

**ANNUAL REPORT**  
Fiscal Year 2019

# Leading Through Partnership

 Office of Technology  
Commercialization

# Leading Through Partnership

## ANNUAL REPORT

Fiscal Year 2019

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# FOREWORD FROM EXECUTIVE DIRECTOR

Momentum remains high for moving University of Kentucky (UK) innovations to market, as commercialization activity once again set new record highs for inventions (104), patents filed (85), and licenses executed (30). Patent Palooza! grew in attendance by 10%. With this core activity growth, and through a number of new programs and initiatives launched to sustain this activity and serve the ideas generated, we continue to demonstrate one of our new favorite OTC-isms related to innovation in our community: “There is more than you think, and there will be more than there is.”

Serve the Idea: This was a theme in FY 19. With every discussion, decision, and action, we want to make sure that we are serving the idea – the technology - first. To do this, we needed to continue to expand our services. We built an OTC New Ventures team to better serve our startups and support the Lexington entrepreneurship ecosystem. We created greater effectiveness in our tasks and responsiveness to our innovators and administrators, by building or adopting tools and processes to execute MTAs and NDAs faster, to monitor our pipeline of technologies better, to show administrators trends in a college’s commercialization activity more transparently, and to introduce our technologies to commercialization partners more creatively.

We developed new partnerships with the UK Alumni Association and UK Philanthropy to execute the inaugural UK Entrepreneur Showcase, and with the University of Louisville and the Kentucky Cabinet for Economic Development to create a new statewide program offering shared technology transfer services to every public university and college in the state. Seeing the value in developing regional networks, we brought 30 universities together and led the launch of a program and two regional platforms (Southeast and Midwest), Executives-on-Roster (XOR), to help our startups team-build by finding and matching with experienced entrepreneurs and executive leaders in other networks. We also launched the UK Women Innovators Network (UKWIN) with our first inaugural conference. Additionally, we completed Phase I of the NIGMS IDeA Hub grant for the Southeast IDeA region, where UK OTC is leading a network of 24 universities to build new solutions to educate inventors and accelerate biomedical innovation to market.

We recognize fully that we could have done none of the above without the support of President Eli Capilouto and Vice President for Research Lisa Cassis, firstly, and many other partners, stakeholders, and innovators. We thank all of our supporters, and we hope that you are as excited as we are about the innovation culture on this campus and in this community.

Sincerely,

**IAN D. MCCLURE**

Executive Director, OTC



“For more than 150 years, the University of Kentucky has played a leading role in developing technology that fuels the economy and improves the health and well-being of those we serve. UK faculty and staff entrepreneurs are building upon a legacy of new

ideas, technologies, and inventions manifest in UK’s more than 600 patent assets deployed around the world. UK Research and the Office of Technology Commercialization are integral elements of our commercialization and innovation pipeline; these efforts are fundamental to our role as the University of, for, and with Kentucky.”

**ELI CAPILOUTO**

University of Kentucky President



“The Office of Technology Commercialization’s work to promote innovation and discovery by bringing together university, industry, entrepreneurs and business leaders, and their success in securing federal funding to boost these partnerships and accelerate

innovation, is a testament to UK’s commitment to improve lives in Kentucky and beyond.”

