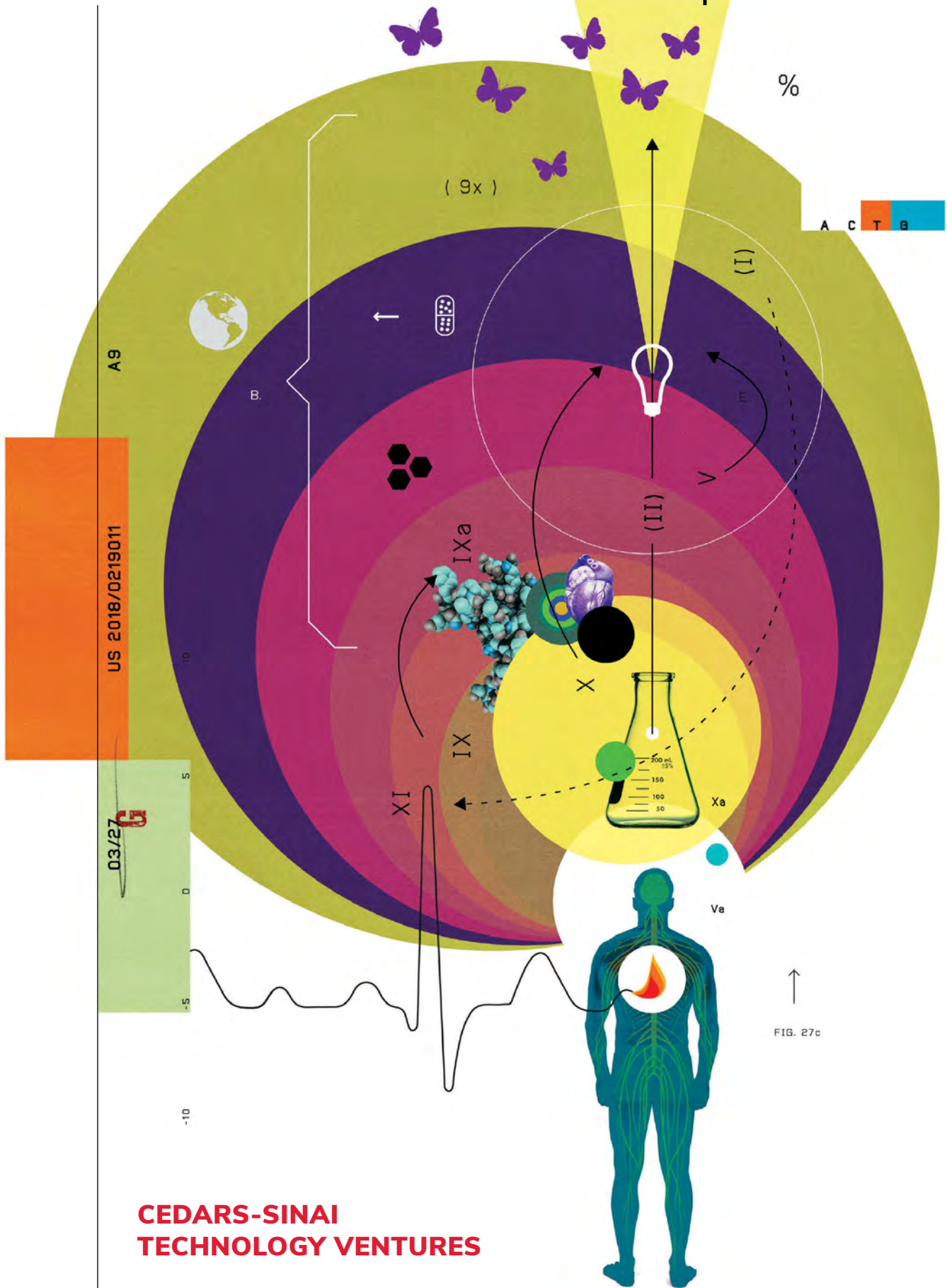


# The Innovation Equation



TECHNOLOGY  
VENTURES

Diagnostics

Therapeutics

Devices

INNOVATION  
FUND

SPIN-OFF  
COMPANIES

Algorithms

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## The Innovation Equation

The Cedars-Sinai Technology Transfer Office was established to enable innovative medicine, patient care and health outcomes.

Each project is unique, yet they all have the potential to improve patient care and provide financial returns that Cedars-Sinai can then reinvest into additional research.

Sometimes a traditional technology transfer strategy works to move the inventions from the research bench to the patient bedside, but often these inventions require more sophisticated tools in order to develop the technologies for the market.

Technology Ventures evolved to provide not only core technology transfer services, but also a wide range of advanced financial and venture approaches to transform ideas into new products and services for the healthcare market.

The Technology Ventures team also looks for solutions that a more traditional technology transfer process would not address, such as creative partnerships, both in the United States and internationally. Technologies that once would have languished in the research lab now have the support they require to continue to develop into new treatments and tools for patient care.

The team pushes the boundaries to deliver technologies and foster companies that offer quality healthcare services, expand the horizons of medical knowledge and improve the health of patients worldwide.

## CEDARS-SINAI

1,019\*

LICENSED BEDS

55,333\*

ADMISSIONS

283,809\*

PATIENT DAYS

(approximately 778 per day)

\* INCLUDES  
CEDARS-SINAI  
MEDICAL CENTER  
AND MARINA  
DEL REY HOSPITAL

817,371\*

OUTPATIENT VISITS

(approximately 2,239 per day)

\$194 million

RESEARCH EXPENDITURES

3,210

RESEARCH  
PUBLICATIONS

**TECHNOLOGY VENTURES**

**\$37.5 million**  
TECHNOLOGY TRANSFER REVENUE

**465**  
TOTAL ACTIVE  
TECHNOLOGIES

**105**  
TOTAL LICENSE AND  
OPTION AGREEMENTS

**174**  
PATENTS  
FILED

**38**  
PATENTS  
GRANTED

**23**  
LICENSE AND OPTION  
AGREEMENTS SIGNED

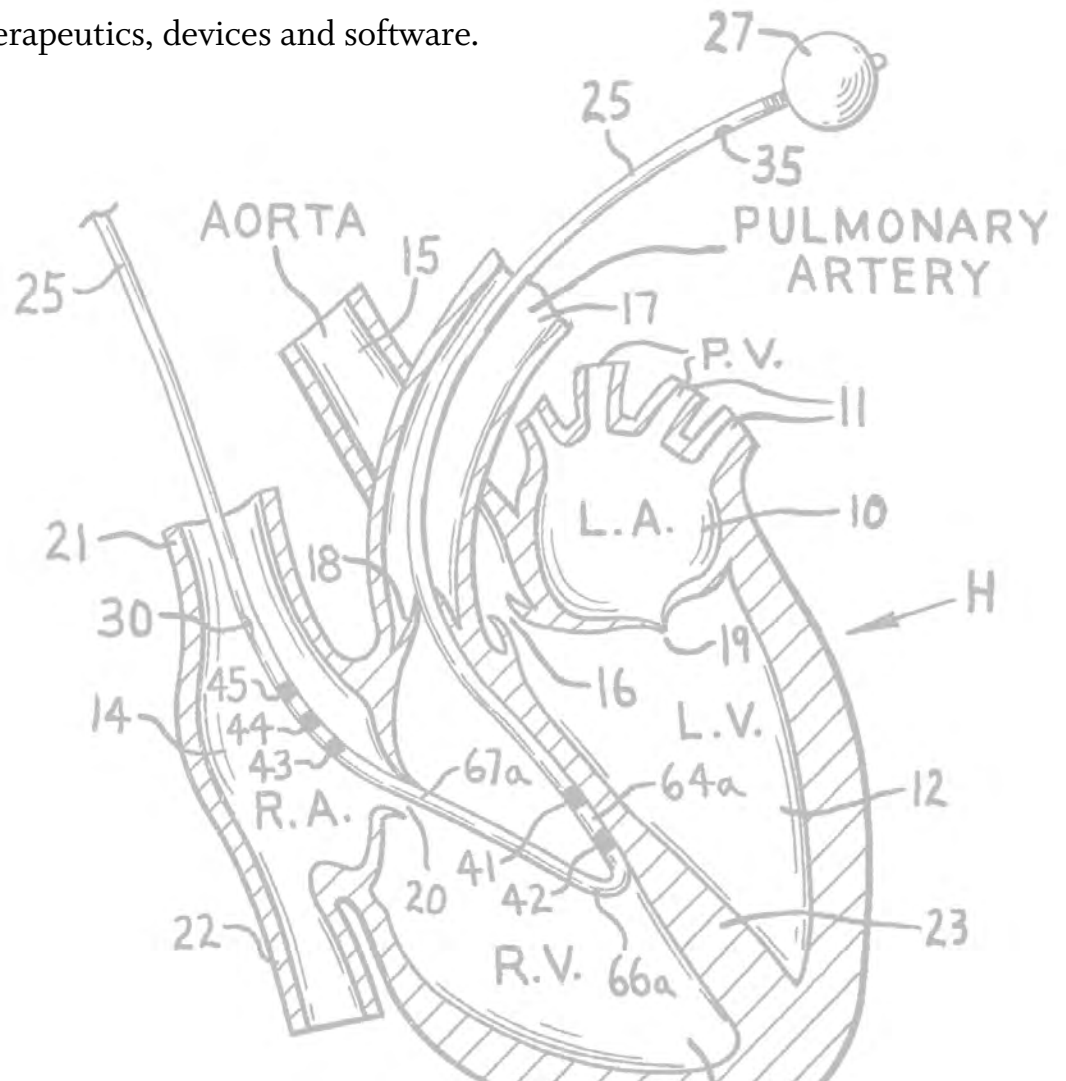
**90**  
CONFIDENTIALITY  
AGREEMENTS SIGNED

**\$76 million**  
EQUITY PORTFOLIO VALUE

**66**  
INVENTION  
DISCLOSURES

Patients around the world benefit from decades of inventions developed at Cedars-Sinai, part of its ongoing commitment to innovative research and healthcare. Nearly 500 active technologies currently in development have the potential to push the boundaries of medicine.

The four groundbreaking inventions described on the next page provide examples of discoveries from academic research labs at Cedars-Sinai that went on to transform how clinicians care for patients. These stories underscore the important work that clinicians, researchers and the Technology Ventures team undertake to create and develop cutting-edge discoveries that start as mere ideas and are transformed into novel diagnostics, therapeutics, devices and software.



U.S. Patent No. 3,995,623.  
Multipurpose Flow-Directed  
Catheter, issued 12/7/76

### **1970s | SWAN-GANZ CATHETER**

More than 45 years ago, two Cedars-Sinai physicians, Jeremy Swan, MD, PhD, and William Ganz, MD, changed the course of heart medicine with the invention of the Swan-Ganz catheter. The landmark invention, still used more than a million times a year in the United States alone, measures blood flow and pressure to the heart and lungs. But at the time of its invention, Cedars-Sinai lacked an office responsible for new inventions. The physicians sold their revolutionary device for a mere \$10,000. To prevent another lost opportunity, Cedars-Sinai established the Patent and Invention Policy, which is implemented by Technology Ventures.

### **1980s | FACTOR VIII**

Alan Rubinstein, MD, wanted a way to minimize the effects of undesirable microorganisms in the blood-clotting agent factor VIII, a concentrate used to increase the clotting ability in a hemophiliac patient's blood. The concentrates are typically prepared from pools of plasma contributed by thousands of donors, and can potentially contain hepatitis, HIV and other pathogens. Previously, heat treating plasma was not an option because it reduced or eliminated clotting-factor activity. Rubenstein's breakthrough process for heating the plasma in a lyophilized form—essentially freeze drying it—provided a method to inactivate unwanted microorganisms without reducing clotting-factor activity.

