UCLA TECHNOLOGY DEVELOPMENT GROUP

7th ANNUAL

MEDTECH

PARTNERING CONFERENCE

INVENTORS

SMARTER DEVICES

INDUSTRY

INVESTORS

MARCH 5, 2019
UCLA CAMPUS

CONFERENCE PROGRAM

8:30 am — **REGISTRATION AND NETWORKING**

MORNING SESSION

9:30 am — **WELCOME**
Emily Loughran, Senior Director of Licensing and Strategic Alliances, UCLA Technology Development Group

9:40 am — **KEYNOTE—HEALTHCARE VENTURE FINANCING AND EXIT TRENDS**
Jonathan Norris, Managing Director Healthcare Practice, Silicon Valley Bank

10:00 am — **EARLY STAGE INVESTORS PANEL**
Baxter Healthcare Corporation, Gore Innovation Center, Health2047, Innovate.org, Olympus Corporation, Wavemaker Three-Sixty Health

10:45 am — **BREAK**

11:00 am — **UCLA MULTI-DISCIPLINARY RESEARCH INNOVATIONS AND INITIATIVES**
UCLA Computational Medicine, UCLA Anesthesiology and Perioperative Medicine, UCLA Biodesign, Center for Technology and Innovation in Pediatrics (CTIP)

11:30 am — **SMARTER DEVICES/INDUSTRY PERSPECTIVES**
Amgen, BD, Edwards Lifesciences, IBM

12:15 pm — **LUNCH**

AFTERNOON SESSION

1:00 pm — **KEYNOTE—WHAT IT TAKES TO BRING INNOVATIVE MEDICAL DEVICES TO PATIENTS IN THE US: FDA PERSPECTIVE**
Murray Sheldon, Associate Director of Technology and Innovation Center for Devices and Radiologic Health, FDA

1:20 pm — **UCLA INNOVATION FUND**

2:00 pm — **VALUE PROPOSITION: THE NEW ELEVATOR PITCH**
Jenell Paul-Robinson, Vice President, Clinical Value and Provider Relations, MedTech Innovator

2:15 pm — **UCLA START-UP SUCCESS STORIES**
Avenda Health, Bruin Biometrics

2:45 pm — **BREAK**

3:00 pm — **MEDTECH INNOVATOR AWARD WINNER**

3:10 pm — **START-UP FAST PITCHES**

4:00 pm — **WINE AND CHEESE RECEPTION**

5:00 pm — **EVENT CLOSE**

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Joe Boystak

Advisor, Corporate Finance

Health2047

Joe is an Advisor of Corporate Finance at Health2047 Inc. He has been CEO at Brightwaters Capital for more than 10 years. Joe is also Managing Partner at Health2047 Capital Partners. During his 25-year career in healthcare investment banking on Wall Street, Joe became the founding Managing Director of Life Science Investment Banking at Jefferies. He is a seasoned technology and healthcare advisor with expertise in investment banking, venture capital, and private equity. Joe has co-founded and helped launch companies in the therapeutic, molecular diagnostic, medical technology, information technology and artificial intelligence sectors out of top-tier academic medical centers including UCLA, Johns Hopkins, Harvard and Memorial Sloan Kettering. He started his career at American Medical International, Inc., a global health services company, in corporate development. Joe serves or has served on numerous corporate and nonprofit boards, some of which include PAIGE LLC, Bruin Biometrics LLC, Exosome Diagnostics, Inc., SoCalBio, Johns Hopkins Bloomberg School of Public Health Advisory Board and chaired the Committee on Innovation and Commercialization, and UCLA's Foundation Board of Governors. He frequently lectures at industry and academic events including the Milken Institute's Global Conference. He is a registered representative with FINRA and holds Series 7 and Series 63 securities licenses. Joe earned his Master of Health Science from Johns Hopkins Bloomberg School of Public Health and his BA from Boston University.

Martin Burns

CEO

Bruin Biometrics

European CEO, Entrepreneur of The Year 2018, Martin Burns is CEO of Bruin Biometrics. From his appointment in 2012, Martin has lead the company through the entire concept through commercialization cycle for the SEM Scanner, the first medical device for detection of early signs of incipient pressure ulcers. The company's SEM Scanner has been granted FDA clearance through the *de novo* pathway and CE Mark; received 27 patents; awarded seven global innovation awards; and, has pioneering customers achieving zero pressure ulcers through the use of the Scanner in clinical practice. BBI has two other diagnostic technologies in development. Prior to BBI, Martin spent more than 15 years as a management consultant in the US and Europe at Deloitte Consulting and PricewaterhouseCoopers where he led corporate strategy, innovation, operations, quality and regulatory, M&A and global expansion assignments for medical device and life sciences companies.

Maxime Cannesson

Professor and Vice Chair

UCLA Department of Anesthesiology and Perioperative Medicine

Maxime Cannesson, MD, PhD, is Professor of Anesthesiology, and Vice Chair for Perioperative Medicine in the Department of Anesthesiology and Perioperative Medicine at the University of California Los Angeles, David Geffen School of Medicine. He has published more than 190 peer reviewed articles and three textbooks. The focus of his career has been the improvement of patients' outcomes in the Perioperative Environment through the development of: (1) non-invasive monitoring technologies, specifically the development of pulse pressure variation and respiratory variation in the SpO2 waveform monitoring (PPV and PVI) to predict fluid responsiveness, (2) standardization of care and decreased variability in medical decision-making using closed-loop (automated) anesthesia and clinical decision support systems, (3) new care delivery models in the perioperative period such as Enhanced Recovery After Surgery and the Perioperative Surgical Home, and (4) Development of Physiological Predictive tools based on machine learning and feature extraction techniques. He has a long track record of industry and NIH funded research and has transferred several monitoring technologies that are currently used at the bedside.

Sam Elhag

Partner

Innovate.org

Sam Elhag is a partner at Innovate, serial entrepreneur and product manager. Prior to Innovate, Sam co-founded Engrade, a learning management system acquired by McGraw Hill Education in 2014. Sam was an executive consultant for Explore.org, overseeing a team tasked with promoting the work of nonprofits across new media platforms. Sam was also a co-founder of VidMeter, which was acquired by Visible Measures and a sports fitness technology for strapless heart rate monitoring. Sam is passionate about impact oriented technologies and advising new start-ups.

Linda Elkins

Leader

Gore Innovation Center

Linda Elkins' career spans nearly 20 years, in which time she's served in multiple roles at W. L. Gore & Associates. In the Sunnyvale, California-based Medical Products Division, Linda led new product development teams from ideation to commercial launch, drove technical project development and resourcing and obtained two patents. Linda earned Master of Science degrees in both Biomedical and Mechanical Engineering from the University of Michigan and a Bachelor of Science degree in Biomedical Engineering from the University of Notre Dame. Linda led the design and creation of the Gore Innovation Center in Silicon Valley, where she took the facility from its original concept to its execution, completion and launch. In addition to creating an inspiring physical space, she also established the mission and vision for the center and led its entry into the Silicon Valley ecosystem. Linda serves as co-leader of the Innovation Center, where she works to mature its mission and vision while expanding areas of exploration, establish partnerships, and advance relationships and idea generation for each of Gore's divisions.

Eleazar Eskin

Chair, Computational Medicine

UCLA Department of Computational Medicine

Eleazar Eskin serves as the inaugural chair for the UCLA Department of Computational Medicine, jointly housed in the UCLA David Geffen School of Medicine and Samueli School of Engineering. Eleazar is fascinated by the intersection of computer science and biology and through his research is developing computational methods for analysis of genetic variations in human disease. There are millions of variants in the genome and identifying the variants involved in disease often require tens of thousands of patient samples. In order to analyze these tremendously large datasets, Eleazar and his team are solving challenging computational problems and developing new computational techniques. Eleazar is the recipient of the Alfred P. Sloan Foundation fellowship and his work is supported by the National Science Foundation and the National Institutes of Health.

Paul Grand

CEO

MedTech Innovator

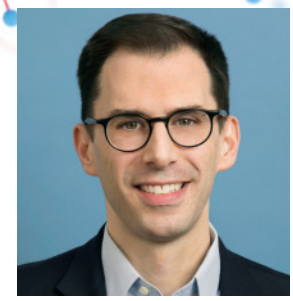
Paul Grand is CEO of MedTech Innovator, the medtech industry's global competition and accelerator, with a mission to improve the lives of patients by accelerating the development of start-ups transforming the health care system. He has an extensive global network in transformative medical innovation. Prior to MedTech Innovator, Grand was Managing Director at RCT Ventures, an early-stage life science investor since 2005. At RCT, Grand focused on medtech investments and sourcing innovation. He founded MedTech Innovator as a program within RCT Ventures in 2013, and he left to run MedTech Innovator as a stand-alone company with RCT's support in 2016. Prior to RCT, Grand was an entrepreneur, founding and/or serving as CEO in eight companies in life sciences and technology, including most recently Imagine Pharmaceuticals, which developed a platform to deliver therapeutics across the blood brain barrier and MicroSurgeon, which developed a thermal ablation device treating solid tumors. Grand is actively involved in programs to encourage healthcare innovation. He has lectured and mentored students and scientists at numerous universities, including UCLA, Stanford, USC and UCSF. Grand served as an investment advisor to the LARTA NIH Commercialization Assistance Program for SBIR awardees. He is on the Oversight Committees for the Coulter Translational Research Partnership Programs at USC and University of Washington. Grand has reviewed proof of concept and commercialization-focused funding programs for the University of California, USC, University of Utah, and University of Colorado.

Alice Landis-McGrath

Executive Clinical Consultant

IBM Watson Health

Dr. Alice Landis-McGrath is a member of IBM Watson Health Oncology and Genomics group, focused on improving efficiency through the use of cognitive technologies at the point of care. In this role, Alice provides global clinical Subject Matter Expert support for Watson for Oncology, Clinical Trials Matching, and Genomics. Prior to joining IBM Watson Health, Dr. Landis-McGrath was a Vice President in the Consulting and Management division at The Advisory Board Company where she led the Optimization service line. She has 17 years of clinical informatics experience, including electronic medical record implementation and optimization, business process and workflow redesign, clinical governance and adoption, reporting and analytics, and IT strategy with a focus on oncology specific sales and implementations. During her career, she has worked with individual ambulatory clinics, small regional medical centers, large academic institutions, and integrated delivery networks. Alice received her MD from the University of Pennsylvania School of Medicine, and her BA in Chemistry from Franklin & Marshall College.



Thomas Lipkin

Director of Entrepreneurship & New Ventures

UCLA Technology Development Group

Thomas Lipkin joined UCLA TDG in 2012 and serves as Head of New Ventures. Dr. Lipkin and his team work to further the entrepreneurial environment at UCLA by building start-up companies around UCLA's intellectual property, serving as a resource to faculty members, aiding existing UCLA start-ups in sourcing financing and talent, and helping secure additional funding for campus-wide start-up initiatives. Dr. Lipkin is also responsible for actively promoting UCLA's intellectual property assets and engaging with parties interested in further developing early-stage technologies in the life sciences, physical sciences, and internet technology space. Previously, Dr. Lipkin was with Osage University Partners, a venture capital fund that invests exclusively in university-based start-up companies. Dr. Lipkin received his BS in Biology from Indiana University and his PhD in Cell Biology and Pathology from Columbia University.

Emily Loughran

Senior Director of Licensing and Strategic Alliances

UCLA Technology Development Group

Emily Loughran joined UCLA TDG in 1994 as a technology transfer officer. Currently, as the Senior Director of Licensing and Strategic Alliances she manages the licensing group in the medical device and physical sciences space. She oversees these areas' large portfolio of invention disclosures, patents, and license agreements. Additionally Emily has launched many strategic initiatives for TDG; founding and developing branded and ongoing events such as the UCLA Annual MedTech Partnering Conference, the annual Code for the Mission App Competition, Pathways to Commercialization and First Fridays. Emily is also actively involved with the Innovation Fund initiative that TDG manages. Emily started in intellectual property administration at the City of Hope Medical Center where she was the Technology Transfer Manager responsible for patenting and licensing activities. Emily holds an MBA from USC and a BS from UC Berkeley.

Luke Macyszyn

Associate Program Director, Department of Neurosurgery

University of California, Los Angeles

Luke Macyszyn is an Assistant Professor of Neurosurgery at UCLA and co-director of the Neurosurgery Machine Learning Laboratory. He studied biomedical image analysis at the University of Pennsylvania, where he developed image-based clinical decision support tools using machine learning. During his tenure at Penn he also co-founded MotionView, a touch-less interface for viewing and manipulating radiology images, which took runner up in the Penn iDesign competition. At UCLA, he has been developing automated tools to help physicians diagnose patients with low back pain using AI. This project has been selected as the winner of the 2017 UCLA Innovation Fund competition and is now a funded start-up.