**LISA CASSIS, Ph.D.**

Vice President for Research

# THE OTC TEAM



**IAN MCCLURE**  
Executive Director



**ALLISON SPURRIER**  
Executive Administrative Assistant

## INTELLECTUAL PROPERTY DEVELOPMENT TEAM



**DON KEACH**  
Associate Director



**SABRINA DARNELL**  
Intellectual Property/Compliance  
Coordinator



**TANNER ANDERSON**  
Intellectual Property/Data  
Management Assistant

## NEW VENTURES & ALLIANCES TEAM



**TAUNYA PHILLIPS**  
Senior Associate Director



**ERIC HARTMAN**  
Associate Director New Ventures



**MARIAM GORJIAN**  
New Ventures Manager



**JACQUELINE J. GREENE**  
Marketing Coordinator



**CAYLIN EASLEY**  
Student Marketing Assistant

## TECHNOLOGY COMMERCIALIZATION & LICENSING TEAM



**ERIC CASTLEN**  
Associate Director



**NATASHA JONES**  
Commercialization Manager



**RAJA KRISHNAN**  
Commercialization Manager



**ALI BOCOOK**  
Senior Contracts Coordinator

## FELLOWS TEAM



**MARION COE**



**STEPHANIE DAVIS**



**GABRIELLE KEB**



**MICHAEL ORR**



**JOSEPH STEVENS**



**AUSTIN WEISS**

## ACCOMPLISHMENTS:

**SABRINA DARNELL:** Became a member of the Association of University Technology Managers (AUTM) Finance Committee, Agreement Compliance Course, Compliance Course, and TOOLS Course

**JACQUI GREENE:** Voted to the UK Women's Forum Board for a one-year term and selected for the Association of University Technology Manager (AUTM) website committee

**NATASHA JONES:** Appointed to the Certified Licensing Professionals (CLP) Exam Development and Maintenance committee.

**IAN MCCLURE:** Promoted to executive director, voted to the Association of University Technology Managers (AUTM) Board of Directors for a three-year term, and identified as one of the world's leading IP strategists in the 2019 edition of IAM Strategy 300.

**TAUNYA PHILLIPS:** Promoted to senior associate director, New Ventures & Alliances, appointed to the Midwest Research University Network (MRUN) Board of Directors, and selected president-elect of the University of Kentucky (UK) Alumni Association and received a UK staff award.

# 2019 FISCAL YEAR IN REVIEW

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85

PATENT  
APPLICATIONS  
FILED

104

INVENTION  
DISCLOSURES

26

PATENTS  
ISSUED

30

NEW LICENSES  
AND OPTIONS  
EXECUTED

\$5.61  
million

DISTRIBUTED  
TO INVENTORS  
SINCE 2010

\$15.72  
million

DISTRIBUTED TO  
COLLEGE  
AND DEPARTMENTS  
SINCE 2010

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\$2,356,523

GROSS ROYALTY INCOME IN FY2019

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# MILESTONES

## AUGUST 2018

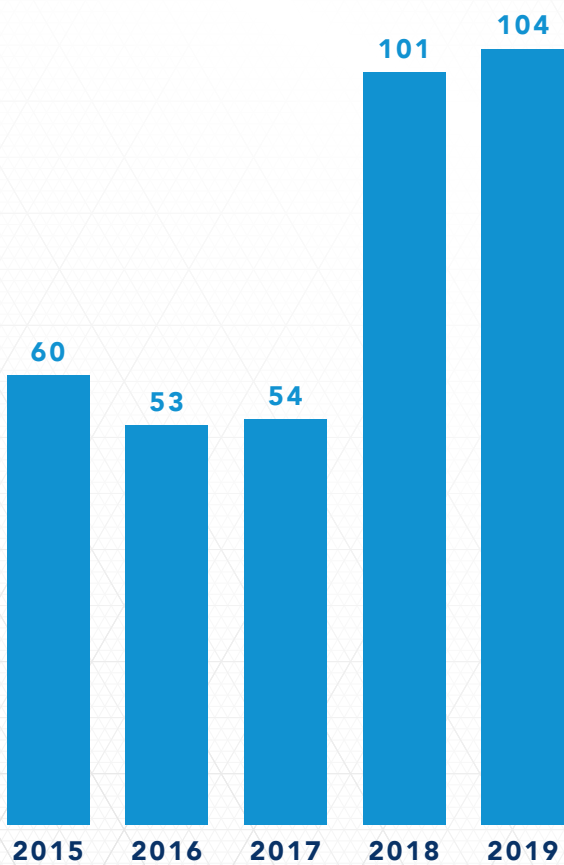
- Launch of the Midwest XOR and Southeast XOR Platforms (page 11)
- Organized and co-hosted the state's first Commonwealth Commercialization Summit with Presidents and administrative leadership from all public colleges and universities in Kentucky