### **1990s | BARATH CUTTING BALLOON**

Cardiologist Peter Barath, MD, noticed that an unusually high number of patients who underwent angioplasties returned months later with a condition called restenosis, or a re-narrowing of the arteries. He set out to develop a device to reduce the risk of damaging artery walls. The result was the Barath cutting balloon, a catheter balloon fitted with tiny blades that allowed heart surgeons to perform more controlled incisions, leading to less scar tissue. Sales of the device now exceed \$100 million annually.

### **2000s | RIFAXIMIN FOR IBS**

When Mark Pimentel, MD, began to consider that a bacterial infection could cause irritable bowel syndrome (IBS), he opened the door to a new understanding of the disease. Previously IBS was viewed as a psychological disorder brought on by stress. Pimentel began studying the antibiotic rifaximin, which was prescribed to treat traveler's diarrhea because it did not seem to generate drug-resistant bacteria. He went on to discover that rifaximin provided IBS patients with long-lasting relief even after they stopped taking the medication. Rifaximin is now Food and Drug Administration (FDA)-approved for this use, with sales in excess of \$1 billion annually.

## The Technology Ventures Team

The mission of Cedars-Sinai Technology Ventures is to identify, protect and support the commercialization of discoveries and technologies developed at Cedars-Sinai or its partner institutions. Through its activities, Technology Ventures supports the development of promising inventions that improve the ability to treat patients around the world.

The role of Technology Ventures is to:

- Promote awareness of the principles of intellectual property (IP) protection
- Identify and capture new technologies
- Evaluate whether an invention or technology has the potential market value to warrant IP protection
- Secure IP protection, as appropriate
- Invest in the development of the technology to increase its market readiness and value
- Commercialize the technology by marketing to licensees or through spin-off companies

Technology Ventures currently manages more than 100 licenses that generate over \$30 million each year. These diverse technologies include therapeutics, devices, diagnostics and software. The office is always interested in building partnerships that can help bring technologies to market. Working with industry leaders and peer institutions expands the number of opportunities to bring advances in medical technologies into markets around the world.



**EDWARD M. PRUNCHUNAS**  
Executive Vice President  
and Chief Financial Officer



**JAMES D. LAUR, JD**  
Vice President,  
Intellectual Property



**NIRDESH K. GUPTA, PhD**  
Executive Director,  
Technology and Venture Affairs



**KRISTIN A. MARTINEZ**  
Executive Director,  
Alliance Affairs



**PETER S. PARK, JD**  
Director, Program Development  
and Innovation



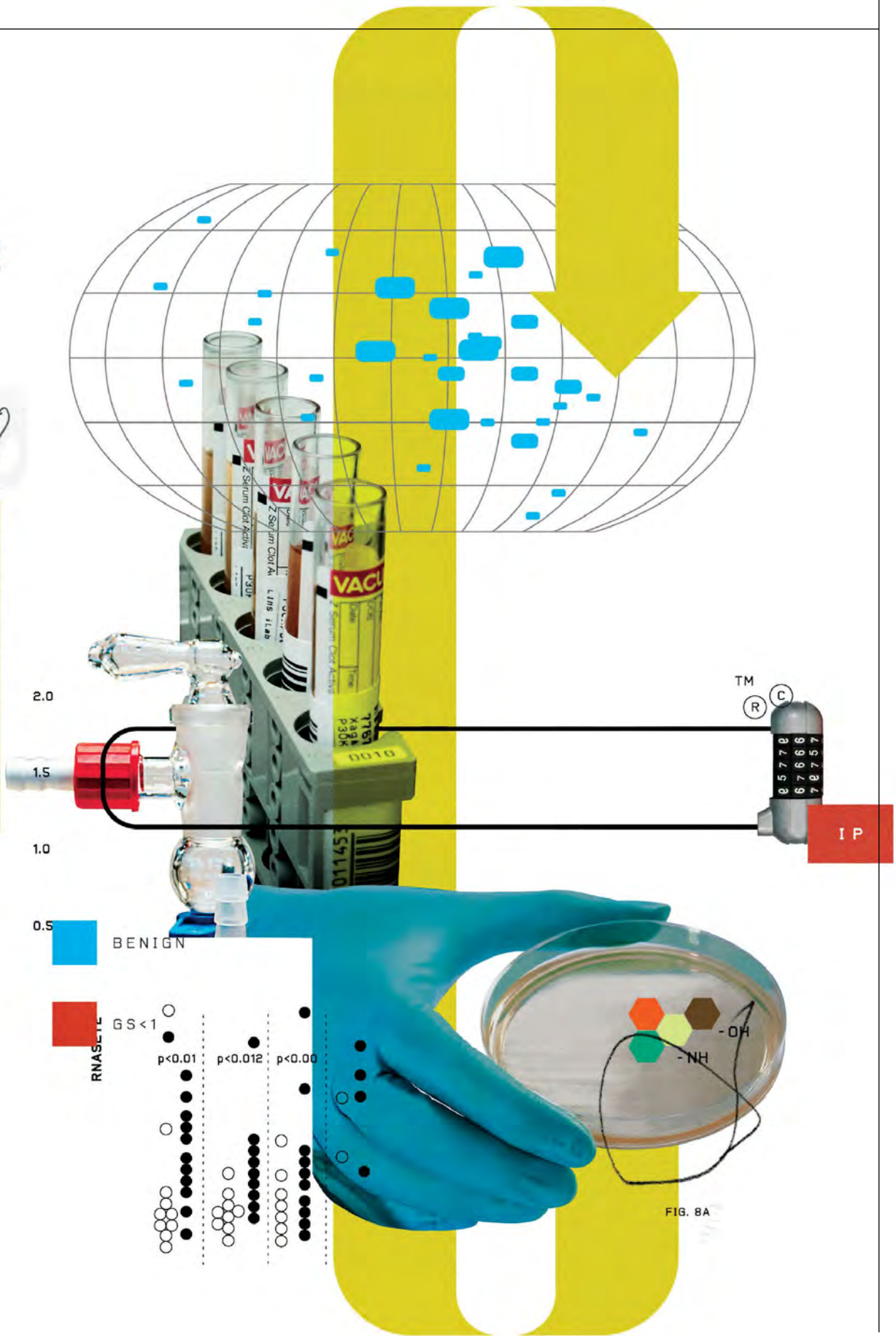
**PAMELA N. COLLINGWOOD, Esq.**  
Senior Counsel,  
Technology Transfer



2018/03/41

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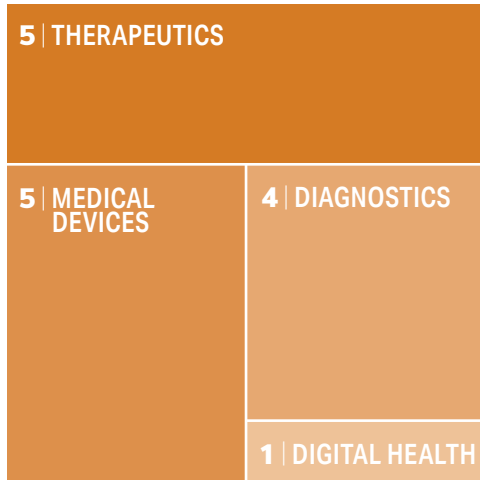
## An Investment in the Future

Cedars-Sinai Technology Ventures invests \$1 million annually from its Innovation Fund to support research and promote the transformation of innovations in its portfolio. The fund has fostered the development of more than 40 projects since its inception. Support from the fund has led to numerous breakthroughs through proof-of-concept funding, prototyping, additional research, drug synthesis, clinical trials and diagnostic development.

The focused use of the fund has allowed technologies that would have ordinarily not been candidates for licensing to become more commercially viable. The fund has also been used to produce important data to enable discoveries to become more attractive for licensing. In all, the Innovation Fund provides an essential resource for getting discoveries from the laboratory bench to the patient’s bedside.

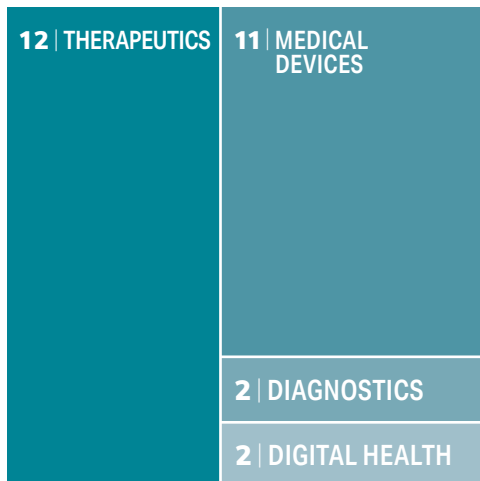
### 15 CURRENTLY ACTIVE PROJECTS

Among these, 5 are aiming to develop prototypes and 3 at target-to-lead generation.



### 27 COMPLETED PROJECTS

Among these, 9 are aiming to develop prototypes and 6 at target-to-lead generation.



## Alliances for Collaboration

The Alliance Affairs team at Cedars-Sinai serves as the key interface between Technology Ventures and its external partners to transform biomedical research discoveries into improved healthcare globally.

The team is responsible for building and managing a variety of partnerships, including alliances with:

- *International Partner Network*—An integrated program of more than 40 international partners from strategic research institutions, government and industry to access global markets, find resources to further develop innovations and identify opportunities for investment or licensing
- *3rd Street Diagnostics*—Cedars-Sinai’s in-house diagnostic development business unit for development and commercialization of diagnostic targets and biomarkers from both Cedars-Sinai and its international partners
- *Innovation Alliance*—A partnership program of U.S. medical centers, industry, entrepreneurs and strategic investors that provides a platform to identify, assess and develop products and services



## Precision Health’s Rosetta Stone

New advances in biomarker research may turn out to be the Rosetta Stone of precision health, the key that unlocks the potential for treatments to be tailored to the individual patient. Biomarker discoveries also play an instrumental role in Cedars-Sinai’s mission to improve clinical outcomes for patients.