Jennifer McCaney

Executive Director

UCLA Biodesign

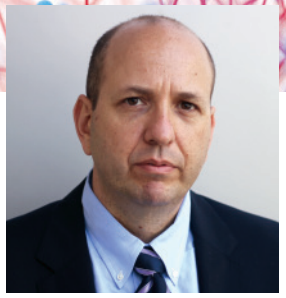
Jennifer McCaney, PhD, is the Executive Director of UCLA Biodesign, an early-stage innovation program for healthcare technology and Associate Director of the UCLA CTSI. Jennifer is an Assistant Professor in the Department of Medicine at the UCLA David Geffen School of Medicine and a Lecturer at the Anderson School of Management where she leads courses on disruptive technology and entrepreneurship in healthcare. A co-founder of Hourglass Technologies, a Stanford Biodesign company, Jennifer led early product development and also launched the MedTech Innovator Accelerator, which grew from an initial cohort of 20 companies to over 150 alumni with a combined $700M in funding. Jennifer has worked extensively with start-up companies in medtech, digital health and diagnostics, as well as business development executives from leading manufacturers, including J&J, Amgen, Baxter, BD, Olympus, and others in her role as the Director of MedTech Innovator. A Fulbright Scholar, Jennifer completed her PhD in mechanical engineering at Stanford and MS in biomedical engineering from the University of New South Wales. Jennifer holds an MS and BS in mechanical engineering from MIT where she was a Draper Fellow and a BS from the MIT Sloan School of Management.

Christos Monovoukas

Vice President of Business Development and Strategy

Olympus Corporation of the Americas

Christos leads Olympus' medical business development and strategy function. He analyzes internal and external businesses and markets to identify strategic growth opportunities and determine Olympus' business strategy. Christos is a senior executive with extensive US and international success, including evaluating high-growth market opportunities and emerging technologies, defining strategy and creating roadmaps to achieve objectives, with particular expertise in the medical device industry. He drives immediate and long-term business growth, plans and executes growth strategies and creates shareholder value. His leadership experience spans all functional areas, including business development, market development, strategy, operations, R&D, product development and manufacturing. He is also experienced in navigating M&A, funding and venture capital arenas in highly competitive areas. Christos is a decisive, action-oriented leader who thrives on challenge and is energized by creating and driving strategy for product innovation/commercialization, market development and business growth. He received his MBA from Harvard University and his MS from Columbia University.



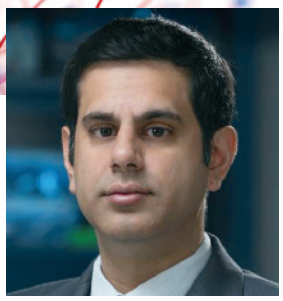
Amir Naiberg

Associate Vice Chancellor, CEO & President

UCLA Technology Development Group

Amir Naiberg serves as Associate Vice Chancellor, and President & CEO of UCLA Technology Development Corporation. He leads the UCLA Technology Development Group, a campus wide resource that serves as a Gateway to Innovation, Research and Entrepreneurship at UCLA. Additionally, he leads the UCLA Technology Development Corporation as Chief Executive Officer and President, a nonprofit technology company wholly-owned by UCLA focused on better protecting and optimizing the discoveries and inventions developed through UCLA research. Mr. Naiberg also works in concert with several on campus incubators and accelerators to further advance innovation, entrepreneurship and research at UCLA.

Prior to joining UCLA in August 2016, Mr. Naiberg worked at Yeda Research and Development Co, Ltd., in Rehovot, Israel, the technology transfer company of the Weizmann Institute of Science, ranked as one of the top three technology transfer organizations in the world. At Yeda, he served for ten years as CEO, following five years as General Counsel. He led the organization's growth in licensing and business partnerships, while building an entrepreneurial ecosystem with local incubators, investors, and the Israeli government. Mr. Naiberg is one of the founders of the Israel Technology Transfer Organization (ITTN), a nonprofit organization that unites various technology transfer offices throughout Israel. Before joining Yeda, he worked for a private law firm specializing in intellectual property, privacy and cyberspace law. Mr. Naiberg holds law degrees from the Hebrew University School of Law and the University of Connecticut School of Law.



Shyam Natarajan

Co-Founder and CEO

Avenda Health

Shyam Natarajan is Co-founder and CEO of Avenda Health, a clinical-stage healthcare technology company focused on personalized prostate cancer treatment. He is also an Assistant Adjunct Professor in the UCLA Departments of Urology and Bioengineering. Prior to Avenda, he led research efforts in developing image-guided interventions for prostate cancer at the Center for Advanced Surgical and Interventional Technology (CASIT) and has authored more than 50 peer-reviewed publications. His work was instrumental in the clinical translation and commercialization of targeted prostate biopsy. Dr. Natarajan additionally served as a Program Manager in the Business of Science Center, launching campus initiatives in entrepreneurship such as Innovation Week and Inventathon, Southern California's first healthcare hackathon. He received a BS in Computer Engineering and BA in Japanese from UC Santa Barbara, and a PhD in Biomedical Engineering from UCLA, where he also completed postdoctoral work within the Department of Surgery.

Jonathan Norris

Managing Director, Healthcare Practice

Silicon Valley Bank

Jonathan Norris is a Managing Director of Venture Capital Relationships for Silicon Valley Bank. Norris oversees business development efforts for banking and lending opportunities as well as spearheading strategic relationships with many life science and healthcare venture capital firms. He also helps SVB Capital through sourcing and advising on limited partnership allocations. In addition, he speaks at major investor and industry conferences and authors widely cited analyses of healthcare venture capital trends. Norris has more than sixteen years of banking experience working with healthcare companies and venture capital firms. Norris earned a bachelor's degree in business administration from the University of California, Riverside and a juris doctorate from Santa Clara University.

Jenell Paul-Robinson

Vice President, Clinical Value and Provider Relations

MedTech Innovator

Jenell Robinson, MSN, RN is Vice President, Clinical Value and Provider Relations at MedTech Innovator. MedTech Innovator is the industry's nonprofit global competition and accelerator for medical device, digital health and diagnostic companies. She brings over 20 years of clinical, operational, and administrative healthcare expertise to the MedTech Innovator team. Jenell provides insight and expertise to innovative start-ups on value propositions, clinical potential and feasibility. Early in her nursing career, Jenell became a travel nurse, gaining experience in multiple care settings, ranging from small, private community hospitals, to large, metropolitan academic medical centers. Through her travels, she became particularly interested in heart and lung transplantation, specializing in cardiothoracic intensive care for both the pediatric and adult patient population. After joining hospital operations management, Jenell received her master's degree in Nursing Administration from UCLA. She served on several national supply chain and academic medical center value analysis professional committees, offering expertise in value analysis and assessment for hospital purchasing decisions. She is the author of "Technology Adoption: Appealing to hospital and health system value analysis" in *Medical Innovation: Concept to Commercialization*.

Kelly Larrabee Robke

Vice President, Clinical Thought Leadership

BD Medical Affairs

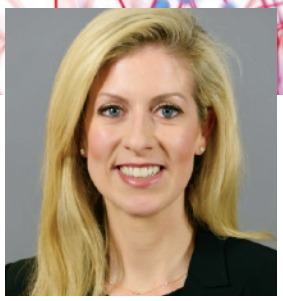
Kelly is currently the Vice President of Clinical Thought Leadership for the Medication Management Solutions organization of BD. She is responsible for engaging leaders in clinical practice, associations, and healthcare organizations in driving knowledge of clinical issues as well as extending educational and publication initiatives for the business. She previously worked in leadership roles for the Pyxis Product Management group at BD, leading efforts to launch Pyxis Enterprise System and Medlink. Prior to her tenure at BD, Kelly successfully developed, led and grew cross functional teams responsible for the delivery of healthcare innovation and technology in positions at the M.D. Anderson Cancer Center, Pfizer Oncology, Hewlett Packard, and Oracle. As a Registered Nurse, Kelly has been responsible for direct patient care of high risk obstetrical patients, and also worked as an oncology nurse. She has published original research articles in *Obstetrics and Gynecology, American Journal of Obstetrics and Gynecology,* the *Journal of Perinatal and Neonatal Nursing,* and the *Monitor*. Kelly received her Bachelor of Science degree in Nursing from West Virginia University, an MBA from the University of Houston, and a Master's of Science in Regulatory Affairs from the University of Southern California.

Murray Sheldon

Associate Director of Technology and Innovation Center for Devices and Radiologic Health

FDA

Dr. Murray Sheldon, MD received his medical degree from the University of Michigan Medical School in 1975 and his cardiovascular fellowship at the Montefiore Hospital and Medical Center in New York. After practicing cardiac, thoracic and vascular surgery in Northern California for over 20 years, he entered the medical device industry, leading device development projects and providing expert consultative services to numerous start-up innovative medical device development firms. Dr. Sheldon joined the FDA in 2013 as the Associate Director for Technology and Innovation overseeing the Center's initiative to proactively facilitate medical device innovation to address unmet public health needs and to align what is traditionally done at FDA with what is required to support the US medical device ecosystem. His primary focus is working with FDA staff, the medical device industry, the clinical community and other stakeholders on ways to facilitate bringing innovative medical devices to the patients in the US first in the world. Dr. Sheldon currently leads the Medical Device Payer Communication Task Force, identifying methods to streamline the path from FDA approval to reimbursement.



Anne E. Sissel

Vice President, Baxter Ventures

Baxter Healthcare Corporation

Anne Sissel is the Vice President and Head of Baxter Ventures. Previous to Baxter, Anne was on the founding team and executive team for Veracyte, Inc. (now NASDAQ: VCYT). Anne led the finance and business development organization and was a cross-functional leader from early discovery through commercialization. Prior to Veracyte, Anne worked in the Investment Banking Division of Goldman, Sachs & Co. in New York and San Francisco, completing over $200bn in financing and M&A transactions. Anne holds an MBA from the Wharton School of the University of Pennsylvania and a BS in Finance from Indiana University. She was selected to Crain's Chicago Business Top 40 Under 40 in 2016 and their Top 50 in Tech in 2015. Anne's current Board and Observation roles representing Baxter include: Kit Check, Medasense, Prescient Surgical, Sanifit and VitalConnect.

Maie A. St. John

Professor and Chair, Department of Head & Neck Surgery

David Geffen School of Medicine at UCLA

A highly renowned surgeon, scientist and educator, Dr. St. John is Professor and Chair of Department of Head and Neck Surgery at the David Geffen School of Medicine at UCLA. She also holds the Samuel and Della Pearlman Chair in Head and Neck Surgery and is Co-Director of the UCLA Head and Neck Cancer Program. Dr. St. John's laboratory studies the mechanisms of tumor progression and metastasis in head and neck cancer and seeks to identify and study novel genes and pathways for future targeted therapies, while actively incorporating the results of their laboratory-based research into the development of novel therapeutics. Dr. St. John received her undergraduate degree from Stanford University and both MD and PhD degrees from Yale University. She completed residency and postdoctoral training at UCLA and served previously as Chief of Head and Neck Surgery at Harbor-UCLA Medical Center. Dr. St. John's clinical expertise is in intraoperative tumor margin delineation in the resection and treatment of head and neck cancers. Her laboratory research is translational with a focus on improving therapies and outcomes for patients with head and neck cancer.

George Tolomiczenko

Advisory Board Member for The Center for Technology and Innovation in Pediatrics (CTIP)

Co-Director for The USC Coulter

Administrative Director for HTE@USC

Expert in fund development and management including negotiations, contracting, policy formulation, and other activities related to fundraising from corporations, partner funders, volunteers and high net-worth individuals. Demonstrated success in negotiating win-win agreements in multi-sector organizational and research partnerships with federal, provincial, academic and health charity stakeholders across Canada and the US. Leadership and research responsibilities for complex healthcare projects and external partnerships related to developing large- and small-scale project management and data collection efforts for program development and marketing.

Kwame Ulmer

Venture Partner

Wavemaker Three-Sixty Health

Kwame Ulmer is a venture partner at Wavemaker Three-Sixty Health—the leading Southern-California based, early stage venture capital firm (Seed and Series A) focused on the healthcare industry. He participates in all aspects of fund management (e.g. deal sourcing, diligence, negotiation and advising portfolio company management teams). Kwame brings nearly 20 years of experience evaluating medical technologies in the government and private sector, and serving in senior operating roles at medical device companies. He has personally evaluated more than 1,000 medical technologies in his career. Kwame spent 12 years at the US Food and Drug Administration (FDA) in progressive leadership roles, including Deputy Director and Branch Chief. He also served as Vice President, Regulatory Affairs and Quality Assurance at Implant Direct, a Danaher Corporation operating company. He is a member of the Executive Committee of Tech Coast Angels (LA), the world's largest angel investing network. Kwame earned his BS in Physics from Lincoln University, and has two Master's degrees from University of Virginia, in Materials Engineering and Business Administration.

Jimmy Whitesides

US Marketing Director, Critical Care

Edwards Lifesciences

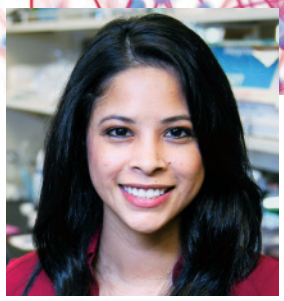
Jimmy Whitesides has been with Edwards Lifesciences since March of 2009 and is currently responsible for the company's US Critical Care marketing organization. Jimmy has held a variety of roles with increasing levels of responsibility. He was the lead marketer following the acquisition of the noninvasive ClearSight technology and led subsequent launches in Europe, the US and Japan. Jimmy also served as the heavy weight team lead for Edwards' closed loop development initiatives. He graduated from Brigham Young University and earned his master's degree in business administration from the University of Southern California.

Erich Wohlhieter

Executive Director, Digital Health & Innovation

Amgen

Erich Wohlhieter has been at Amgen over 16 years in a variety of roles spanning research, corporate transformation and strategy, and is currently an Executive Director in Amgen's Digital Health and Innovation group. Erich received his Bachelor's in Chemistry from the University of California, Berkeley and his PhD in Organic Chemistry from the University of California, Los Angeles.



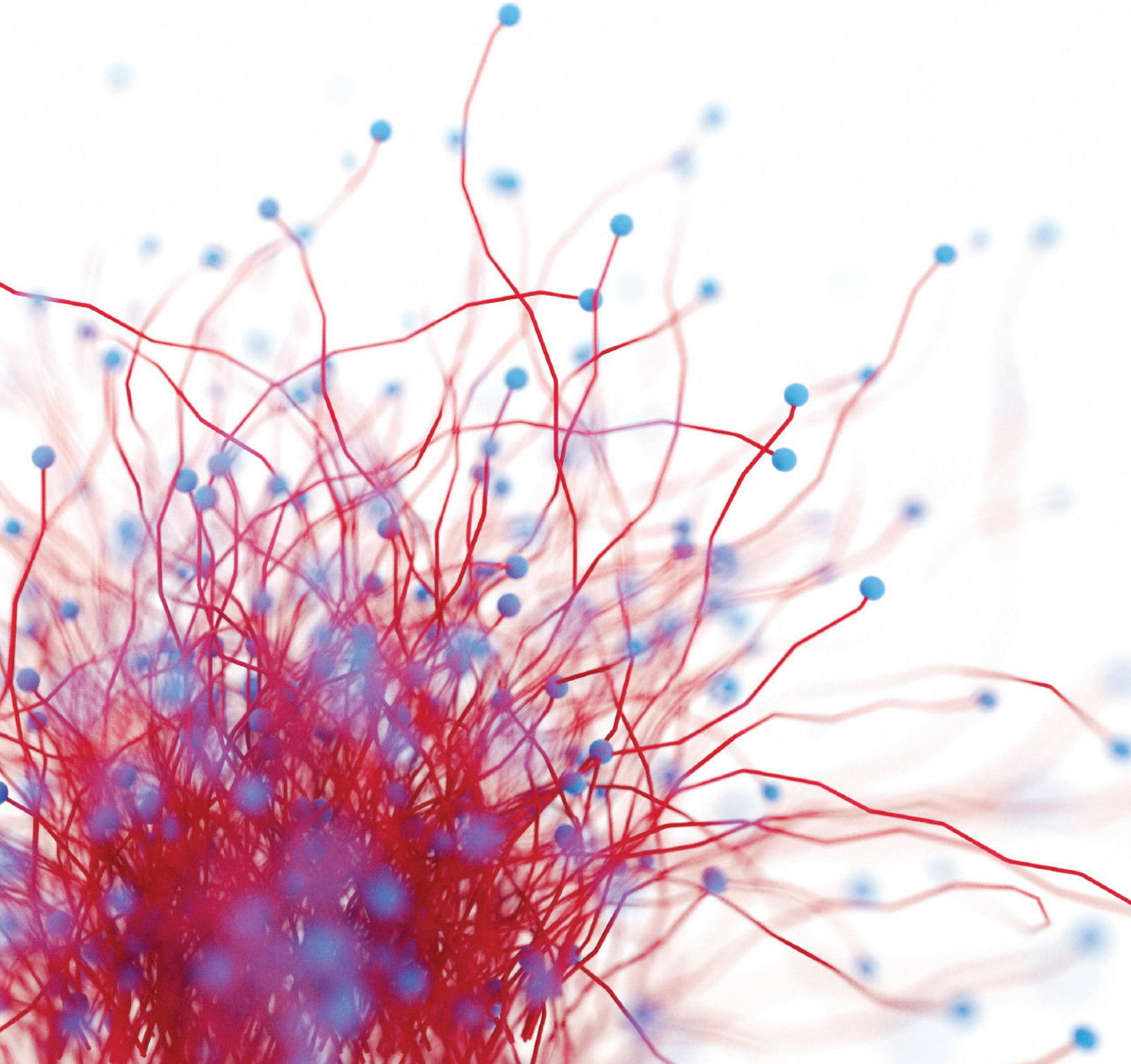
Kathryn Zavala

Vice President, Operations & Business Development

MedTech Innovator

Kathryn Zavala is the Vice President, Operations & Business Development at MedTech Innovator, a nonprofit global competition and accelerator for medical device, digital health, and diagnostic companies. She previously held a position as Senior Technology Fellow at the UCLA Technology Development Group, where she assisted with the commercialization of university technologies. At Campbell Alliance, Kathryn developed launch strategies for biopharma clients. She received her Bachelor's degree from UC Berkeley, where she majored in Molecular and Cell Biology and Rhetoric. Kathryn earned her PhD in Molecular, Cell, and Developmental Biology from UCLA.

UCLA Medical Device Technologies Available for Licensing



Neuromodulation and Recording Technologies

Wireless Implantable System to Restore Memory

Traumatic brain injury (TBI) may cause both anterograde and retrograde memory impairment. While implantable deep brain stimulation (DBS) systems are FDA-approved for the treatment of Parkinson's disease and epilepsy, there are currently no interventional therapies for memory restoration in TBI patients. UCLA researchers have developed a wireless, implantable DBS system that delivers electrical brain stimulation via specially designed electrodes in order to restore and enhance the memory of patients suffering from TBI.

UCLA Case No. 2014-959
Lead Inventor: Itzhak Fried
Patent Status: Pending
Pub. No. US 20170113046

Monitoring of Brain Electrical Oscillations to Predict Outcomes of Transcranial Magnetic Stimulation (TMS) for the Treatment of Major Depressive Disorder (MDD)

A novel method of assessing the efficacy of rTMS on MDD patients in early stage of treatment was developed. This novel approach evaluates the brain oscillatory circuit before, during and after the initial treatment session. By determining the brain's pretreatment baseline oscillations and the changes in oscillations with treatment, this novel method can determine whether the administered rTMS can lead to MDD remission. This invention can also be used to guide the optimization of rTMS for individual patients in order to achieve better treatment outcomes.

UCLA Case No. 2017-658
Lead Inventor: Andrew Leuchter
Patent Status: Pending

Liquid Metal Enabled Multifunctional Neural Probes with Ultra-Large Tunable Stiffness

A novel multifunctional, flexible and stretchable neural probe with ultra-large tunable stiffness (ULTS) was developed for electrochemical sensing and chemical delivery in the brain tissue. It consists of a soft PDMS substrate and liquid metal gallium (Ga) for electrical interconnects and temporary stiffening material. It can be inserted deep into tissues in its cool and stiff state. Upon melting of Ga, it becomes ultra-soft, flexible and stretchable in all directions. It is also equipped with microfluidic channels for drug delivery and platinum (Pt) electrodes for high quality electrochemical sensing.

UCLA Case No. 2019-327
Lead Inventor: Ximiao Wen
Patent Status: Pending

Wireless Wearable Big Data Brain-Machine Interface

In order to improve the investigation, diagnosis, and treatment of brain activity, UCLA researchers have designed a user-friendly brain-machine interface (BMI) that consists of an implanted recording-and-transmitting module, a wearable receiving-and-forwarding module, and a mobile post-processing unit. Whereas previous systems designed to monitor neural activity are limited in data transfer rates and use physically connected wires, this newly designed BMI can wirelessly transmit data at an unprecedented rate of ~1 gigabit/second. This BMI could support research investigating brain activity mapping, the diagnosis of brain abnormalities, and the development of new treatments to prevent or cure brain-related illnesses.

UCLA Case No. 2014-495
Lead Inventor: Wentai Liu
Patent Status: US Patent Issued #10,027,362

A Method for Deep Brain Stimulation Targeting Based on Brain Connectivity

Researchers at UCLA have developed a method to more effectively place the electrodes used in deep brain stimulation by using diffusion-tensor magnetic-resonance imaging (DTI) to customize the implantation protocol for each individual. This new method of precise targeting is based on tractography (i.e., a procedure for visualizing neural tracts) and uses DTI to map brain connections in individual patients. Therefore, the location of the most effective placement of the electrode can be identified for each individual. This methodology may also have significant implications for targeting new regions in the brain that have poor internal anatomical definition using standard imaging.

UCLA Case No. 2011-700
Lead Inventor: Nader Pouratian
Patent Status: US Patent Issued #9,220,458

Site-Specific, On-Demand Deep Brain Stimulation for Enhancement of Memory in Humans

Researchers at UCLA have developed an advanced surgical procedure that utilizes electrical deep brain stimulation with intracranial electrodes to enhance memory function. In controlled human experiments, the procedure confers significant improvements in spatial learning tasks. The researchers discovered specific brain regions that improve memory task performance over others. The results of these studies suggest that deep brain stimulation is a highly translational and efficacious approach to treating memory and cognition disturbances in a variety of diseases.

UCLA Case No. 2011-330
Lead Inventor: Itzhak Fried
Patent Status: US Patent Issued #9,403,010

Intelligent Flexible Spinal Cord Stimulators for Pain and Trauma Management Through Neuromodulation

Professor Iyer and coworkers have developed a novel spinal cord stimulator (SCS) device that is small, flexible, and can autonomously adjust stimulation patterns for maximum efficacy. The SCS chip can be easily manufactured using microfabrication technology with a high density of electrodes (>1000 cm^2), significantly more than existing systems (32 cm^2). Batteries can be embedded onto the device, eliminating the need for leads and wires. Additionally, on-chip machine learning enables the optimization of stimulation patterns based on individual patient and posture for efficacious pain management.

UCLA Case No. 2018-385
Lead Inventor: Subramanian Iyer
Patent Status: Pending

A Highly-Efficient Near-Field Wireless Power Transfer System That Is Immune to Distance and/or Coupling-Coefficient Variations

Power transfer technologies transfer power optimally at one specific distance. As a result, product designs may require a constant distance and therefore include things like magnets in cochlear products to align the implant and external earpiece. UCLA researchers from the Department of Electrical Engineering have developed a wireless power transfer system that can deliver stable power to the load over a large range of distances. Additionally, the circuitry is mainly built at the power transmitter side of the system, allowing the receiver end (e.g. biomedical implant) to remain very small.

UCLA Case No. 2016-390
Lead Inventor: Asad Abidi
Patent Status: Pending
Pub. No. US 20170353048

Autonomous Thermoelectric Energy-Harvesting Platform for Biomedical Sensors

To make thermoelectric energy harvesters (TEH) a truly autonomous energy source for size-constrained, wireless biomedical sensors and eliminate the need for batteries, it has been necessary to drastically improve their energy density and conversion efficiency. UCLA researchers from the Department of Electrical Engineering have developed an autonomous energy source for implantable biosensors by developing a TEH that can operate with a 68% end-to-end peak efficiency with <20 ms tracking time, and start-up voltages as low as 65 mV. A 645 µW regulated output power was harvested from the head of a rat (0.83 cm^2 surface area) with an implanted TEH device. The new TEH device achieves a 7.9x improvement in regulated power density and represents the first fully autonomous energy harvesting platform for energy-starved applications.

UCLA Case No. 2015-245
Lead Inventor: Dejan Markovic
Patent Status: Pending
Pub. No. US 20170338394

Silicon Microsystems for High-Throughput Analysis of Neural Circuit Activity

Functional MRI (fMRI) and electro-encephalography (EEG) techniques can provide coarse-grained pictures of neuronal activity in the brain; however, they are unable to provide information on rapidly changing activity of single neurons, which is key to unraveling how the brain codes information. UCLA researchers in the Department of Neurobiology have developed a unique electrode array capable of simultaneously mapping neural activity from two or more brain structures. This technology addresses major technical obstacles of recording single neuron activity and expands on the potential for neuronal monitoring by allowing single-cell-resolution measurements of activity from numerous networked brain structures. In addition to enhanced recording performance, these new electrode array-probes will be more cost-effective to manufacture, as well as smaller and hence less invasive.