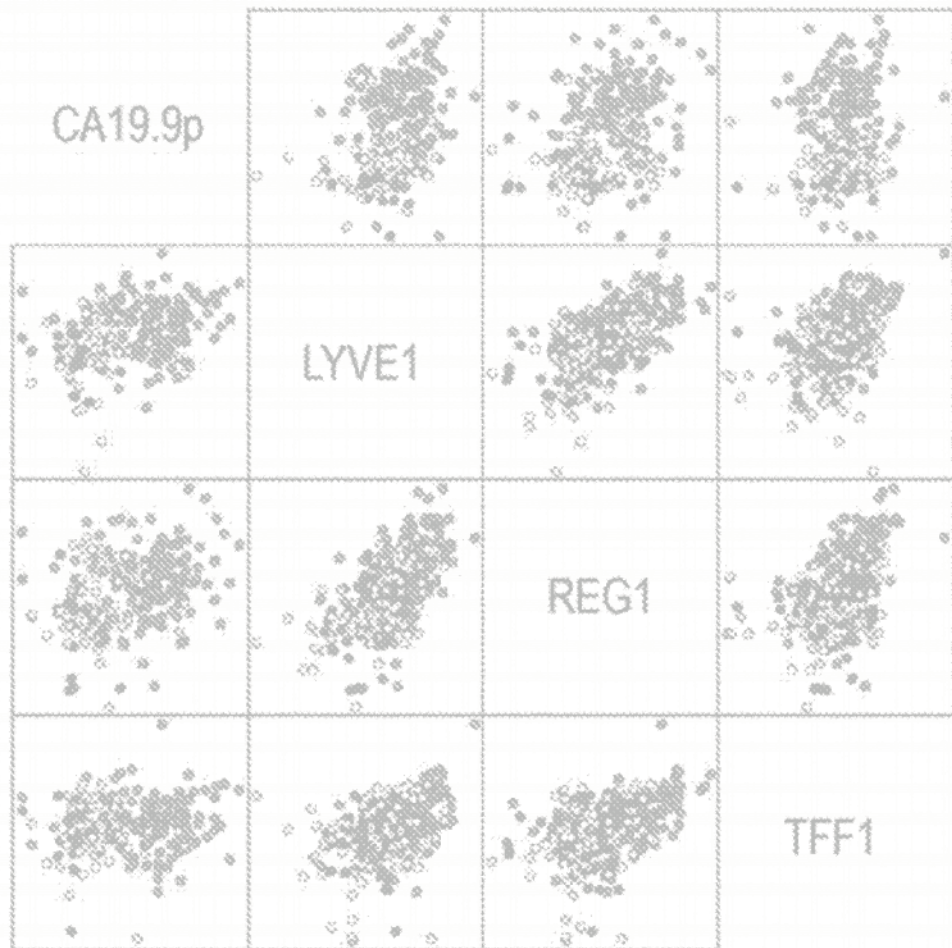
In recognition of the importance of this research, Cedars-Sinai Technology Ventures has developed a full-service diagnostic development business unit, 3rd Street Diagnostics, which evaluates, develops, markets and licenses innovative diagnostic tests and services based on biomarker discoveries. Through 3rd Street Diagnostics, Cedars-Sinai’s international partners also have the opportunity to develop and commercialize promising biomarker discoveries and related inventions. The arrangement will ensure that 3rd Street Diagnostics has a pipeline of diagnostic product candidates to develop and commercialize in collaboration with partners.



3rd Street Diagnostics was formed as a business unit of Cedars-Sinai in 2016 to develop and commercialize diagnostic tests.

PCT application PCT/GB2016/050277 filed on 2/5/16 and nationalized in Australia, Brazil, Canada, Chile, China, Europe, Hong Kong, Israel, Japan, South Korea, Mexico, New Zealand, Singapore and the U.S.

PCT application PCT/GB2016/052991 filed on 9/26/16 and nationalized in Europe and the U.S.



## New Companies Bring Tech to Market

Spin-off companies are new businesses formed to commercialize inventions developed at Cedars-Sinai or, in some cases, sourced by Technology Ventures. Instead of licensing directly to another company, these businesses are created specifically to bring new technologies to market. Here is an overview of some of the companies Technology Ventures has helped launch:

<b>Abcentra</b>	Developing immune therapies to treat skin disorders and cardiovascular diseases
<b>Advanced Bifurcation Systems</b>	Developing the new standard of care for bifurcation stenting
<b>Arrogene</b>	Developing nano agents for drug delivery
<b>Avenzoar Pharmaceuticals</b>	Developing small-molecule therapeutics for cancer
<b>Blacklight Surgical</b>	Developing imaging and diagnostic tools that provide real-time feedback in the operating room
<b>Blaze Bioscience</b>	Developing near-infrared imaging solutions for guided surgery
<b>Emulate</b>	Developing organ-on-chip technology for recreating true-to-life biology systems for drug development
<b>Eos Biosciences</b>	Developing a targeted nano-particle-based drug-delivery system
<b>Gemelli Biotech</b>	Supporting the development of novel diagnostics and therapeutics focused on the microbiome
<b>Naia Pharmaceuticals</b>	Developing an innovative drug to treat short bowel syndrome, a rare disease
<b>NeuroVision Imaging</b>	Developing diagnostic tests and biomarkers for early detection of Alzheimer’s disease
<b>Precision LifeSciences</b>	Developing immune-based therapies for the treatment of cancer
<b>Prometheus Biosciences</b>	Focusing on the discovery and development of precision therapeutics and companion diagnostics for gastrointestinal (GI) diseases and disorders
<b>Visby Medical</b>	Developing a handheld polymerase chain reaction diagnostic device

**DIAGNOSTICS**

- Pancreatic Biomarkers
- Lung Cancer

**SPOTLIGHT**

Mass Spectrometry

**THERAPEUTICS**

- Targets for IPF
- Treatments for IBD
- Screening for Pancreatic Cancer
- UV Light Therapy

**SPOTLIGHT**

Induced Pluripotent Stem Cells

**DEVICES**

- Tricuspid Valve Repair Platform
- Endoscope CleanJet

**SPOTLIGHT**

The MAST Program

**ALGORITHMS**

- Neuropsych Data
- Preeclampsia Point-of-Care Assay

## Engines of Discovery

The innovations nurtured at Cedars-Sinai are nothing short of groundbreaking. Advances in the laboratory will have ripple effects for clinicians and patients worldwide.

Every day, Cedars-Sinai's physicians and researchers are developing and refining diagnostic tests to detect, diagnose or monitor diseases, disease processes and susceptibility.

Historically, diagnosing a patient relied on observations but, as clinical discoveries have increased, diagnoses have relied more heavily on data-driven tests, analysis and software.

As the understanding of disease increases, physicians and researchers are also pushing the boundaries of therapeutic treatments to improve patient outcomes. In addition, lab teams are developing innovative medical devices that have the potential to reduce infections, provide better imaging analysis and improve surgical success.

The common thread is a relentless push toward invention, innovation and new thinking that begins in our labs and, with the help of Technology Ventures, is developed for the market to improve the patient experience around the world.

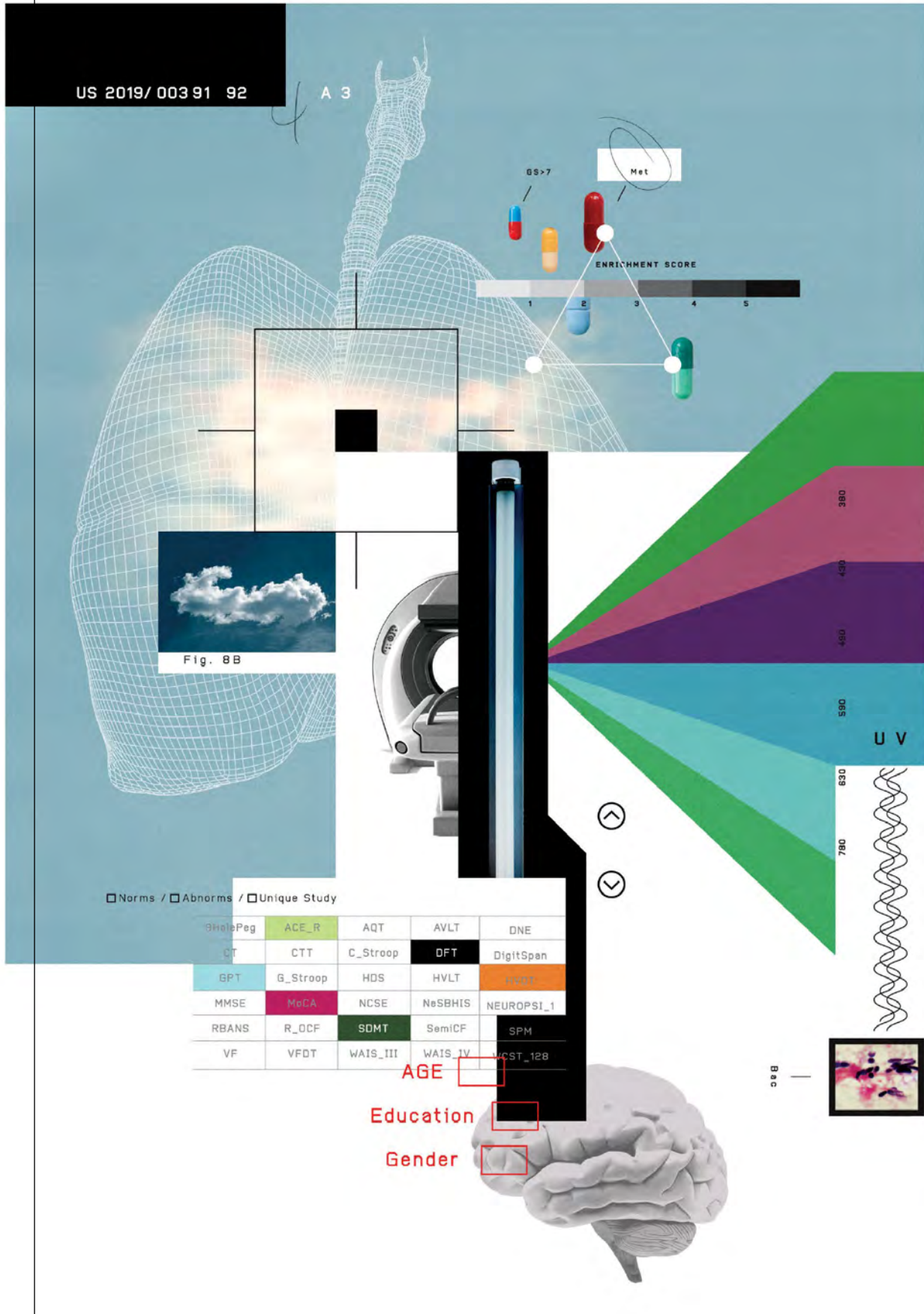


Fig. 8B

Norms /  Abnorms /  Unique Study

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<input type="checkbox"/> CT	<input type="checkbox"/> CTT	<input type="checkbox"/> C_Stroop	<input type="checkbox"/> DFT	<input type="checkbox"/> DigitSpan
<input type="checkbox"/> GPT	<input type="checkbox"/> G_Stroop	<input type="checkbox"/> HDS	<input type="checkbox"/> HVL	<input type="checkbox"/> HVOT
<input type="checkbox"/> MMSE	<input type="checkbox"/> MoCA	<input type="checkbox"/> NCSE	<input type="checkbox"/> NeSBHIS	<input type="checkbox"/> NEUROPSI_1
<input type="checkbox"/> RBANS	<input type="checkbox"/> R_OCF	<input type="checkbox"/> SDMT	<input type="checkbox"/> SemiCF	<input type="checkbox"/> SPM
<input type="checkbox"/> VF	<input type="checkbox"/> VFDT	<input type="checkbox"/> WAIS_III	<input type="checkbox"/> WAIS_IV	<input type="checkbox"/> WCST_128

AGE

Education

Gender

Bac

*A noninvasive, early detection test for pancreatic cancer could improve survival rates significantly.*

PCT application PCT/GB2016/050277 filed on 2/5/16 and nationalized in Australia, Brazil, Canada, Chile, China, Europe, Hong Kong, Israel, Japan, South Korea, Mexico New Zealand, Singapore and the U.S.  
 PCT application PCT/GB2016/052991 filed on 9/26/16 and nationalized in Europe and the U.S.

## A New Way to Screen for Pancreatic Cancer

Over the past 30 years, no significant improvement has been made in the testing methods clinicians use to diagnose pancreatic ductal adenocarcinoma (PDAC). That lack of innovation has had devastating consequences. Patients with PDAC have a median survival duration of just five to six months. However, a new test is providing hope.