UCLA Case No. 2013-039
Lead Inventor: Sotiris Masmanidis
Patent Status: Pending
Pub. No. WO 2014085787

Intracranial Implantable Mechanical Device for Housing Neurostimulators or Drug Infusion

Traditional implantable brain stimulators and drug infusion pumps require stimulation generators and drug pumps to be implanted in the patient's chest, with wires or catheter tubes running up through the neck. UCLA researchers in the Department of Surgery have developed a novel device described as the Skull Universal Indweller for Generators (SUIG) to house cranial energy or drug delivering apparatuses. A rigid mechanical enclosure houses an implantable electrical pulse generator (IPG) or drug infusion pump in the thickness of a removed portion of the skull, eliminating the need for wires and tubes tunneling through the neck. Enclosures can readily accommodate a range of commercially available IPGs and pumps.

UCLA Case No. 2008-616
Lead Inventor: Scott Krahl
Patent Status: US Patent Issued
#9,421,363

Quantitative EEG Method to Identify Individuals at Risk for Adverse Antidepressant Effects

Antidepressant medication has demonstrated efficacy for the symptoms of depression, but some individuals may experience adverse effects on mood during antidepressant treatment that could result in harm to themselves or others. Researchers at UCLA have developed a method that identifies patients likely to experience adverse effects from antidepressant medication. A patient's response to the treatment is measured by using quantitative electroencephalographic recordings (QEEG). This method has been validated in a small double-blind placebo-controlled clinical trial with 97% accuracy. Patient response to medication was corroborated by using standard clinical checklists that diagnose adverse symptoms.

UCLA Case No. 2006-262
Lead Inventor: Aimee Hunter
Patent Status: US Patent Issued
#8,521,270

Sensors and Patient Monitoring Devices

A 3D Microfluidic Actuation and Sensing Wearable Technology for *In Situ* Biofluid Processing and Analysis

Dr. Emaminejad at UCLA has developed a microfluidic wearable biosensor that utilizes a suite of programmable electro-fluidic interfaces, capable of capitalizing on the pitfalls of current technology. Briefly, the device is capable of pumping, mixing and valving for wearable sample analysis. The device has been shown to measure the flux in glucose in iontophoretically-stimulated sweat after glucose intake in fasting subjects. Such results highlight the promising potential that the device has to perform complex sample processing and analysis operations, showing promise for a fully autonomous lab-on-the-body platform for a broad range of healthcare applications.

UCLA Case No. 2018-678
Lead Inventor: Sam Emaminejad
Patent Status: Pending

A Wearable Platform for *In Situ* Analysis of Hormones

UCLA researchers have developed a non-invasive, wearable hormone monitoring platform with high detection sensitivity. This new development enables detection of biomarkers, such as cortisol, critical to molecular diagnostics at concentrations orders of magnitude below competing technologies. Additionally, the detection interface has been enhanced to withstand chemical degradation processes, resulting in improved longevity.

UCLA Case No. 2018-657
Lead Inventor: Sam Emaminejad
Patent Status: Pending

Wireless Remote Sensing of Changes in Fluid Filled Containers

Trials of remote sensing of patient metrics, such as blood pressure, have been successful in reducing hospital visits and medical costs by increasing the accuracy and amount of data, while lowering the amount of staff time necessary to take the data. However, for accurate fluid management, staff must measure and analyze the fluids, their flow rates, and their compositions in order to ensure quality care. UCLA researchers have developed a novel device and method for continuous and dynamic monitoring of patient fluids. This technology may extend beyond patient fluids to other medium such as evaluation of air (air leaks) following lung surgery or injury that guide timely management of drainage tubes. Wireless remote sensing technology may quickly detect changes in fluid or air measurements suggestive of complications before or after surgery enabling earlier discharge from the hospital and safer outpatient monitoring.

UCLA Case No. 2014-499
Lead Inventor: Dieter Enzmann
Patent Status: Pending

Automated Optical Chest Tube Air Leak Detection System

Researchers at UCLA have developed an air leak detection system that consists of an LED and photo-detector placed on the "waterseal chamber" portion of a chest tube drainage system that is normally used clinically to visibly detect air leaks. This system is connected to a computer system that generates a time log of the amount of air leaking out of the chest tube drainage system and allows for 24 hour monitoring. It also alerts hospital staff in case of irregular behavior.

UCLA Case No. 2016-049
Lead Inventor: Peyman Benharash
Patent Status: Pending

BigFoot: Analysis, Monitoring, Tracking, and Sharing of Biomedical Features of Human Appendages

Many diabetic patients suffer from peripheral neuropathy, a disorder that results in the loss of sensation in their extremities. Individuals with this condition may develop severe infections from sores on the soles of their feet without their knowledge, which can lead to the loss of limbs. BigFoot uses customized software integrated with a commercial flatbed scanner that enables easy image acquisition and analysis of feet abnormalities. For patients that find checking their feet difficult, this tool can easily monitor, track data and share image data in order to identify abnormalities early and prevent complications.

UCLA Case No. 2014-132
Lead Inventor: Aydogan Ozcan
Copyright Status: Pending

Multiplexed Sweat Extraction and Sensing Wearable Interface for Normalized and Periodic Analysis

A novel sweat extraction and analysis platform was developed to resolve the aforementioned bottle neck issues. This platform uses an innovative iontophoresis electrodes/hydrogel for sweat induction. This method made sweat samples accessible on-demand for analysis and doesn't threaten the sample integrity. The platform includes a total of 8 compartments for analysis and a wireless circuit board for control, signal processing and wireless transmission. The compartments consist of arrays of biomarker sensors and calibrating sensors such as pH, skin temperature and sweat rate.

UCLA Case No. 2017-881
Lead Inventor: Sam Emaminejad
Patent Status: Pending

Ultra-Low Cost, Transferrable and Thermally Stable Sensor Array Patterned on Conductive Substrate for Biofluid Analysis

Researchers at UCLA have developed a novel biosensor array that physically decouples the sensing layer and the electrode module. This innovative design consists of a thermally stable disposable sensor array that is fabricated on a conductive and adhesive substrate. This substrate can be easily mounted onto its electrode counterpart, making the electrode module reusable. This design especially benefits devices that require frequent sampling of fresh biofluid. Furthermore, the probe/enzyme activity in this novel sensor array is preserved through applying freeze-drying (lyophilization) technique. This approach enables extended sensing activity in uncontrolled environments, since the sensing reagents would stay in solid form and stay non-reactive at room temperature until coming in contact with body temperature biofluid.

UCLA Case No. 2017-882
Lead Inventor: Sam Emaminejad
Patent Status: Pending

In Situ Sweat Rate Monitoring for Normalization of Sweat Analyte Concentrations

Researchers at UCLA have developed a novel method to monitor sweat rate *in situ* to achieve a normalized measure of the target biomarkers. The sweat rate information allows for characterizing and decoupling the confounding effect of the influential secretion parameters in the transport of the target biomarkers into sweat. The sweat rate information is also a useful measure of hydration status, temperature, and oxygen regulation. Normalization methodology helps mitigate the dependency of the sweat readings on secretion parameters. This sweat rate monitoring method can be incorporated into a wearable device, or it can be integrated into existing consumer electronic devices to provide valuable physiological insight.

UCLA Case No. 2018-218
Lead Inventor: Sam Emaminejad
Patent Status: Pending

Wireless *In Situ* Sensors in Stents for the Treatment and Monitoring of Chronic Obstructive Lung Disease (COPD)

Researchers led by Professor William Kaiser have invented a novel wireless, passive, and biocompatible sensor that can sense flow in bronchoscopically implanted stents *in situ* and in the absence of specialized equipment. This invention can be used as a straightforward electromechanical upgrade to current stent fabrication methods and can be used in place of current stents. This technology offers a safe and convenient method for effectively guiding COPD rehabilitation and treatment that has not been previously available and could potentially be used for other biosensing applications, such as orthopedic and dental implants as well as wearable fabrics (i.e. smart patches).

UCLA Case No. 2009-406
Lead Inventor: William Kaiser
Patent Status: Pending
Pub. No. US 20170319096

Oral Microsensor Arrays for Remote Monitoring of Salivary Electrolytes for Precision Healthcare

This microsensor system is an integrated network composed of a miniature electrochemical microsensor, a smart toothbrush for data collection and power supply, and a remote analysis and feedback system (ROHAS) for personal health monitoring and disease prevention. The microsensor is an RFID-based sensing system bonded to a molar tooth, which conditionally activates during chewing and dynamically measures sodium and potassium levels in the saliva. The toothbrush handle contains a reader that retrieves the measurement data, which is then transmitted to a central cloud server for analysis and monitoring via a smartphone. The toothbrush head is a near field charger that replenishes power supply for the molar bonded microsensor. This solution leads to long-term, unobtrusive and dynamic monitoring of dietary sodium and potassium intake that provides paramount insights into dietary electrolyte effects on disease prevention and progression.

UCLA Case No. 2017-854

Lead Inventor: Vivek Shetty

Patent Status: Pending

The Method of Enhanced Pressure Sensing Performance for Pressure Sensors

UCLA Researchers in the Department of Materials Science & Engineering have developed conductive microstructured air gaps that can be used to create the higher pressure sensitivity, fast response time, and pressure sensing tenability of capacitance-based, transistor-based, or related pressure sensors. Compared to conventional microstructure air-gap devices, these sensors exhibit relatively higher pressure sensitivity and fast response time due to their (i) more compressible dielectrics, (ii) thinner profile, and (iii) inherent viscoelastic behavior of elastomers.

UCLA Case No. 2017-501

Lead Inventor: Xiangfeng Duan

Patent Status: Pending

NMR Probe for Detection of Microstructures

Nuclear Magnetic Resonance (NMR) spectroscopy is a widely-utilized method for analyzing small molecule compositions. However, NMR sensitivity is too poor for diagnostic purposes, limiting its use to academic research. A key component responsible for the sensitivity is the NMR probe, which holds the sample as it is inserted into the magnetic field. UCLA researchers developed an NMR probe with sensitivity superior to current designs. It contains a novel noise reduction mechanism, making it the most sensitive probe of its kind. These properties allow the detection of metabolites at the single cell level. Additionally, the probe has a planar configuration, making it ideally suited for microfluidic chips used for diagnosis and prognosis. It is also made with an ultra small detection region, 0.08 mm length by 0.05 mm width by 0.05 mm height, for samples of small volume and low concentration (such as biological samples).

UCLA Case No. 2012-550

Lead Inventor: Louis Bouchard

Patent Status: US Patent Issued #10,094,893

Robotic Surgery Systems

Multi-Modal Haptic Feedback System

Researchers at UCLA have developed multi-modal haptic feedback systems (HFSs) that are capable of providing benefits for many different robotic surgical applications. Having inherited an existing tactile feedback system designed for reducing crush injuries in robotic surgical procedures, multi-modal HFSs integrate additional modalities of feedback including kinesthetic force feedback, vibration feedback, and various critical enhancements for pneumatic normal force tactile feedback, and design of a highly configurable software architecture allowed the application of the multi-modal HFS in several different RMIS applications. The multi-modal HFSs not only improve upon the previously developed unimodal tactile feedback systems with regards to reduction of grip force in RMIS, improvements to the sensing technology such as design of shear sensing mechanisms also help expand the application of haptics beyond grip force reduction.

UCLA Case No. 2017-877

Lead Inventor: Ahmad Abiri

Patent Status: Pending

Robotic Micro-Surgery System

Researchers at UCLA have developed a robotic system that performs complete micro-surgical procedures by exactly mimicking the motion of a joystick controlled by a surgeon. The system incorporates multiple arms, which can be moved separately or in unison. Each arm holds a surgical instrument that is moved in real time, has high range of motion, and has access to a universal cartridge that facilitates connections for multiple utilities. The instrument precision is further refined by filtering and removing the natural tremor of the surgeon's hand. Additionally, because micro-surgery requires the instrument to mechanically maintain a fixed-point of rotation at the site of penetration, the system incorporates an integrated tracking system that allows the robot to compensate for patient movement. The tracking system also triggers automatic termination in the event that the patient moves beyond a determined threshold.

UCLA Case No. 2009-300

Lead Inventor: Tsu-Chin Tsao

Patent Status: US Patent Issued #9,283,043

Laser-Assisted Intraocular Surgical Alignment

UCLA researchers have developed an automated method to align a remote center of motion (RCM) to a surgically relevant point for robot-assisted surgeries. To assign the RCM, two lasers are mounted on the desired surgical instrument carriage with the RCM as their point of intersection. This intersection point can then be aligned to the desired incision site by combining control of the stage with computerized visual feedback. This automated alignment procedure takes less than two minutes per surgery and requires no physical contact with the patient. Positional accuracy of the alignment technique was within 0.6 mm.

UCLA Case No. 2017-500

Lead Inventor: Tsu-Chin Tsao

Patent Status: Pending

Rapid and Precise Tool Exchange Mechanism for Intraocular Robotic Surgical Systems

Researchers at UCLA have developed a rapid and precise tool exchange mechanism to improve intraocular procedures that is compatible with any intraocular surgery platform. The system consists of a series of tool mounts for receiving surgical instruments, a set of tool collars for universal fitting and a tool-constraint element that secures the tools while also allowing for low force tool removal. This system is also equipped with a rotational actuation method and a translational actuation method that drive the rotational and translational motions of the surgical instrument. This setup allows fast, precise and repeatable tool exchange during surgery. The locking mechanism allows for a single tool to be precisely placed into mounts at the exact same location repeatedly, which dramatically cuts down time spent in tool alignment during surgery. The small form factor of this tool exchange system also allows space to accommodate surgical tubing and wiring, diminishing obstructions between stationary and moving components during surgery.

UCLA Case No. 2018-213

Lead Inventor: Tsu-Chin Tsao

Patent Status: Pending

System and Method for Automated Image Guided Robotic Intraocular Surgery

Professor Tsao and coworkers have developed a robotic surgical platform that incorporates optical tomography for autonomous cataract removal. Highly accurate 3D models are generated and used to automate cataract lens removal, with real-time monitoring and potential intervention by a supervising surgeon. Evaluation of progress can be achieved at regular intervals to ensure complete cataract removal. Robot-guided motion prevents inadvertent contact of the tool tip to the artificial lens capsule, minimizing the most common surgical complications.

UCLA Case No. 2018-214

Lead Inventor: Tsu-Chin Tsao

Patent Status: Pending

Docking System to Stabilize Eyeball During Intraocular Surgery

Researchers at UCLA have developed a novel docking system that can be used to secure an eyeball during intraocular surgery and constrain it relative to an imaging-system probe. The docking system contains a rigid support structure that serves as an interface between the sterile and non-sterile field. The system is also designed with a flexible port that fits over the imaging system probe while securing the eyeball in place relative to the imaging device. A flexible cannula allows insertion, extraction, and tangential movement of the surgical instrument during the surgical procedure. A separate fluid port allows lubricating fluid to flow into the cavity between the interface (separating the sterile and non-sterile surgical field) and the patient's eyeball to maintain lubrication of the eye. The fluid also improves the imaging quality of systems that require a fluid medium, such as for an OCT probe.

UCLA Case No. 2018-215

Lead Inventor: Tsu-Chin Tsao

Patent Status: Pending

Intraoperative Assessment of Implant Positioning

Researchers from the Departments of Mechanical Engineering and Ophthalmology led by Matthew Gerber have developed a modified intraocular lens (IOL) and surgical implantation procedure to treat glaucoma and astigmatism. They have created an imaging system and an algorithm to precisely calculate the position and adjustments needed for correct placement of the IOL. The adjustments can be made by the surgeon or dictated to a robotic surgical interface. They have developed an IOL that pairs with their surgical procedure and allows for ease of position tracking with specialized marks on the IOL and rivets for ease of physical manipulation by the surgeon or robot.

UCLA Case No. 2018-371

Lead Inventor: Jean-Pierre Hubschman

Patent Status: Pending

Surgical Tools

A Video-Guided Chest Tube Insertion System

Dr. Robert Cameron, Professor of Clinical Cardiothoracic Surgery and Surgical Oncology in the Department of Surgery at UCLA, has designed a novel trocar system that supports real-time visual monitoring of chest tube placement. Thousands of chest tubes are placed annually into the pleural space of patients who have excessive air and/or fluid collapsing the lung. Currently, chest tube placement involves either an extremely painful "medieval" incision and clamp technique or a trocar/dilator system, both of which are "blind" procedures often leading to poor tube position, organ damage, and even death. Dr. Cameron's device capitalizes on existing medical video technology to provide real-time monitoring and guidance of anatomical position of the chest tube during placement.

UCLA Case No. 2012-287

Lead Inventor: Robert Cameron

Patent Status: Pending
Pub. No. US 20150342699

IVC Filter Web Retrieval Device

UCLA researchers have developed a new IVC filter retrieval system that can be used for extraction of the web component of an inferior vena cava (IVC) filter, a device designed to stop a blood clot from traveling to the heart and lungs. Generally, the filter is removed when the patient is no longer thought to be at risk for future thromboembolic disease, due to the risk of potential complications associated with longer filter dwell times (including caval thrombosis, IVC or adjacent vessel perforation, and filter migration). Despite that, filter retrieval rates remain low, ranging from 20% to 60%, as IVC filter retrieval requires a trans-jugular approach, and these techniques cannot be used for secure and reliable retrieval of the web component. This device can be used for secure and reliable retrieval of the web component of IVC filters, which cannot be achieved by other filter retrieval systems. After web retrieval, the frame remains in the IVC.

UCLA Case No. 2016-639

Lead Inventor: Bashir Tafti

Patent Status: Pending

Expandable Vascular Sheath for the Removal of Foreign Objects in the Vasculature

Researchers at UCLA have developed a vascular sheath whose diameter can be increased temporarily to allow for capture and retrieval of various foreign objects such as IVC filters. Whereas other vascular sheaths are limited by inflexible tips, this new technology has an expandable feature that allows for adjustment to the irregular size and shape of foreign objects.

UCLA Case No. 2015-167

Lead Inventor: Bashir Tafti

Patent Status: US Patent Issued
#9,974,642

Bidirectional IVC Filter

Researchers at UCLA from the Department of Radiology have developed an improved IVC filter with better filtering performance that is easily retrievable. Their filter is specially designed to have minimal contact with the vessel, which makes retrieval simple. Unlike other filters, this new design offers flexibility in that it can be implanted and retrieved from

either the jugular or femoral veins. It also has a finer mesh that offers more protection than other filters. In the future, this design can also incorporate a drug eluting component for even better results.

UCLA Case No. 2014-422

Lead Inventor: Bashir Tafti

Patent Status: US Patent Issued #9,289,280

Image-Guided Irrigating Suction Cannula for Removal of Intracerebral Hemorrhage and Other Lesions

Intracerebral hemorrhages (ICHs) are potentially life-threatening conditions that occur when a blood vessel ruptures within the brain and causes an accumulation of blood. Dr. Neil Martin at UCLA has designed a simple multifunctional cannula system for performing minimally invasive image-guided evacuation of ICHs. After making a small burr hole in the skull, the cannula system is inserted toward areas of localized bleeding to both evacuate excess blood and irrigate the wound site until hemostasis is reestablished. With multiple instrument adapters, this system is capable of performing visual endoscope guidance, stereotactic image guidance, MRI image guidance, and computerized tomography image guidance. Additionally, Dr. Martin's instrument may be adapted to allow the use of a rotational clot or tissue fragmentation device for hematomas with higher levels of blood clotting.

UCLA Case No. 2014-320

Lead Inventor: Neil Martin

Patent Status: Pending
Pub. No. US 20170197017

Innovation of the Cerebral Shunt System

Researchers at UCLA have developed a blockage-free cerebral shunt system to prevent obstruction in the CSF drainage system. A common cerebral shunt consists of a distal part (distal catheter), a valve and a proximal part (ventricular catheter), which attributes to 30.4% of the obstruction. The innovative cerebral shunt design features an outer porous tube that allows continuous flow of CSF, and an inner air tube that uses pressurized air to push away debris accumulated at the pores of the outer tube. The air is generated under pressure in a cyclical fashion by a motor that is fitted on top of the shunt system. The blockage-clearing air pulse is generated once or more daily based on the amount of debris accumulated around the outer tube. Once the debris is cleared, the CSF can flow into the drainage tube again through the pores without obstruction, and the system stops generating pressurized air. This novel self-clearing design can prevent obstruction in the proximal part of the cerebral shunt system, reducing complication symptoms in hydrocephalus patients and extending cerebral shunt lifetime.

UCLA Case No. 2018-009

Lead Inventor: Thirusivapragas Subramaniam

Patent Status: Pending

Organ Resuscitation Solution and System for Enhanced Liver Transplantation

Researchers in the Department of Surgery and UCLA Pfleger Liver Institute have developed a novel solution and system to minimize the tremendous degree of ischemia and reperfusion injury (IRI) associated with liver transplantation. The invention serves to replenish exhausted nutrients and resuscitate the organ before revascularization. In a swine model, use of the novel solution and system demonstrated enhanced liver function and improved survival compared to conventional approaches. This system may salvage livers, deemed to have incurred severe degree of ischemic injury and discarded, to transplantable organs. A solution and system to alleviate organ damage from IRI would have significant consequences on patient outcomes as well as the availability of transplantable organs.

UCLA Case No. 2012-292

Lead Inventor: Johnny Hong

Patent Status: Pending
Pub. No. US 20140329221

Lung Isolation System

Researchers at UCLA have invented a novel system that achieves reliable lung isolation using a standard large bore single lumen endotracheal tube, which maximizes compatibility with other devices. The system enables true dual lumen lung isolation/ventilation thus enabling all the benefits of both a double lumen tube and a bronchial blocker (the current methods of treatment) without the downsides of either. It also incorporates a video visualization system, thus precluding the need for traditional fiberoptic bronchoscopy.

UCLA Case No. 2011-739

Lead Inventor: Nir Hoftman

Patent Status: US Patent Issued #9,744,323

Novel Surgical Device for Scleral Buckling Retinal Detachment Repair

UCLA researchers Michael Klufas and Jean-Pierre Hubschman and colleagues have invented a novel surgical tool that aids in the placement of scleral buckles for the treatment of detached retinas. The compact tool allows the surgeon to directly visualize the sclera during the procedure, allowing for more accurate and acceptable placement of both the scleral buckle and drains. Currently, placement of subretinal fluid drains is done 'blind' in most clinics. The device requires no electronics and can be used with standard ophthalmic equipment. It can also be utilized as a teaching aid for new ophthalmic physicians.

UCLA Case No. 2016-99K

Lead Inventor: Michael Klufas

Patent Status: Pending

Diagnostic Tools

A Method to Determine Cause of a Cardiac Arrest and Provide Cause-Specific Decision Support in Real Time Using Continuous Electrocardiography

Researchers led by Duc Hong Do from the Department of Cardiology at UCLA have developed an algorithm to detect the cause of cardiac arrest in a hospital setting. Based upon electrocardiogram (EKG) recordings their algorithm can predict the onset and cause of a cardiac arrest in real time. Additionally, this algorithm can provide cause-specific decision support for the management of cardiac arrest. Their invention can either display the cause of the cardiac arrest and subsequent treatment plan via a monitor or via audio through a speaker. Their results are based off a study of 89 patients, where they were able to identify 5 different types of EKG patterns of cardiac arrest with each type representing a different underlying cause.

UCLA Case No. 2019-257

Lead Inventor: Duc Hong Do

Patent Status: Pending

Multiplexed-Vertical Flow Immunodiagnostic Assay (xVFA) and Mobile Reader for Detection of Antibodies in Lyme Disease

A novel POCT for Lyme disease was developed based on a multiplexed vertical flow assay (xVFA). The assay consists of vertical stacking of functional paper layers to allow repeated and consistent measurements. Spatially multiplexed sensing membranes in the paper layers contain Lyme specific antibodies that generate colorimetric signals when pathogen is present. The results can be analyzed within 20 minutes using a low-cost mobile phone reader that sends the image to a remote server to be rapidly evaluated. This POCT is highly efficient, low cost, sensitive, specific, easy to use and robust, which makes it a perfect solution for rural populations.

UCLA Case No. 2019-321

Lead Inventor: Hyou-Arm Joung

Patent Status: Pending

Multi-Modal Depth-Resolved Tissue Status Monitor

Researchers at UCLA have developed a portable tissue status monitor that sits on the surface of the skin and can provide depth-resolved information about tissue health status, which is of paramount importance where tissue is very thin or consists of multiple layers. The monitor uses a variety of sensors to perform not only near-infrared spectroscopy, but also ultrasound, pressure, temperature and stretch sensing. In providing depth-resolved physiologic information, the technology may be used to monitor tissue after vascular surgery, during prolonged surgeries, or after mastectomy. In addition, the device can fit easily under surgical dressings or casts, and operates wirelessly, making it rather simple to use.

UCLA Case No. 2013-527

Lead Inventor: Warren Grundfest

Patent Status: Pending
Pub. No. US 20160022223

Fine Needle Device for the Measurement of Material Properties

Researchers at UCLA have utilized a needle device that allows for the *in vivo* cancer diagnosis of solid tumors such as thyroid, breast, and liver by mapping the quantitative insertion forces that occur during needle insertion.