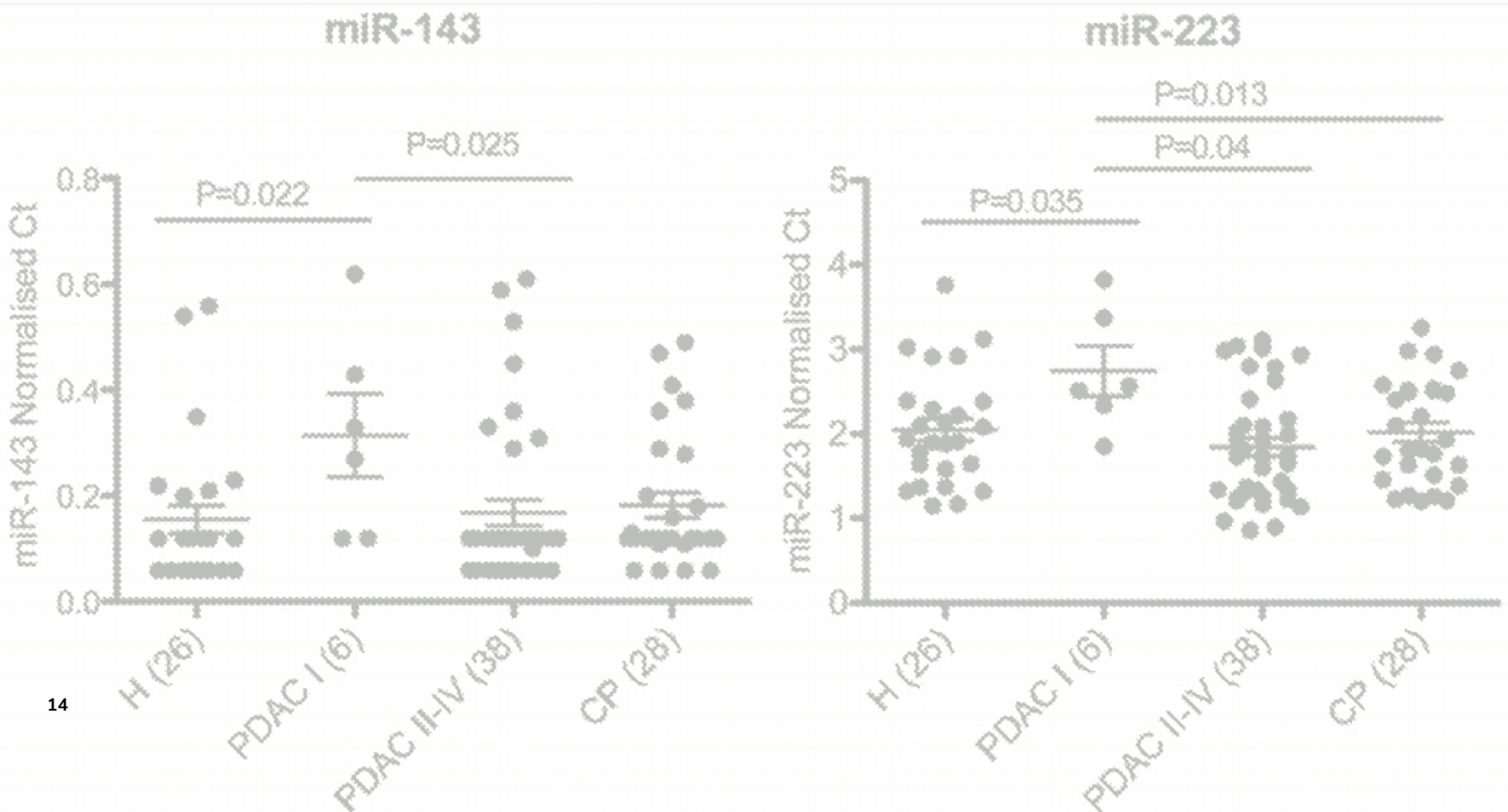
A noninvasive test being developed at Cedars-Sinai for the early detection of PDAC has the potential to significantly improve survival outcomes for pancreatic cancer patients. PDAC test development is focusing on validating usefulness and accuracy of a new urine analysis based on the discovery of three biomarkers that can detect pancreatic cancer in patients with greater than 90% accuracy. Cedars-Sinai Technology Ventures, through its business unit 3rd Street Diagnostics, and in partnership with the Samuel Oschin Comprehensive Cancer Institute, the Diagnostics Development (DxD) Hub of the Singapore Agency for Science and Technology Research (A\*STAR), and Queen Mary University of London, is leading the effort to bring the PDAC urine test to clinics.



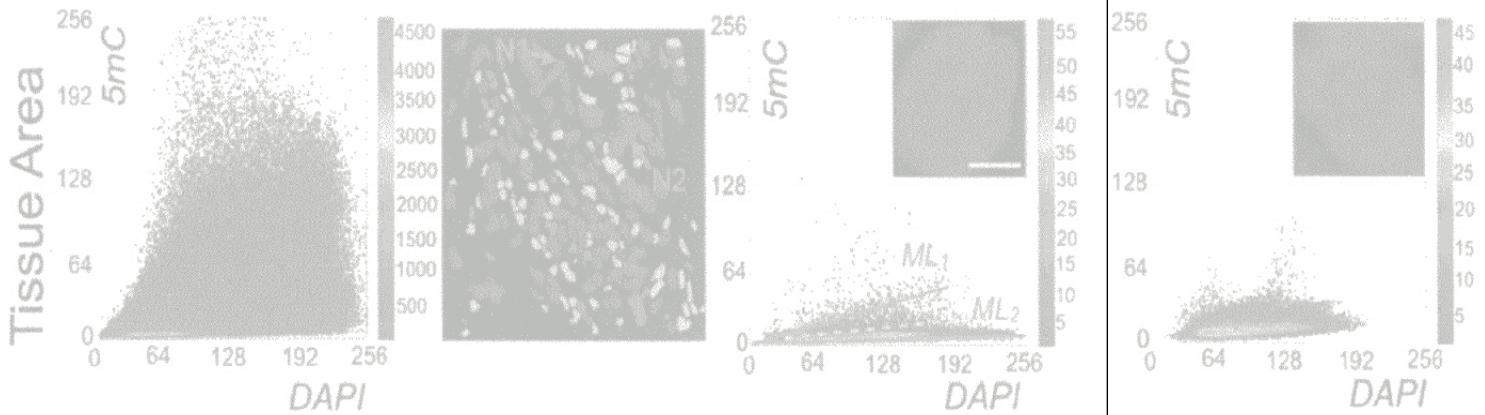
**STEPHEN J. PANDOL, MD**  
 Director, Basic and Translational Pancreatic Research, Samuel Oschin Comprehensive Cancer Institute



**SIMON LO, MD**  
 Director, Pancreatic and Biliary Diseases Program  
 Director, Gastrointestinal Endoscopy  
 F. Widjaja Family Chair in Digestive Diseases







## Early Lung Cancer Detection

Lung cancer continues to be the most lethal cancer, accounting for approximately 1.6 million deaths per year, globally. The current gold standard methods for screening for lung cancer include radiographic techniques such as computed tomography (CT) and positron emission tomography (PET). Both of these tests are expensive and require exposing patients to potentially harmful radiation. But a new, noninvasive, early-detection screening method developed at Cedars-Sinai could offer a more effective solution to identify lung tumors and improve patient outcomes.

With the new test, cells are extracted from human sputum, or mucus, and subjected to a high-content screening platform with immunofluorescence readout and quantification to characterize cells. This noninvasive test recognizes a unique pattern in the nuclei of labeled upper respiratory cells based on epigenetic coding of DNA, known as DNA methylation, which changes in specific cells of the lung during early cancer development in comparison to normal respiratory cells. The test could be suitable to deploy for the screening of large, high-risk populations and monitoring of relapse in lung cancer patients post-resection.

A patent-pending clinical prototype test has been developed and validated in a 30-subject clinical study. A second, larger clinical trial aims to validate the test before formal product development and regulatory approval are sought. Once confirmed, the test could be ready for clinical use by 2021.



**JIAN TAJBAKSH, PhD**

Research Scientist, Technology Ventures  
Assistant Professor, Surgery



**HARMIK J. SOUKIASIAN, MD**

Director, Division of Thoracic Surgery  
Associate Director, Cardiothoracic Surgery Residency Program

*An affordable, noninvasive early-detection lung cancer test could soon come to market that performs on par with or better than gold standard radiographic methods.*

PCT application PCT/US2015/047567 filed on 8/28/2015 and nationalized in Australia, Brazil, Canada, China, Europe, Hong Kong, Israel, Japan, South Korea, Mexico, United Arab Emirates and the U.S.

*Researchers are using mass spectrometers for insights into the origins of disease with the aim of finding ways to prevent and treat illness.*

## Exploring Protein Function

Proteins may hold the secret to a vast array of diseases, but unlocking these insights for therapeutic use is no easy task.

The expert team of physician-scientists in the Advanced Clinical Biosystems Research Institute at the Smidt Heart Institute is using innovative methods to better understand how proteins contribute to disease. Their explorations require powerful technology.

The Smidt Heart Institute operates seven state-of-the-art mass spectrometers, which are used to identify the chemical makeup of proteins. They are just one part of a suite of cutting-edge instruments that are helping researchers like Jennifer Van Eyk, PhD, take a detailed look into how diseases originate.

The team in the Van Eyk Laboratory is using mass spectrometry and big data analysis to study proteins—as part of an exciting biotechnology field called proteomics—and decipher the precise role that protein expression profiles and modifications play in disease progression.

With a focus on cardiovascular disorders, her team's projects range from basic discovery research to clinically relevant analytical studies that could, eventually, help improve cardiovascular health. The team also works closely with industry partners to bring the latest technologies to clinical studies and new therapies.

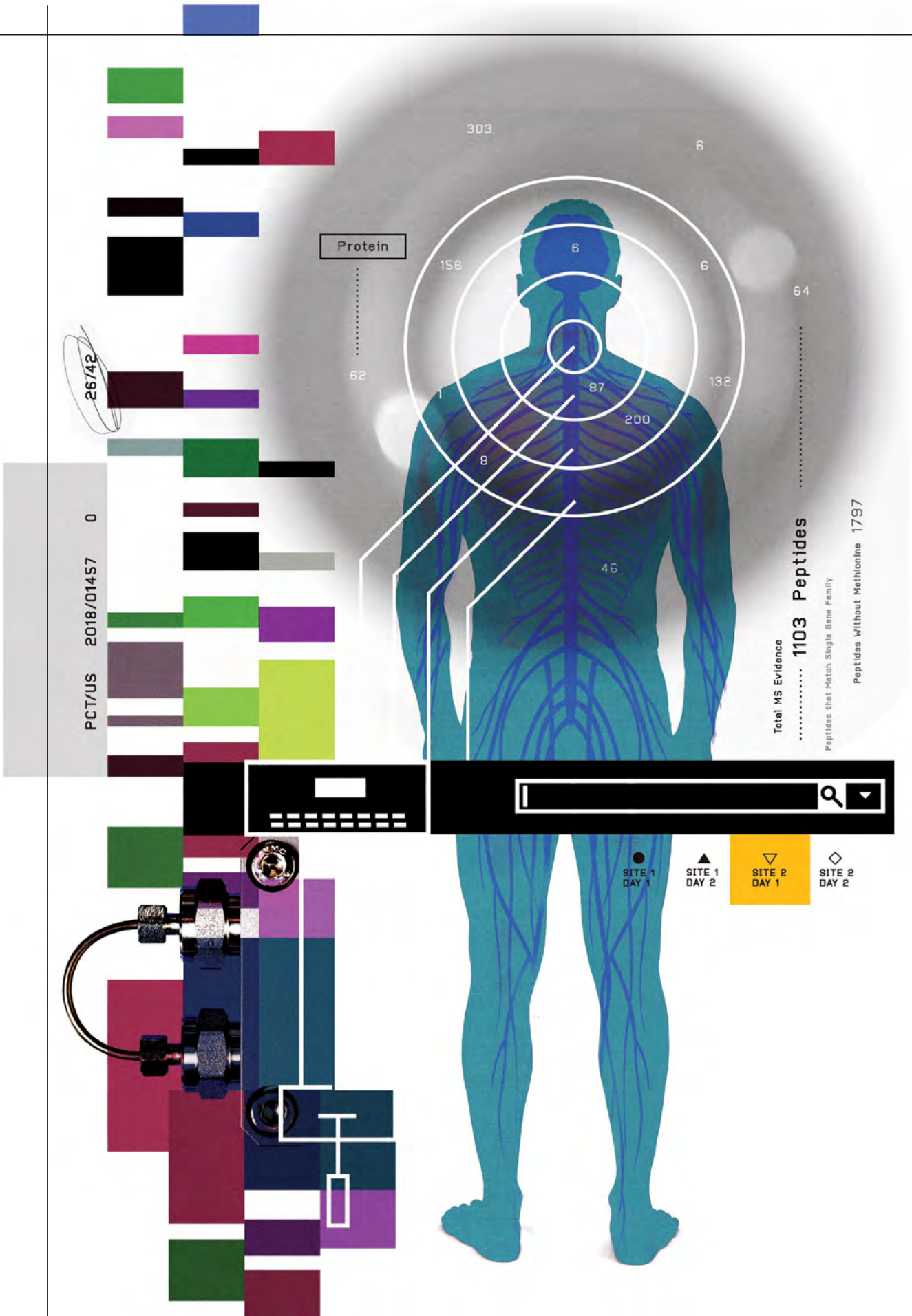


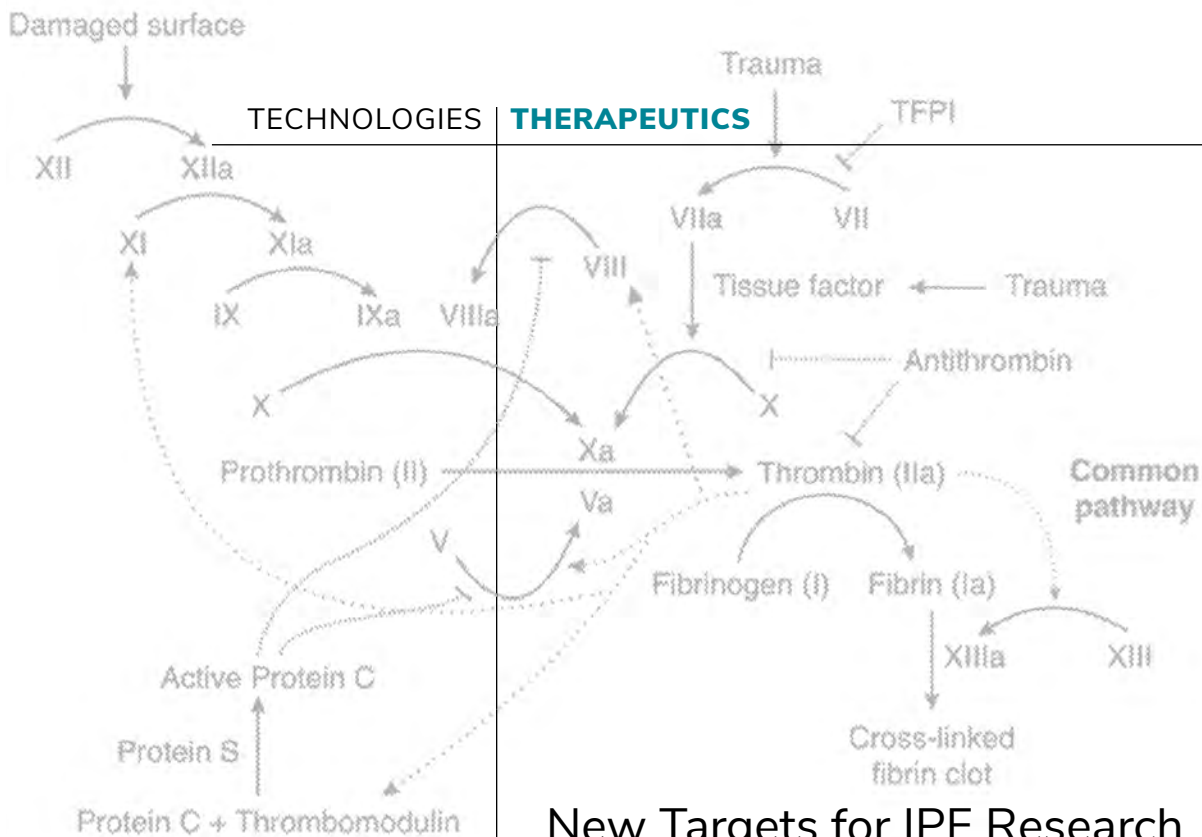
### JENNIFER VAN EYK, PhD

Director, Advanced Clinical Biosystems Research Institute,  
Department of Biomedical Sciences

Director, Basic Science Research, Barbra Streisand Women's Heart Center,  
Smidt Heart Institute

Erika J. Glazer Chair in Women's Heart Health





*While idiopathic pulmonary fibrosis is currently a terminal disease, researchers have found new areas of exploration in the lab that are providing hope for novel drug treatments.*

## New Targets for IPF Research

For sufferers of idiopathic pulmonary fibrosis (IPF), treatments can slow the decline of lung function, but currently the condition is terminal. The only hope is a lung transplant, which itself holds a range of risks and complications. But that could soon change.

Led by Paul Noble, MD, a team of investigators at the Women’s Guild Lung Institute at Cedars-Sinai has discovered several new targets related to the development and progression of IPF. The next step is to take these findings and use them to develop new, safe drug therapies.

To enable this, Technology Ventures has engaged and funded a team of drug design and development experts at a contract research organization to work with the Cedars-Sinai Molecular Therapeutics group. The team has begun a drug-discovery program and is in discussions with pharmaceutical companies to further develop a possible treatment for IPF.



**PAUL NOBLE, MD**  
 Professor, Medicine  
 Chair, Department of Medicine  
 Director, Women’s Guild Lung Institute  
 Vera and Paul Guerin Family  
 Distinguished Chair in Pulmonary Medicine



**DIANHUA JIANG, MD, PhD**  
 Professor, Medicine

PCT application PCT/US2016/053743 filed on 9/26/2016 and nationalized in Europe and the U.S.  
 PCT application PCT/IB2016/056575 filed on 11/1/2016 and nationalized in Europe and the U.S.

## IBD Treatments on the Horizon

No cure and few treatment options exist for patients suffering from Crohn's disease and ulcerative colitis, collectively known as inflammatory bowel disease (IBD). New methods to diagnose and treat this debilitating disease are urgently needed.

Stephan Targan, MD, Dermot McGovern, MD, PhD, and Janine Bilsborough, PhD, may have cracked the code to a better understanding of the disease. The trio is leading a group of scientists studying a secretion by the immune system, cytokine TL1A, and the role it plays in Crohn's disease. In mice, the team reproduced the disease, identified TL1A in subjects and effectively neutralized the effects of the TL1A antibody.

The results are so promising that Technology Ventures helped form a start-up company, called Precision IBD, subsequently merged to form Prometheus Biosciences, to use these findings to develop novel drug treatments. In addition to managing and protecting the complex intellectual property involved in this endeavor, Technology Ventures was instrumental in forming key strategic partnerships.

The research team also established the Material and Information Resources for Inflammatory and Digestive Diseases (MIRIAD) Biobank, the world's largest repository of IBD specimens. This resource will play a crucial role in accelerating the pace of discovery and the development of personalized health treatments for IBD patients around the world.

*Physician-scientists at Cedars-Sinai may have found the key to understanding IBD, while Technology Ventures is helping to translate these findings into novel treatments.*

PCT application PCT/US2017/058019 filed on 10/24/17.  
PCT application PCT/US2014/038333 filed on 05/16/14 and nationalized in the U.S. and the E.U.



**STEPHAN R. TARGAN, MD**

Director, F. Widjaja Foundation Inflammatory Bowel and Immunobiology Research Institute  
Feintech Family Chair in Inflammatory Bowel Disease