UCLA Case No. 2014-513

Lead Inventor: James Gimzewski

Patent Status: Pending
Pub. No. WO 2016025389

A Device for *In Vivo* Characterization of Body Fluids

The rheological properties of certain fluid reservoirs in the body, such as the vitreous humor of the eye, hold clinical value for monitoring a variety of disorders as well as evaluating effects of therapeutic treatments. However, no devices currently exist to rapidly assess fluid properties in humans *in vivo*. Dr. Pirouz Kavehpour, Professor in the Department of Mechanical & Aerospace Engineering at UCLA, and colleagues have developed a needle-like probe to directly quantify the rheological properties of human body fluid in real time. Dr. Kavehpour's work has demonstrated that the physical properties of human body fluid can be informative in determining macromolecular structure and organization within an organ and that this information may be useful for detecting and monitoring disease. This probe has the advantages of being minimally-invasive and can measure fluid properties *in vivo*, obviating the need for fluid extraction. Thus, this device can be used to diagnose the risk or the presence of a degenerative or pathologic state through measurement of body fluid.

UCLA Case No. 2011-208

Lead Inventor: Pirouz Kavehpour

Patent Status: US Patent Issued #10,149,651

A Non-Intrusive and Portable System for Assessment of Sleep Apnea

Researchers at UCLA have designed a novel non-intrusive, remote health monitoring system for assessing sleep apnea. Studies have shown that OSA is associated with dysfunction in cardiovascular regulation of blood pressure and blood circulation. This sleep apnea screening system aims at predicting the sleep apnea by triggering and observing cardiovascular responses in participants. This system consists of a mobile phone, a Bluetooth-enabled blood pressure monitor, a Bluetooth-enabled pulse oximeter and a Valsalva box. During the test, the Android application implements a 20-minute protocol that guides users through a series of challenges that have been medically shown to trigger cardiovascular responses. Based on the user's blood pressure, heart rate and blood oxygen saturation measurements, all collected by the application, advanced feature selection and machine learning algorithms are used to identify the user's key contextual features and build effective prediction models that help identify OSA patients.

UCLA Case No. 2015-501

Lead Inventor: Majid Sarrafzadeh

Patent Status: Pending
Pub. No. 20170332917

Spatio-Temporal Pacing and Recording for Evaluation, Induction, and Mapping of Arrhythmias

Researchers led by Marmar Vaseghi from the David Geffen School of Medicine at UCLA have developed a high density electrode array to evaluate, induce, and map arrhythmias. This new electrode array has greater contact with the heart than previous arrays, which allows for more reliable stimulation and recording. Their electrode array has a high density of electrode contacts to create a detailed electrical map of the heart and extract electrical properties that makes it easier to locate sources of arrhythmia. Additionally, this new array can stimulate using multiple electrodes at once or in sequential order, rather than using only one site like current electrode arrays. This makes the induction of arrhythmias for diagnostic purposes more efficient and can even be used while the patient is under anesthesia. Their arrays can be delivered through open chest surgery, a catheter, or an endoscope depending on which part of the heart the cardiologist wants to observe.

UCLA Case No. 2018-375

Lead Inventor: Jeffrey Ardell

Patent Status: Pending

Homogenous Entropy-Driven Biomolecular Assay (HEBA)

Professor Di Carlo and colleagues have developed a novel biomolecule detection assay utilizing small oligonucleotides which immediately generates signal in the presence of a specific analyte. HEBA is a single-pot assay capable of detecting the presence of a biomolecule in relevant bio fluids at room temperature in 10 minutes. HEBA overcomes multiple limitations of current molecule detection assays as it does not require washing steps or temperature cycling, is enzyme independent, does not require immobilization at a surface, and is sensitive to the attomolar range in a microfluidic digital assay platform. Compared to current assay methods HEBA improves the level of detection of analyte, is performed as a homogeneous assay and requires only 10 minutes for detection.

UCLA Case No. 2015-579

Lead Inventor: Dino Di Carlo

Patent Status: Pending

Pub. No. 20180179576

Drop-Carrier Particles for Digital Assays

UCLA researchers led by Prof. Dino Di Carlo have developed a new low-cost multi-material particle that acts as a shuttle or carrier for a desired drop for digital assays. Each particle has a hydrophilic core for substrate or analyte binding, surrounded by a hydrophobic exterior. These types of dual-material particles can be designed with 3D shapes such that they can encapsulate, support, and stabilize water drops in the interior of the particles while being suspended in an oil phase to prevent coalescence of drops needed for digital assays.

UCLA Case No. 2017-533

Lead Inventor: Dino Di Carlo

Patent Status: Pending

Imaging Tools

A Method for Enhancement of Medical Images

UCLA researchers have developed an algorithm for hallucination-free resolution enhanced brain MRI images. This algorithm is useful for overcoming tradeoffs between image resolution, brightness and contrast detectability in MRI imaging. A locally adaptive learned filtering technique is used to improve the resolution of brain MRI images. This algorithm achieves superior performance in visually impaired images (with a peak signal-to-noise ratio about 0.3 dB higher than the RAISR algorithm) as well as low computational complexity in locally adaptive regression-based learning. Moreover, the images have improved sharpness and no hallucination. Applications to other medical imaging modalities such as CT/PET and digital X-ray is expected, where the technique can provide good quality images at a lower radiation dose. The algorithm can also be extended for de-noising, dynamic range improvements, image compression and color reconstruction.

UCLA Case No. 2019-007

Lead Inventor: Bahram Jalali

Patent Status: Pending

A Method for Digital Pathology Using Augmented Reality

Professor Jalali and coworkers have developed a novel method for digitizing pathological analyses. The method relies on phase stretch transform (PST), a computational imaging algorithm for improved image feature detection. The image is processed in multiple steps, first using PST to create a feature library and then using machine learning to identify specific regions of interest (ROIs). The microscope stage is aligned with the desired ROI and a quantitative analysis and tissue grading is carried out. The information is then stored for physician decision support. PST exhibits superior edge detection compared to previous best-in-class techniques in visually impaired images with high noise and low contrast.

UCLA Case No. 2018-748

Lead Inventor: Bahram Jalali

Patent Status: Pending

Non-Invasive Optometric Medical Diagnostic Device

UCLA researchers have created a fast, low-cost, and non-invasive approach for diagnosing various skin-related diseases. The technology takes advantage of the temporal response of endogenous fluorophores to a pulse of excitation light. A non-invasive optometric device is used to measure skin autofluorescence which depends on the health of the patient. The optometric device can be used to diagnose any disease affecting the auto-fluorescence of the skin. Examples include hyper-pigmentation diagnosis of non-melanoma skin cancer, photo-aging caused by UV, and monitoring utriculus. It can also be used to determine the depth and size of a cancerous lesion and changes in skin morphology. The device could be used for—but is not limited to—monitoring diabetes, skin-related disorders, cancer, acne, and photo-aging.

UCLA Case No. 2004-657

Lead Inventor: Laurent Pilon

Patent Status: US Patent Issued #7,904,140

Rapid, Portable and Cost-Effective Yeast Cell Viability and Concentration Analysis Using Lensfree On-Chip Microscopy and Machine Learning

UCLA researchers led by Prof. Aydogan Ozcan have developed a novel portable lab-on-chip lens free microscope system to monitor yeast cell viability and concentration. Furthermore, the device utilizes machine learning algorithms to process images, eliminating user subjectivity, and reducing acquisition and analysis time. These dual developments have allowed for the development of the Automated Yeast Analysis Platform technology which yields data that agrees well with current gold-standard technologies.

UCLA Case No. 2017-093

Lead Inventor: Aydogan Ozcan

Patent Status: Pending

Quantitative Fluorescence Sensing Through Highly Autofluorescent and Scattering Media Using Cost-Effective Mobile Microscopy

UCLA researchers have developed a novel method for quantitative fluorescence sensing through highly autofluorescent and scattering media. The inventors have created a compact and cost-effective fluorescence microscope to perform quantitative measurement of the concentration of a target fluorescent dye embedded inside a tissue phantom that mimics the autofluorescence and scattering characteristics of human skin. Then, a spatial Fourier transform-based image-processing method is used. This method takes advantage of the spatial modulation of the excitation beam. It digitally separates the signature of the target fluorescent signal from tissue autofluorescence although they severely overlap in space and optical spectrum.

UCLA Case No. 2016-833

Lead Inventor: Aydogan Ozcan

Patent Status: Pending

Demosaiced Pixel Super-Resolution for Multiplexed Holographic Color Imaging

UCLA researchers have developed a new high-resolution color microscopy technique, which solves Bayer CFA related spatial sampling limitations and color artifacts of previous color de-multiplexing approaches, significantly improving the performance of holographic high-resolution color imaging. This D-PSR approach first captures a plurality of raw holograms on a Bayer color sensor chip using simultaneous multi-wavelength illumination, where the sensor plane is shifted by small increments. Then it performs pixel super-resolution based on these sub-pixel shifted raw holograms to digitally synthesize smaller pixels (e.g., by a factor of ~3 fold) for each element of the Bayer CFA. Using the pre-calibrated spectral cross-talk matrix of each filter of the Bayer CFA at the selected illumination wavelengths, this approach de-multiplexes three color channels, each of which is also pixel super-resolved.

UCLA Case No. 2016-802

Lead Inventor: Aydogan Ozcan

Patent Status: Pending

Mobile Phone Based Fluorescence Multi-Well Plate Reader

UCLA researchers working with Dr. Aydogan Ozcan have developed a fluorescence microplate reader integrated onto the optical camera interface of a mobile phone. This device uses a cost-effective fiber optic bundle to create the microplate reader.

UCLA Case No. 2017-440
Lead Inventor: Aydogan Ozcan
Patent Status: Pending

Corneal Hydration Sensing with THz Illumination

Proper corneal hydration levels are critical to maintaining optical vision. Researchers at UCLA have developed an imaging system to detect corneal hydration levels by illuminating the cornea with low power, low energy, terahertz (THz) frequency light and measuring the magnitude of the reflected THz signal. The system is capable of resolving 0.18% changes in the water concentration of the cornea *in vivo* and results suggest a ~3x increase in dynamic range over ultrasound-based pachymetry. This system can be used for detecting inflammation, immune responses, edema, or other disease in the cornea.

UCLA Case No. 2012-100
Lead Inventor: Martin Culjat
Patent Status: US Patent Issued #8,690,331

An MR-Compatible System for Motion Emulation

Researchers at UCLA from the Departments of Mechanical Engineering and Radiological Sciences have developed a magnetic resonance- (MR-) compatible device that can emulate respiratory motion. Unlike other devices on the market, the lack of ferrometallic or electromagnetic components makes this device completely MR-compatible. This device can move 25 mm in one direction to mimic human respiration, but an amplifier can increase this range to 50 mm to mimic larger respiratory profiles. Their invention can emulate pre-recorded respiratory profiles from patients with less than 2% error and sub-millimeter error with amplification.

UCLA Case No. 2017-506
Lead Inventor: Tsu-Chin Tsao
Patent Status: Pending

Multi-Layer Electro-Textile MRI RF Coil Array

Researchers at UCLA have developed a multi-layer electro-textile RF coil that covers a larger imaging area while maintaining superb imaging quality. Using a multi-layer electro-textile array provides better imaging quality than traditional non-flexible coils. The coil maintains a flexibility similar to clothing while maintaining high durability. Its durability will make the coil practical for clinical use and reduce maintenance costs. Moreover, this array decreases patient discomfort, resulting in reduced scan times and higher throughput of MRI scans.

UCLA Case No. 2017-904
Lead Inventor: Yahya Rahmat-Samii
Patent Status: Pending
Pub. No. US 20180372817

3D Printed Normal Force Sensor

A novel 3D printing method was developed to design and produce normal force sensors for robotic surgical applications. The specific designs can be customized in software and read by the 3D printer. Conductive graphene filament and copper tapes are used to 3D print the designed force sensor. This method is low-cost, fast and user friendly. The normal force sensor product is widely applicable in other devices and machineries other than robotic surgery systems.

UCLA Case No. 2018-740
Lead Inventor: Warren Grundfest
Patent Status: Pending

Device Materials

Flexible Fan Out Wafer Processing and Structure: FlexTrate™

Researchers led by Professor Subramanian Iyer have developed a novel method to fabricate flexible electronics using FOWLP. Unlike conventional technologies, which use large chips with rigid substrates, this technology utilizes small dielets on flexible substrate in order to provide flexibility. Not only can this invention be processed at a wafer-level, but various device dielets with different thicknesses can be integrated and biocompatible resins, such as PDMS, can be used, thus providing heterogeneous integration. These innovative biocompatible flexible devices will have numerous applications, such as wearable sensors and implantable electrodes.