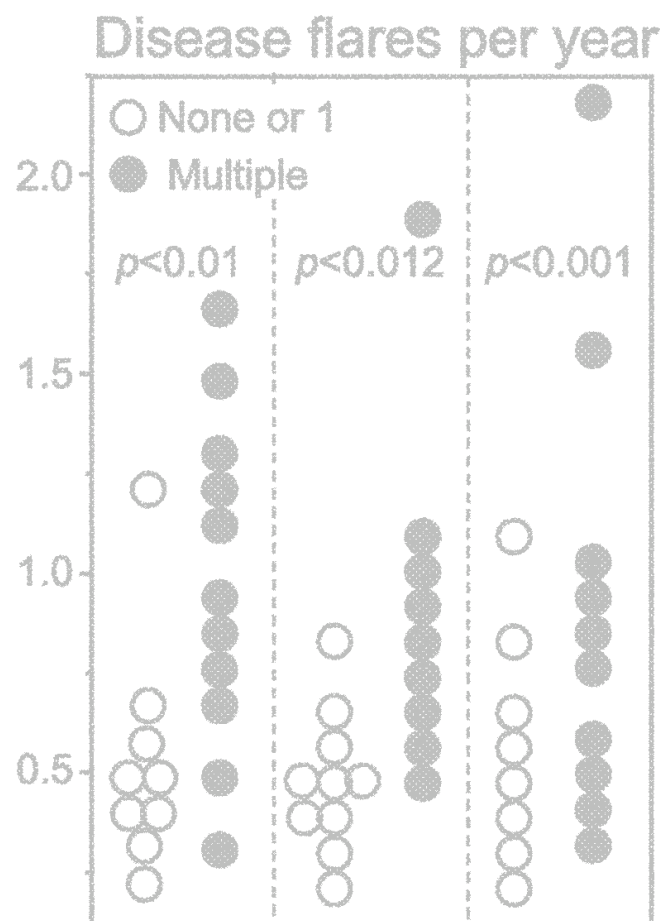
**DERMOT P. MCGOVERN, MD, PhD**

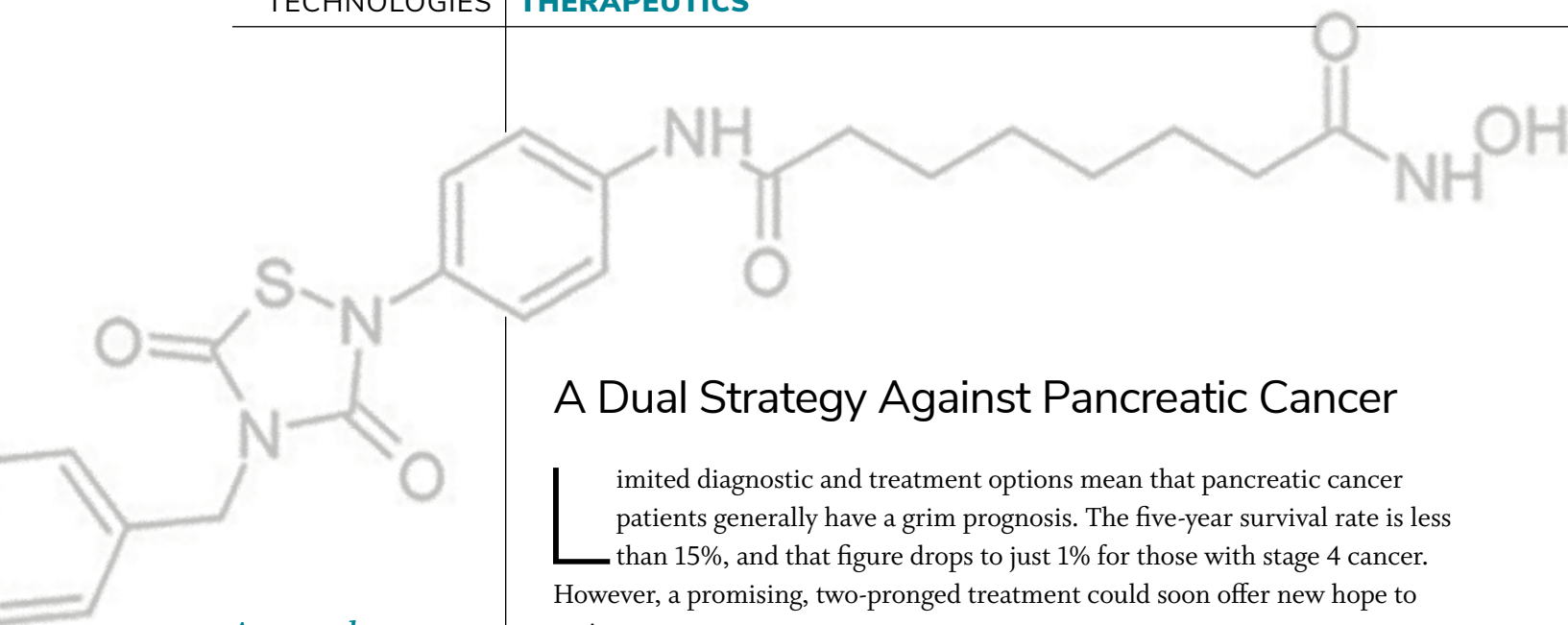
Director, Translational Research, F. Widjaja Foundation Inflammatory Bowel and Immunobiology Research Institute  
Joshua L. and Lisa Z. Greer Chair in Inflammatory Bowel Disease Genetics



**JANINE BILSBOROUGH, PhD**

Director, IBD Drug Discovery & Development





*A ground-breaking, two-pronged treatment approach is providing the foundation for potential drug therapies for pancreatic cancer.*

## A Dual Strategy Against Pancreatic Cancer

Limited diagnostic and treatment options mean that pancreatic cancer patients generally have a grim prognosis. The five-year survival rate is less than 15%, and that figure drops to just 1% for those with stage 4 cancer. However, a promising, two-pronged treatment could soon offer new hope to patients.

Stephen Pandol, MD, and researchers in his lab designed a dual treatment strategy that targets tumor growth and metastasis at the same time. In lab models, this has proven to be highly effective. But this discovery required further validation of its efficacy and commercial potential before it could attract the level of funding required for continued development.

Technology Ventures partnered with the scientists to fund a team of drug design and development experts at a contract research organization to produce several new and safe therapeutic drugs that could serve as potential treatments for pancreatic cancer patients.

The most promising of these drug candidates led to a spin-off company, Avenzoar Pharmaceuticals, which licensed the rights to the compound. Avenzoar obtained an orphan drug designation for the compound from the FDA and is actively developing it for therapeutic use.



### STEPHEN J. PANDOL, MD

Director, Basic and Translational Pancreatic Research, Samuel Oschin Comprehensive Cancer Institute



### SIMON LO, MD

Director, Pancreatic and Biliary Diseases Program  
Director, Gastrointestinal Endoscopy  
F. Widjaja Family Chair in Digestive Diseases



### MOUAD EDDERKAOUI, PhD

Assistant Professor, Medicine  
Assistant Professor, Biomedical Sciences

PCT application PCT/US2015/035659 filed on 6/12/2015 and nationalized in Australia, Canada, China, Europe, India, Japan, Mexico, South Korea, and the U.S.

U.S. patent application 15/317,559

## Light Therapy to Fight Infection

Superbugs, or drug-resistant bacteria, fungi and viral strains are a major worldwide threat. The unfortunate reality is that these pathogens are adapting to our existing antibiotics faster than new drugs are being developed. A research team at Cedars-Sinai is working on an innovative solution involving ultraviolet (UV) light.

UV light therapy has long been used to treat a variety of skin conditions, like psoriasis and eczema. But Ali Rezaie, MD, Mark Pimentel, MD, and Gil Melmed, MD have developed a trailblazing new system to treat infection and inflammation using therapeutic doses of UVA and UVB light. In addition to being a safe, accessible and affordable solution to superbugs, it has the potential to be more effective than current antibiotics and anti-inflammatory treatments.

With support from Technology Ventures, the inventors are testing a prototype device that administers therapeutic light rays. Technology Ventures is also evaluating plans to create a new start-up company or license the rights to the technology to a strategic partner to bring the device to market.

*A new, ultraviolet light therapy developed at Cedars-Sinai could be the solution to antibiotic-resistant superbugs.*



**MARK PIMENTEL, MD**

Director, Medically Associated Science and Technology (MAST) Program  
 Director, Gastrointestinal Motility Program  
 Associate Professor, Medicine and Gastroenterology



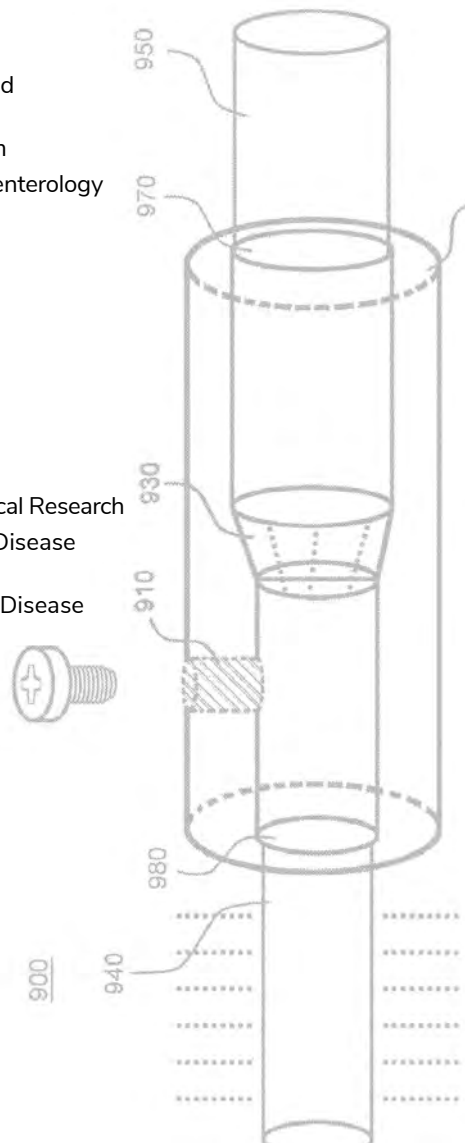
**ALI REZAIE, MD**

Medical Director, GI Motility  
 Assistant Professor, Medicine



**GIL Y. MELMED, MD**

Director, Inflammatory Bowel Disease Clinical Research  
 Director, Advanced Inflammatory Bowel Disease Fellowship Program  
 Co-Director, Clinical Inflammatory Bowel Disease



PCT application PCT/US2017/035316 filed on 5/31/18

*Investigators are reprogramming adult stem cells to create specific tissues and heal the body.*

## Evolving Stem Cell Technology

Imagine growing a new organ in a lab instead of waiting for a donor. Or rejuvenating brain and spinal cord tissue to heal injuries or halt Parkinson's disease. This could soon be a reality, thanks to investigators at the Board of Governors Regenerative Medicine Institute and the David and Janet Polak Foundation Stem Cell Core Laboratory.

Investigators at Cedars-Sinai are studying the inner workings of the human body in unprecedented ways that have the potential to revolutionize the field of medicine. In the lab, adult cells from blood or skin tissue are reprogrammed back in time to assume an embryonic stem-cell state, known as induced pluripotent stem cells (iPSCs). These iPSCs can then be turned into specific body cells—including components of the nervous system, eyes, blood, bones, heart, gut, liver and pancreas—for use by researchers and, potentially, clinicians.

Possible applications of this technology include modeling human diseases such as cancer, Crohn's disease and Parkinson's, drug screening, and developing cell replacement or regenerative therapies. While the technologies are still evolving, investigators have had promising results in the lab and the research team is hopeful that these results can be translated into powerful new avenues to treat, if not cure, a wide variety of conditions that are currently terminal.



### **CLIVE SVENDSEN, PhD**

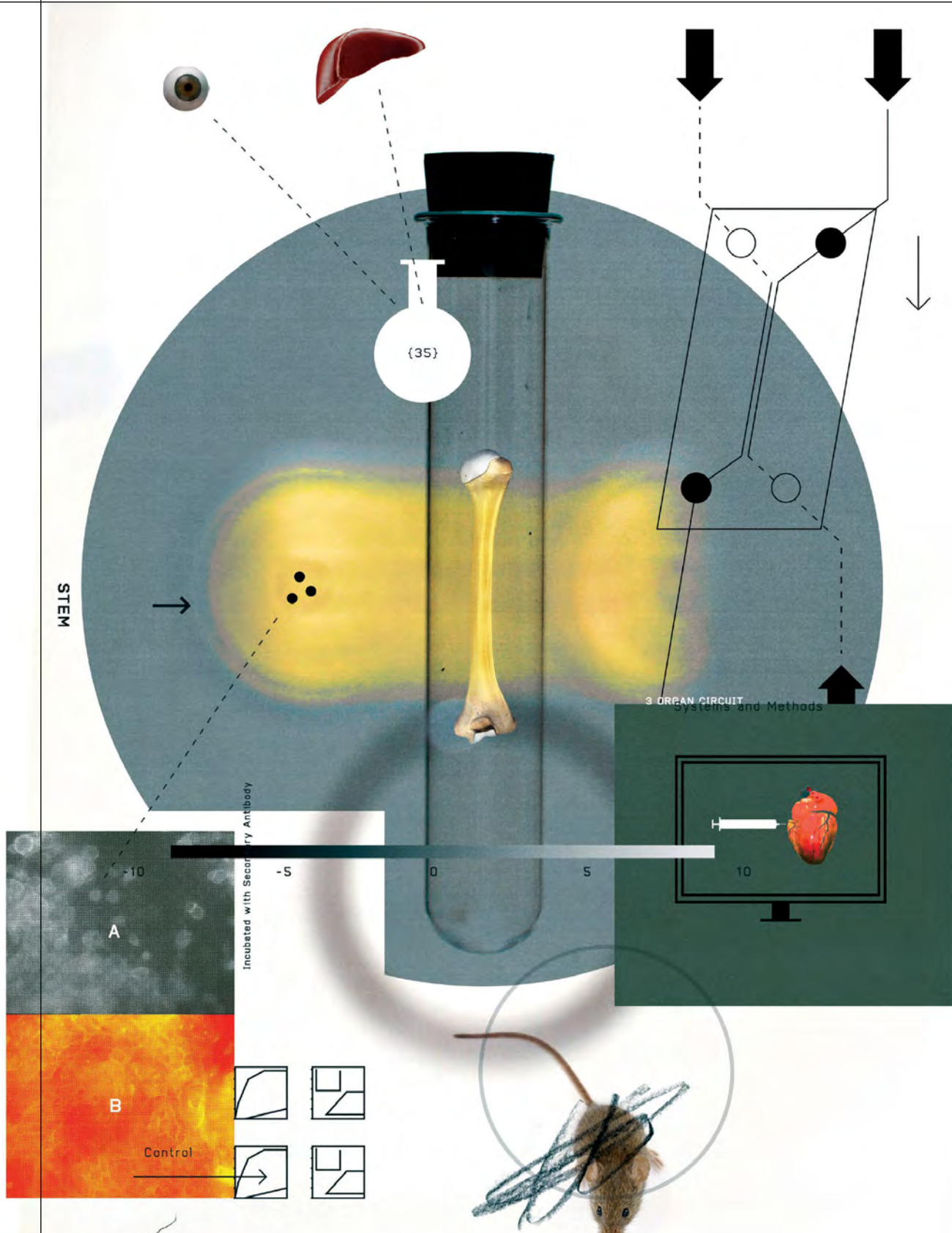
Director, Board of Governors Regenerative Medicine Institute  
 Professor, Medicine  
 Professor, Biomedical Sciences  
 Kerry and Simone Vickar Family Foundation Distinguished Chair  
 in Regenerative Medicine



### **DHRUV SAREEN, PhD**

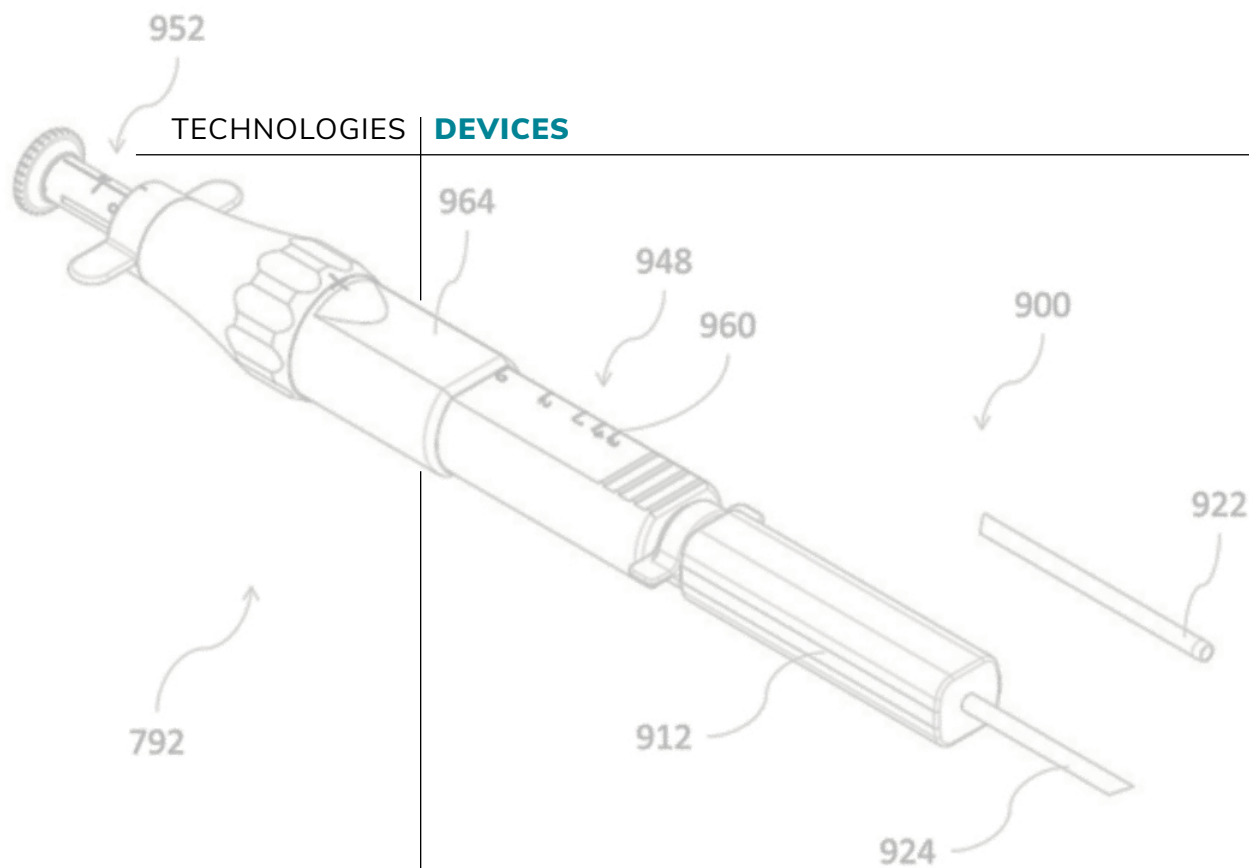
Director, Induced Pluripotent Stem Cell Core Facility  
 Assistant Professor, Biomedical Sciences





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*A new surgical platform could provide a lifesaving treatment for patients suffering from tricuspid regurgitation.*

## A Promising Way to Repair Heart Valves

Tricuspid regurgitation is a serious heart condition that can lead to an enlarged heart, heart failure and, in many cases, death. However, less than 1% of tricuspid regurgitation patients receive treatment because they don't qualify for current surgical options or the procedure is deemed too risky. A new option developed by researchers at Cedars-Sinai may soon be available.

Robert Siegel, MD, has invented a pioneering transcatheter system and a method to repair severe tricuspid valve regurgitation. Together, the device and procedure offer a promising platform for surgeons and their patients.

With funding from Technology Ventures and a philanthropic donor, the investigators developed a prototype device. In 2016, a team was hired to engineer the platform, and a number of iterations of the treatment platform have been tested and patented. The final prototype was delivered in April 2018. Animal testing at Cedars-Sinai proved successful, enabling the technology to move forward.

Technology Ventures is currently marketing the platform to leading device manufacturers to bring the technology through the regulatory approval process and, ultimately, to the market.

PCT application PCT/US2016/043750 filed on 7/23/16 and nationalized in Europe, Japan and the U.S.  
PCT application PCT/US2018/015105 filed on 1/24/17



### **ROBERT J. SIEGEL, MD**

Director, Noninvasive Cardiac Laboratory  
Medical Director, Clinic for Hypertrophic Cardiomyopathy and Aortopathies  
S. Rexford Kennamer, MD, Chair in Cardiac Ultrasound

## Endoscope Cleaning Device to Reduce Infections

Each year, over half a million patients in the U.S. undergo endoscopic retrograde cholangiopancreatography surgery. The procedure utilizes a duodenoscope, a sensitive surgical tube and camera. But the device is extremely difficult to clean and disinfect, posing a critical health challenge. Now that challenge has met its match.

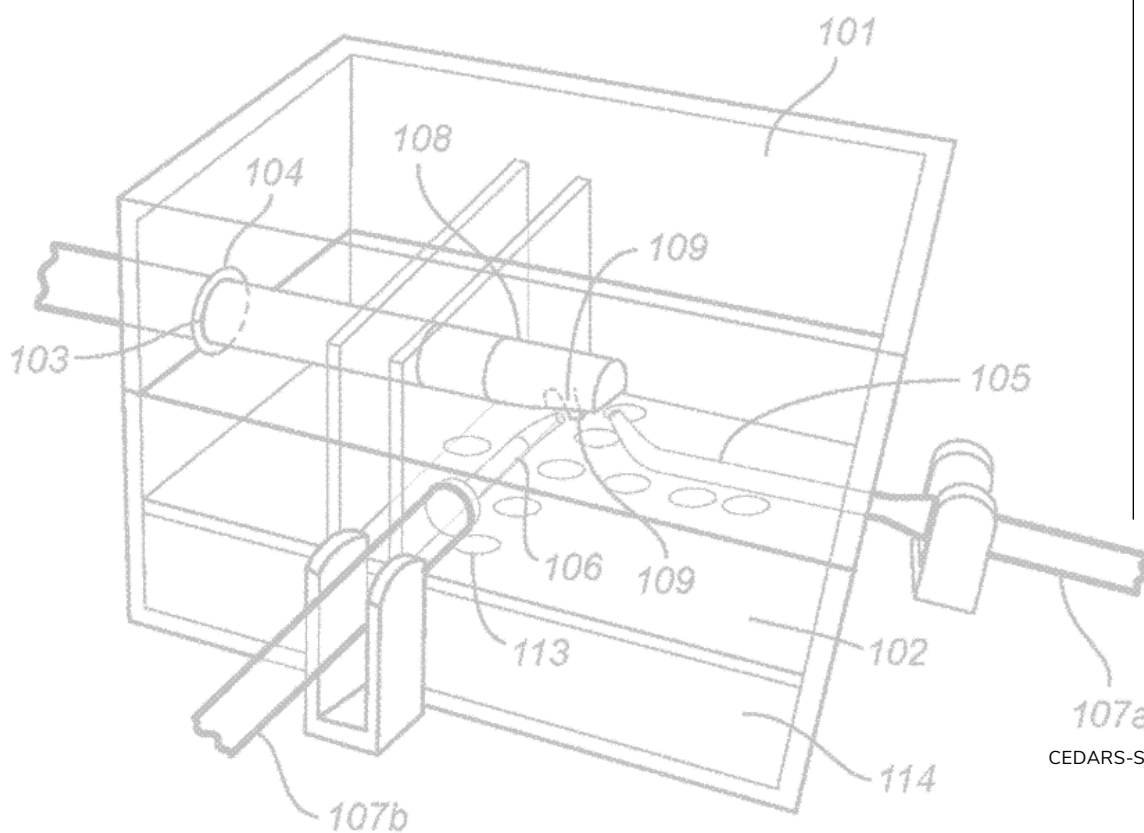
Kapil Gupta, MD, invented the CLEANjet, a novel endoscope cleaning and disinfecting device that uses a high-pressure jet of magnetically charged water. The system's configuration allows it to access hard-to-reach crevices and spaces in the endoscope with an elevator channel.

As part of its efforts to develop this technology that serves an unmet clinical need, Technology Ventures hired a contract research organization to develop a prototype in 2015. After months of rigorous testing, the device was validated. The marketing campaign proved so successful that a company specializing in endoscope reprocessing entered into a licensing agreement with Cedars-Sinai in 2018 to develop, manufacture and commercialize the technology.

*An innovative endoscopic cleaning device is coming to market that has the potential to improve patient safety and reduce infections.*



**KAPIL GUPTA, MD**  
Clinical Chief, Division of Gastroenterology



PCT application PCT/US2016/031744 filed on 5/11/16 and nationalized in Canada, China, Europe, Japan and the U.S.

*The MAST Program is a collaboration between a dynamic research team and Technology Ventures that advances new drugs, devices and other treatments for patients with gastrointestinal and metabolic diseases.*

## Microbiome Partnership

The Medically Associated Science and Technology (MAST) program at Cedars-Sinai develops novel drugs and devices to diagnose and treat illnesses related to imbalances or alterations in the microbiome—particularly metabolic, gastrointestinal function and motility disorders.

The MAST team brings to this pioneering endeavor basic science and clinical expertise, along with a track record of successfully navigating the FDA's approval process and required post-approval work. Technology Ventures has established a hybrid partnership with the MAST program to provide focused strategic direction and project-specific support to expedite the translation of new technology into commercial products.

Patients are at the center of MAST's mission. Physicians and investigators are driven to develop new treatments in the lab for people who can benefit at the bedside and beyond. Direct interaction between patients and clinicians provides inspiration to move quickly toward solutions.