UCLA Case No. 2017-212
Lead Inventor: Subramanian Iyer
Patent Status: Pending

Flexible and Stretchable Interconnects for Flexible Systems and FlexTrate™

Researchers led by Arsalan Alam from the Department of Electrical Engineering at UCLA have developed a novel fabrication technique to create stretchable electronics. The innovation behind their fabrication is two-fold. Their fabrication embeds dies in a proprietary flexible substrate called FlexTrate™ that allow their electronics to bend, twist, and roll up. Second, they have created a way to make rigid, metal interconnects robust to stretching and bending. These two facets combine to make their electronics robust to over 500 cycles of stretching and rolling without having any broken connections and while maintaining their efficiency of electrical conduction.

UCLA Case No. 2018-219
Lead Inventor: Subramanian Iyer
Patent Status: Pending

Platform Technology for Customizable Nanoscale Wound Management Tools

UCLA researchers in the Departments of Chemistry, Physics, and Bioengineering, led by Dr. Tim Deming of the Bioengineering department, have developed a platform to create and modify nanoscale vesicles and hydrogels for use in wound management. The poly-peptide based platforms created by the Deming group are customizable in nearly all physical characteristics, can be tailored in size, be loaded with hydrophobic, hydrophilic, or cellular payloads, adaptable to specific delivery locations, low toxicity, are fully synthetic, possess highly reproducible properties, and are inexpensive to prepare compared to solid-phase peptide synthesis. The platform can be used to create novel, need-based nanoscale vesicles or injectable hydrogels, and can be used to augment existing material systems.

UCLA Case No. 2015-124
Lead Inventor: Timothy J. Deming
Patent Status: Pending
Pub. No. US 20170296672

Graphene-Based Catalysts for Biomimetic Generation of Antithrombotic Species

Thrombogenicity (the tendency for blood to adhere to a material's surface) has remained a major challenge for implanted medical devices since their inception. UCLA researchers from the Departments of Chemistry and Materials Science and Engineering have developed a graphene-based catalyst for generating HNO, an antithrombogenic species, for biomedical applications. This material greatly extends the lifetime of antithrombogenicity by

using endogenous and abundant glucose and L-arginine for the production of HNO. The graphene-based conjugates can be incorporated into polymer coatings that can be applied to biomedical devices.

UCLA Case No. 2014-521

Lead Inventor: Xianfeng Duan

Patent Status: Pending
Pub. No. US 20160339154

A Novel Polymer Platform for Drug Delivery

Aggressive surgical resection and chemoradiation therapy (CRT) are the dominant treatment course for patients with Head and Neck Squamous Cell Carcinoma (HNSCC), but these approaches often negatively impact patient quality of life, including disfiguration and loss of facial mobility in some cases. UCLA researchers have developed a novel implantable drug delivery device that reproducibly reduces tumor growth *in vivo*, bypassing the traditional HNSCC treatment course. The technology combines biocompatible polymer sheets with anti-tumor drugs and immune-boosting proteins that can be implanted to the surgical bed after debulking of the tumor. These layers of sheets are highly customizable, as they can incorporate multiple drugs at different concentrations and release rates.

UCLA Case No. 2014-235

Lead Inventor: Benjamin Wu

Patent Status: Pending
Pub. No. US 20150094518

Bidirectional Hyperelastic Covers for Woven Stents

Current stent designs frequently result in hazardous wrinkling of the cover upon deployment, substantially increasing the risk of stent failure, and subsequent morbidity. UCLA researchers have developed a novel hyperelastic thin film nitinol (HE-TFN) that can be used to cover medical stents. This porous film maintains a deformation ratio that matches the commercial stent distortion during deployment. As a result, potentially dangerous kinks and folds that arise from the crimping/expanding process are substantially avoided. This ensures the conformal stent delivery and deployment. Furthermore, the design strategy and the hyperelastic material allow customization of the cover to different deformation ratios, making the novel cover widely applicable to various types of commercial stents.

UCLA Case No. 2013-238

Lead Inventor: Greg Carman

Patent Status: US Patent Issued
#10,085,862

Surface Modification of Endovascular Devices

Current endovascular procedures for the treatment of vascular diseases use a number of metallic devices including guidewires, stents and coils. Although these materials are commonly used, they have several limitations, such as friction generated during the installation procedure and the need to be on blood thinning medication for a long time after implantation. Researchers at UCLA have discovered a method of treating NiTi, “nitinol,” sheets, wires, or stents that overcomes these limitations. The devices are treated with a type of light, causing them to take on super hydrophilic properties. This conversion increases the affinity between the device and vascular tissue, resulting in the acceleration of the healing process and a reduction in clotting. The hydrophilic device also demonstrates less friction during insertion and delivery.

UCLA Case No. 2008-007

Lead Inventor: Satoshi Tateshima

Patent Status: US Patent Issued
#8,487,284

Improvement of Dental Resins: Decreased Toxicity and Improved Biocompatibility

Resin-based and resin-containing materials are routinely used in dental practice as direct filling materials, fissure sealing agents, and as bonding resins or resin cements for metal, porcelain, resin inlays, veneers, crowns, and bridges. While the use of resin-containing materials is beneficial to the appearance of patients, these materials carry the risks of cytotoxicity and allergy often through resins such as HEMA or TEGDMA. UCLA investigators have discovered that the presence of a chemical inhibitor (CI) can inhibit HEMA- and TEGDMA-mediated apoptosis (cell death) in numerous human cell lines. Not only was cell death inhibited, but the presence of the CI also led to an increased viability and function of treated cells. The results indicate that the CI prevents adverse effects mediated by HEMA, TEGDMA and bleaching agents and may be incorporated into additive resin materials.

UCLA Case No. 2005-379

Lead Inventor: Anahid Jewett

Patent Status: US Patent Issued
#8,481,005

A Fast-Setting Moisture-Tolerant Root Canal Retrofilling and Repair Material

Professor White and colleagues have developed a new endodontic root-end filling, repair, obturating, and pulp capping material. The filling material has none of the disadvantages of currently used materials, such as mineral trioxide aggregate (MTA) and resin-modified glass-ionomers. Yet, it boasts additional advantages such as moisture friendliness, a quick light-cure command set, wide clinical application, and low cost. The technology has applications in dental offices as an alternative to existing materials for root end-filling during root canal surgery and other dental procedures.

UCLA Case No. 2013-309

Lead Inventor: Shane White

Patent Status: US Patent Issued
#9,889,071

A Novel Way to Activate Implant Materials

UCLA researchers have developed a novel and inexpensive method to augment the biocompatibility of titanium implants. The method involves a rapid, pre-surgical treatment of the titanium implant that improves osteoblast adherence to the implant surface. Because the treatment has been established as a safe and inexpensive physiochemical treatment for other metallic instruments, the technology will immediately provide a significant technical advantage in clinical and commercial application.

UCLA Case No. 2011-871

Lead Inventor: Takahiro Ogawa

Patent Status: Pending
Pub. No. US 20140119987

Orthopedic Devices and Biomechanics

Tendon-Driven Actuation Module for Robotic Hands

Researchers, led by Dr. Veronica J. Santos in the UCLA Biomechatronics Lab, have developed a compact actuation module that can deliver fast, forceful, high-precision control of any tendon-driven robotic manipulator. The design is based on a rotary motor unit that can exert either uni- or bi-directional (“push-pull”) control of any tendon-driven rotational joint, thereby enabling independent, high-performance control of each individual active degree of freedom in a robotic hand, including a palmar flexion degree of freedom.

UCLA Case No. 2015-071

Lead Inventor: Veronica Santos

Patent Status: US Patent Issued
#10,029,364

Soft Shear Force Resistive Sensor Embedded Artificial Skin

The inventors have developed a shear sensing artificial skin using bioinspired, thin and flexible liquid metal filled resistive microchannels. The PDMS based sensor skin is wrapped around a finger-shaped effector and fixed at the location of the nail bed. When the skin is subjected to shear force it results in one side of the skin in tension and the other side in compression that buckles and bulges similar to a human fingertip. The tension and compression are measured by embedded liquid metal strain gauges adjacent to the nail bed, away from the point of finger-object contact. The sensing philosophy can be expanded to provide spatially resolved tactile information and correlations can be acquired via machine learning processes.

UCLA Case No. 2017-841
Lead Inventor: Veronica Santos
Patent Status: Pending

Functionalized Titanium Implants and Related Regenerative Materials

Researchers at UCLA have developed novel titanium surfaces with enhanced bioactivity. The modified surface uses electrostatic interactions to increase adherence to negatively charged proteins and cells. This surface modification enables direct interaction between proteins and cells. The enhanced protein adsorption and cell attachment increases titanium's application in tissue integration and regeneration. Immediate broad applicability is possible because this titanium surface processing is simple, highly effective, and inexpensive.

UCLA Case No. 2009-254
Lead Inventor: Takahiro Ogawa
Patent Status: US Patent Issued #9,872,735

Titanium Plates for Bone Regeneration

UCLA researchers led by Prof. Takahiro Ogawa have developed a new titanium plate optimized for bone regeneration. These new plates have optimized surface properties not only for bone generation but also easy separation from bone once it needs to be removed. This may provide a new opportunity for titanium-plate-assisted bone regeneration.

UCLA Case No. 2017-527
Lead Inventor: Takahiro Ogawa
Patent Status: Pending

Titanium Implants With Novel Roughness

UCLA researchers led by Prof. Takahiro Ogawa have developed new titanium implants optimized for bone regeneration. These new implants have optimized hierarchical surface properties generated by multi-scale (meso, micro, and nano) machining to promote bone growth. These implants with hierarchical roughness and design have demonstrated greater strength of bone-implant integration than titanium implants with micro-scale roughness alone. Titanium implants with this new design may address limitations and problems associated with current implant technologies.

UCLA Case No. 2017-529
Lead Inventor: Takahiro Ogawa
Patent Status: Pending

Wearable Real-Time Gait Analysis and Sensory Feedback System for Gait Rehabilitation and Biomechanical Optimization

Researchers at UCLA have developed a wearable sensory feedback system, which combines real-time gait analysis via fully wearable sensors with time-discrete instructive feedback designed specifically to correct specific features of gait. Based on real-time motion analysis derived from the sensor data, this system is able to guide users to achieve a more symmetrical or better-aligned gait. This system can improve the effectiveness of physical therapy by providing physical therapists with more quantitative tools to assess and guide patients in real time. It could also improve patient participation and compliance by giving time-discrete feedback that reinforces positive changes and discourages negative ones in real time. This wearable feedback system can be used by the patient in the absence of direct physical therapist oversight, thereby expanding the access of patients to high-quality gait coaching.

UCLA Case No. 2018-387
Lead Inventor: Warren Grundfest
Patent Status: Pending

Objective, Real-Time Acoustic Measurement and Feedback for Proper Fit and Fill of Hip Implants

Orthopedic surgeons currently rely on manual assessment of the fit of implants in bone, leaving the procedure prone to technical errors that require revision surgeries. The present invention helps improve implant fit by aiding surgeons' senses during the broaching procedure by analyzing and classifying acoustic features generated from hammering the broach into cancellous bone. The method monitors the impact between the femoral component of a hip prosthesis with the patient's femur. The impact data is decomposed by a data acquisition and analysis device. Metrics based on a number of acoustic features are calculated to determine the fit and stability of the broach in the femur. Results are classified and output to a user interface to assist the surgeon.

UCLA Case No. 2014-935
Lead Inventor: George Hafzalla
Patent Status: Pending
Pub. No. US 20170112634

Cardiovascular Devices

Bioactive Endovascular Coils

Researchers at UCLA have developed a detachable endovascular coil system with increased biological activity. These coil materials are inherently bioactive and can be further coated with, or act as a delivery vehicle for, bioactive or therapeutic agents, such as drugs to control the inflammatory reaction inside an aneurysm. The innovation maintains the mechanical flexibility of the coils, ensuring that they are highly effective at preventing blood flow. These improvements will accelerate aneurysmal healing and minimize their rate of recurrence.

UCLA Case No. 2011-135
Lead Inventor: Benjamin Wu
Patent Status: Pending
Pub. No. US 20140180395

Novel Application of Laser Lithotripsy for Treating Vascular Calcification

Traditionally, vascular bypass surgery has been considered the "gold standard" of treatment for peripheral arterial disease. However, surgery is associated with significant morbidity and mortality, and 40% of these patients are not eligible for surgery. Percutaneous Transluminal Angioplasty (PTA) has been introduced as an alternative to surgical revascularization demonstrating favorable clinical outcomes, but still carries its own limitations. To overcome the limitations of PTA, UCLA researchers have developed a special endovascular catheter that can be used for laser-assisted angioplasty under direct visualization. This method also allows for irrigation and extraction of ablation-induced debris, thus reducing the risk of distal embolization.