Over the past 20 years, the clinician-scientists behind this innovative program have made discoveries that have already helped millions of patients. Countless more could soon benefit from MAST's ongoing projects as the work moves from research to reality, and then into the broader healthcare community through this transformative partnership with Technology Ventures.



### MARK PIMENTEL, MD

Executive Director, Medically Associated Science and Technology (MAST) Program

Director, Gastrointestinal Motility Program

Associate Professor, Medicine and Gastroenterology



### RUCHI MATHUR, MD

Director, Diabetes Outpatient Teaching Education Center  
Anna and Max Webb & Family Diabetes Outpatient Treatment and Education Center



### ALI REZAI, MD

Medical Director, GI Motility

Assistant Professor, Medicine

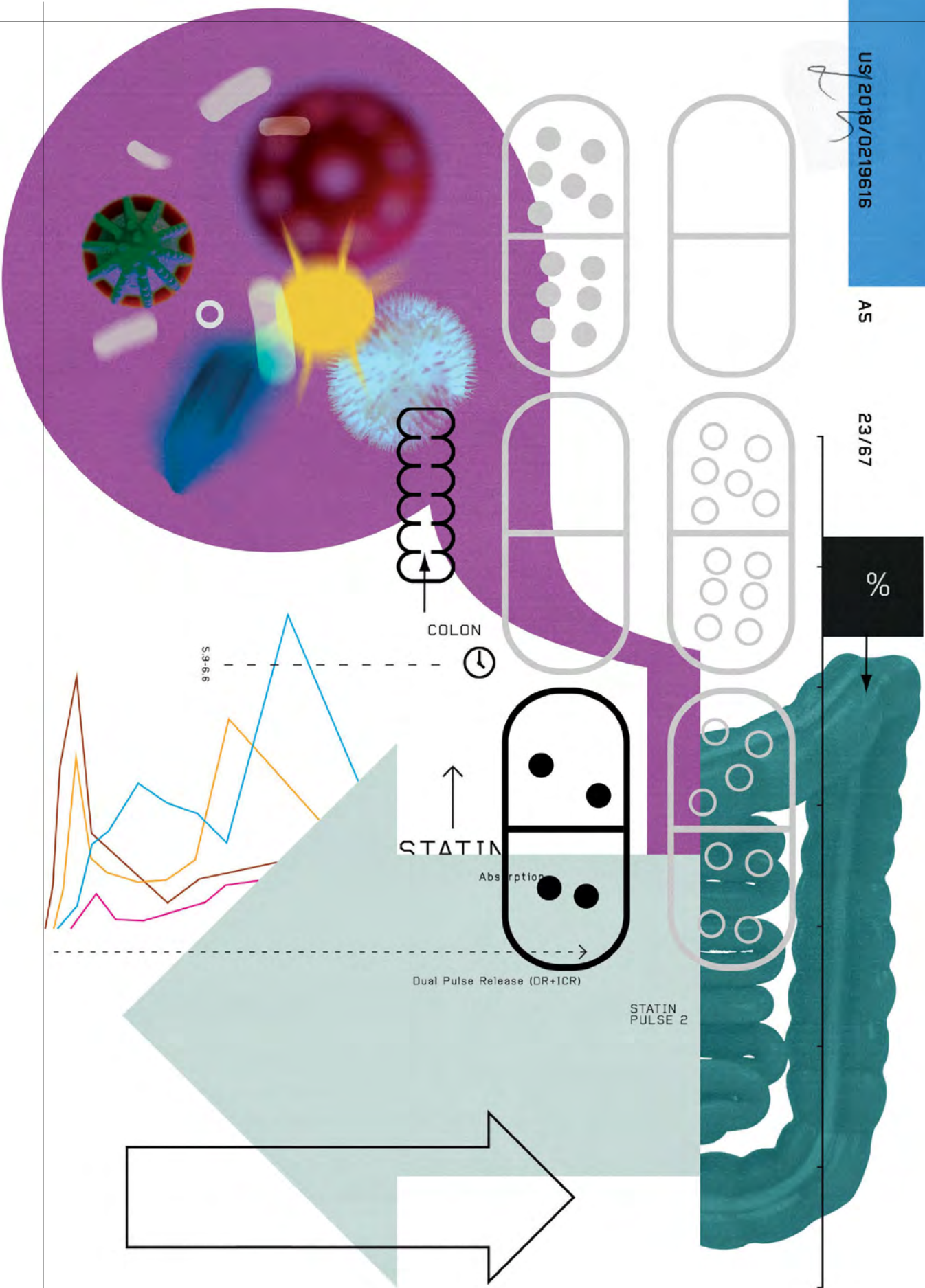


Cedars-Sinai's MAST program functions as the nexus between science and industry in the microbiome space.

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9HolePeg	ACE_R	AQT	AVLT	BNE	BNT	BVRT	CAN	CCPT_II	CCT
CT	CTT	C_Stroop	DFT	DigitSpan	DigSym	DYNA	EIWA	FAB	FT
GPT	G_Stroop	HDS	HVLT	HVOT	H_Stroop	IGT	JLO	K_Stroop	MDRS
MMSE	MoCA	NCSE	NeSBHIS	NEUROPSI_1	NEUROPSI_A_M	NIHToolboxCog	OTT	PerriAVLT	RavensPMT
RBANS	R_OCF	SDMT	SemiCF	SPM	SPNP11LA	SPNP9LA_Peds	TCF	TMT	TPT
VF	VFDT	WAIS_III	WAIS_IV	WCST_128	WCST_64	WCST_M	WHO_UCLA AVL T	WRMT_Words	

*Neuro-psychological data is now generating a new understanding of the brain.*

## Mining Data for Neuropsychologists

For clinical neuropsychologists who study brain structure and pathways, finding comprehensive, ethnically diverse, raw data can be a daunting challenge. But that difficulty has now been overcome.

A decade ago, Enrique López, PsyD, along with software engineer Tom Holton, MS, began compiling normative data for various neuropsychological tests and hosting it on a publicly available website called neuropsychnorms.com. The focus of the database was on multicultural norms, making them more accessible for investigators to reduce the amount of time they might otherwise spend obtaining normative data.

The scientists approached Technology Ventures for advice when a major textbook publisher approached them about acquiring the website. The office recognized the market potential and how this tool would benefit the neuropsychological community. The website was updated in 2017 and reformatted under a subscription model. The switch from open access to a paid model was made to ensure the project’s long-term sustainability. An internal business unit at Cedars-Sinai was formed to oversee the site’s operation.

The neuropsychnorms.com database currently contains normative data related to more than 50 measures and is constantly growing. Overall, more than 800 studies on different measures have been conducted.



NeuroPsychNorms was formed as a business unit of Cedars-Sinai in 2016 to market instant access to the most comprehensive, ethnically diverse, and current neuropsychological normative database for clinical and research settings.



**ENRIQUE LÓPEZ, PsyD**

Director, Neuropsychology Research Training Program  
 Clinical Neuropsychologist, Department of Rehabilitation  
 Psychologist, Cedars-Sinai Pain Center

## Biomarkers Predict Preeclampsia

**P**reeclampsia is a severe pregnancy complication characterized by high blood pressure and potential damage to organs like the liver and kidneys. One of the leading causes of maternal and perinatal morbidity and mortality, it is estimated to affect up to 5% of all pregnancies, accounting for 8.5 million cases each year worldwide and costs to the global healthcare system of \$100 billion.

Since symptoms vary, the condition can be challenging to diagnose, assess and predict. Some countries currently use in vitro diagnostic assessments, though none are available in the United States. The tests usually measure the ratio of two proteins—placental growth factor and soluble fms-like tyrosine kinase 1—in blood. These biomarkers, along with other clinical and medical assessments, can help identify women who are likely to have complications.

To help advance the understanding of preeclampsia and bring an in-vitro, point-of-care test to women in the U.S., Cedars-Sinai physicians Ravi Thadhani, MD, MPH, Ananth Karumanchi, MD, and Anders Berg, MD, PhD, have designed an integrated lateral flow-based assay to measure sFlt-1 from blood. This invention is based on the discovery that elevated concentrations of sFlt-1 measured in plasma are associated with increased risk or presence of preeclampsia in pregnant women.

While the project is ongoing, the results thus far have been extremely promising. To help facilitate development of the test, Technology Ventures arranged a partnership between the physicians and a contract research organization that specializes in the development of diagnostics.



**RAVI THADHANI, MD, MPH**  
Vice Dean, Research and Graduate Research Education  
Chair, Biomedical Sciences

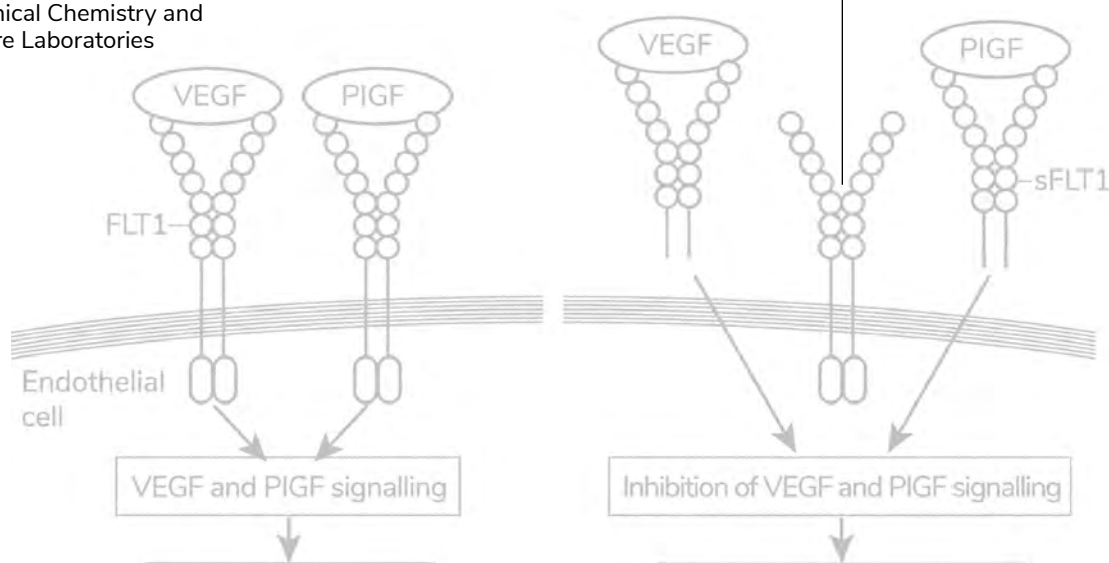


**ANANTH KARUMANCHI, MD**  
Director, Nephrology  
Medallion Chair in Vascular Biology



**ANDERS BERG, MD, PhD**  
Associate Director,  
Clinical Chemistry and  
Core Laboratories

*A new test at the point of care could soon identify which pregnant women are most likely to experience preeclampsia.*



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*“All of these ideas were either born or are being developed right here at Cedars-Sinai. It is our conviction that if we provide scientists and clinicians with extraordinary opportunities to follow educated hunches, the tools to test them and the resources to bring them to life, we can nurture ideas into real solutions that profoundly improve human life.”*

— **SHLOMO MELMED, MD**

Executive Vice President, Academic Affairs

Dean, Medical Faculty

Helene A. and Philip E. Hixon Distinguished Chair in Investigative Medicine



TECHNOLOGY VENTURES

8700 BEVERLY BLVD.  
LOS ANGELES, CALIFORNIA 90048

PHONE: +1 310-423-0326

[CStechtransfer@cshs.org](mailto:CStechtransfer@cshs.org)

[cedars-sinai.edu/techtransfer](http://cedars-sinai.edu/techtransfer)