This method is based on Holmium laser and provides a higher energy and repetition rate for smoother cutting and faster, more efficient tissue ablation.

UCLA Case No. 2012-565

Lead Inventor: Bashir Tafti

Patent Status: Pending
Pub. No. US 20150150442

Novel Adjustable Caliber Catheter System

UCLA researchers led by Prof. Satoshi Tateshima have developed a new adjustable tip catheter system for the removal of clots. The new catheter device is compatible with current standard guide systems and has an adjustable distal tip that can expand to a larger size (10–12 French) to accommodate target vasculature. The adjustable catheter can shrink to 3–4 French making it easier to navigate the delicate vasculature, but when needed can expand to target site diameter to maximize clot removal in a rapid and timely manner.

UCLA Case No. 2017-525

Lead Inventor: Satoshi Tateshima

Patent Status: Pending

System and Method for Improved Treatment of Metabolic Acidosis

Professors Thomas Mason and Jeffrey Kraut in UCLA's Department of Chemistry and School of Medicine, respectively, have developed improved materials and methods of treating acute metabolic acidosis, a condition in which pH within a patient has become abnormally acidic and can be life-threatening. The inventors have developed more effective base-treatment solutions involving a strong base, such as disodium carbonate, mixed with a weak base, such as sodium bicarbonate to raise both intracellular and extracellular pH while beneficially consuming dissolved carbon dioxide. Additionally, the investigators have conceived new methods of delivering these formulations in a time- and spatially-varying manner, thereby optimizing the solution's mixing ratio and rate of delivery based on past and present measurements of a patient's blood-gas parameters, including pH.

UCLA Case No. 2013-076

Lead Inventor: Thomas Mason

Patent Status: Pending
Pub. No. US 20150196708

Novel Catheter for Precise Stent Delivery

Current therapeutic strategies for the management of cerebrovascular disease (CVD) include endovascular stents to expand a narrowed or blocked artery. The flexible nature of the stent that permits expansion and enables passage through tortuous blood vessels also imposes a technical challenge, known as foreshortening, to the accurate placement of the stent. Foreshortening describes the change in length of the stent as it elongates to fit the confines of the delivery catheter and shortens following its expansion within the target vessel—leaving the surgeon to estimate precise placement. UCLA clinician Dr. Satoshi Tateshima in the Division of Interventional Neuroradiology has developed a novel catheter to help anticipate the degree of foreshortening during stent deployment. The present technology overcomes the inherent limitations of the widely used braided and laser cut stents—providing a superior device with increased placement accuracy and ease of use.

UCLA Case No. 2012-218

Lead Inventor: Satoshi Tateshima

Patent Status: US Patent Issued
#9,872,735

Unobstructing Microdevices for Self-Clearing Implantable Catheters

Implanted medical catheters are now an integral part of clinical care. However, many chronically-implanted catheter systems are plagued with reduced performance as a result of accumulating biological debris. Dr. Jack Judy and colleagues in the Department of Bioengineering at UCLA have developed an unobstructing microdevice for self-clearing catheters that alleviates flow obstruction. The researchers designed micro-mechanical mechanisms to disrupt the accumulation of biological material and keep catheter pores clear of debris. This device may be directly integrated into commercially available catheter systems for use in existing surgical techniques (e.g. chronically implanted catheters).

UCLA Case No. 2010-175

Lead Inventor: Jack Judy

Patent Status: US Patent Issued
#9,604,039

Dual Rotational Stent

Researchers at UCLA invented a novel dual rotational stent device for the endovascular treatment of cerebral aneurysm without the need for placing coils in the aneurysm lumen. The adjustable and variable struts density pattern of the new stent device allows it to cover the orifice of the aneurysm. This is advantageous for causing blockage of blood flow to the occluding aneurysm while sparing blood flow to perforators or side branches near the aneurysm neck. Specifically, the new compound stent has two main, but separate components; one for being positioned and stabilized in the parent vessel spanning the neck of the aneurysm, and another for controlling the degree of blood flow into the aneurysm.

UCLA Case No. 2009-668

Lead Inventor: Dieter Enzmann

Patent Status: US Patent Issued
#9,763,812

Brain Collateral Perfusion Augmentation by Cerebral Venous Pressure Modulation

UCLA researchers have developed a novel method and device to improve cerebral blood flow to about 50% of normal baseline value, thereby treating acute or chronic ischemia associated with stroke. The device and corresponding method uses applied pressure to artificially achieve collateral circulation in the brain. To increase cerebral venous pressure and thereby, redirect maldistributed blood flow, the device creates an occlusion of one or more veins coupled to the collapsed vessel. The device consists of an elongated tubular member with proximal and distal ends for insertion into a patient's superior vena cava (or other vein), an expandable occluder located at the distal end of the tubular member (the occluder has an expanded and a collapsed state), a device to measure pressure at the distal end of the tubular member, a device to measure cerebral blood flow in the patient, and a controller programmed to actuate the expandable occluder as a function of the measured venous pressure and the measured cerebral blood flow.

UCLA Case No. 2009-224

Lead Inventor: David Liebeskind

Patent Status: US Patent Issued
#9,833,598

Fully Implantable Artificial Heart

Professor Grundfest and coworkers have developed a totally implantable artificial heart. Requiring no protruding tubing, the heart does not use hydraulic fluid, but instead uses a design based on the human lung. A motor is attached to a synthetic membrane, which pushes blood through the ventricles via a connected, fluid-filled cavity. This enables the heart to be lighter and smaller, with subsequent reduced power consumption. The artificial heart may be able to function with no external power supply, and the completely implantable system minimizes risk of infection from protruding tubing.

UCLA Case No. 2018-389

Lead Inventor: Warren Grundfest

Patent Status: Pending

Artery Finder

Dr. Rejai has proposed a novel device to assist with arterial cannulation which provides the benefits of ultrasound (greater sensitivity and success rate) with the ease-of-use of traditional palpation (lack of cumbersome setup). The new device concept combines a pressure sensing layer that detects arterial pressure which is in turn reported by a visual output utilizing either a color changing material or LED component. Combining these two components allows for the visualization of the artery as defined by the arterial pressure being exerted at the time of cannulation, ultimately allowing the practitioner to find the artery and obtain best visual cues by refining the image as displayed on the visual component.

UCLA Case No. 2016-269

Lead Inventor: Sepehr Rejai

Patent Status: Pending
Pub. No. 20180325448

Radiation Oncology

A Breast Immobilization Device to Improve Radiation Therapy Dosimetry

Breast setup and immobilization is a difficult problem for external beam radiation therapy of breast cancers. A lack of setup reproducibility with breast tissue results in sub-optimal dosimetry and tissue toxicity in non-targeted, healthy tissues. Dr. Ke Sheng, Associate Professor in UCLA's Department of Radiation Oncology, has developed a novel breast immobilization device that allows for more comfortable support as well as a robust radiation dosimetry improvement in breast tissue without the skin dose build-up effect that has plagued existing methods. The device is low-cost and modifiable for the desired breast morphology.

UCLA Case No. 2013-077

Lead Inventor: Ke Sheng

Patent Status: US Patent Issued
#9,913,689

Magnetic Resonance Imaging (MRI) Device for Improved High-Dose-Rate (HDR) Brachytherapy Treatment Planning

Internal radiation therapy (brachytherapy) involves the positioning of tiny, radiation-emitting sources within tumor tissue by using delivery devices such as catheters, needles or other hollow conduits. Dr. Daniel Ennis, Dr. Jeffrey Demanes, and colleagues in UCLA's Department of Radiological Sciences have developed a device that allows for the effective imaging of the radiation-delivering catheter and the surrounding tissue. Under MRI, the device can be detected with high contrast, thereby providing valuable positioning information of the treatment catheters relative to the tumor and normal tissue. The device will allow optimal positioning of the radiation source for the purpose of radiation therapy. This device has utility in visualizing catheter placement in the body where brachytherapy is the preferred treatment strategy and where catheters are used as brachytherapy conduits.

UCLA Case No. 2012-546

Lead Inventor: Daniel Ennis

Patent Status: Pending
Pub. No. US 20160030768

Device for Global and Targeted Delivery of Brachytherapy to the Bladder Lumen

UCLA researchers have developed a device capable of delivering local radiation to the bladder lumen while essentially eliminating radiation exposure to the rest of the body. The device significantly reduces the potential for overtreatment or misses in an organ whose size, shape, and location change constantly. Furthermore, the device may be modified to accommodate concurrent administration of other types of therapy such as hyperthermia, chemotherapy, and immunotherapy. Despite being an effective therapy, radiotherapy has thus far been rarely used to treat early-stage bladder cancer. By facilitating localized radiation treatment, this device has the potential to shift treatment paradigms and enable use of brachytherapy as an effective treatment for early-stage bladder cancer.

UCLA Case No. 2016-093

Lead Inventor: Robert Chin

Patent Status: Pending

Pub. No. 20180311483

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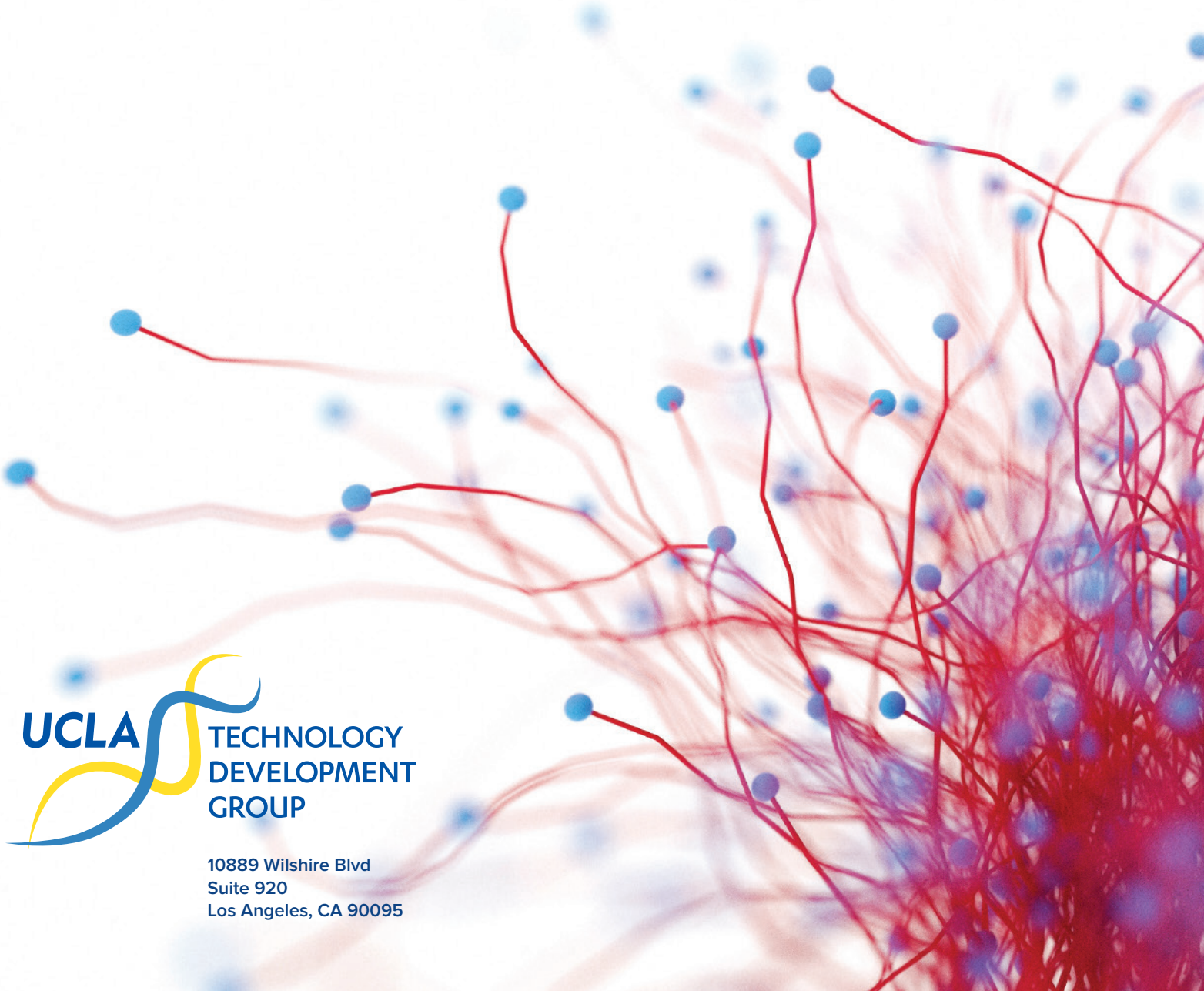

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