## OCTOBER 2018

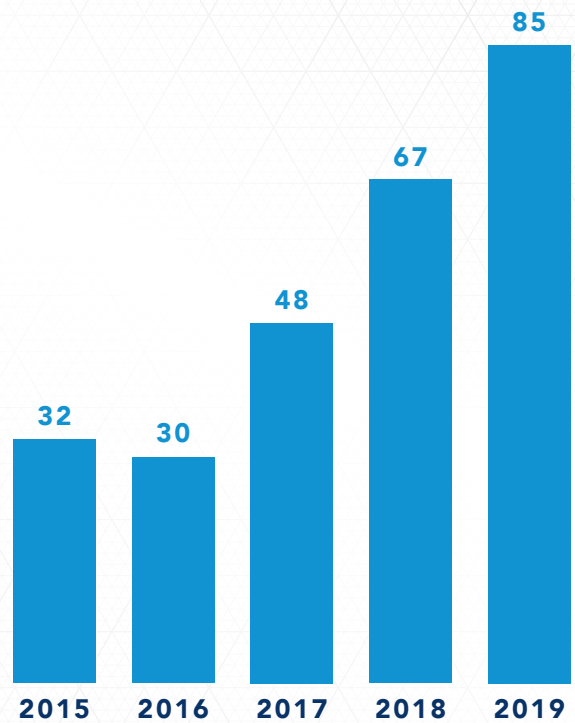
- Received National Institute of General Medical Sciences (NIGMS) IDeA Technology Transfer Hub grant (nearly \$500,000 for Phase I) from the National Institutes of Health (NIH) (page 11)
- Inaugural UK Women Innovators Network (UKWIN) conference was held

## NOVEMBER 2018

- Received Regional Innovation for Startups and Entrepreneurs (RISE) grant (\$400,000) (page 12)



## INVENTION DISCLOSURES RECEIVED



## PATENT APPLICATIONS FILED

\*Data as of 06/20/2019

## DECEMBER 2018

- Led the development of a Commonwealth Commercialization Center (C3) partnership with UofL and KY CED (page 12)

## MARCH 2019

- Implemented an Intellectual Property (IP) Training Video and Agreement regarding Bayh-Dole changes
- Inaugural UK Entrepreneur Showcase in partnership with UK Alumni Association and UK Philanthropy held
- Hosted third annual Patent Palooza! with record attendance

## JUNE 2019

- Hosted OVALS conference bringing together alumni, commercialization and philanthropy (page 11)

# ON THE HORIZON

- Launch of the CATalyst Fund, a proof-of-concept fund to help de-risk early stage UK technologies
- Launch of Mentors-in-Residence (MIR) Program matching subject matter experts with faculty innovators
- Launch of the Startup License Program (SLP)
- New Services for Intellectual Property (IP) Development with hiring of new Senior Associate Director
- REACH grant (KYNETIC)

538

**MATERIAL TRANSFER  
AGREEMENTS**

449

**NON-DISCLOSURE  
AGREEMENTS**

73

**DATA USE  
AGREEMENTS**

AGREEMENTS



# STARTUPS

# 68

**TOTAL ACTIVE STARTUPS  
RELATED TO UK TECHNOLOGY**

# 4

**UK STARTUP COMPANIES  
LICENSED IN FISCAL YEAR 2019**

- Advanced Semiconductor Processing Technology, LLC
- Carbon Science Solutions
- Bluegrass Advanced Materials, LLC
- ExoNanoRNA, LLC

## UK STARTUP COMPANIES THAT PARTICIPATED IN OTC ENTREPRENEURSHIP PROGRAMS

- AMdx – Florin Despa (College of Medicine)
- Cellie Coping Kit – Meghan Marsac (UK HealthCare)
- PlateLast – Zhenyu Li (College of Medicine)
- Wild Dog Physics, LLC – Janelle Molloy (College of Medicine)

## UK STARTUP COMPANIES THAT RECEIVED SBIR/STTR FUNDING IN FY 2019

- Enepret Incorporated – Joseph Chappell (College of Pharmacy)
- Lepidext, LLC – Angelika Fath-Goodin (formerly College of Agriculture, Food and Environment)
- Naprogenix Inc – John Littleton (College of Arts & Sciences)
- W-Z Biotech, LLC – Dongfang Wang (College of Medicine)

## STARTUP COMPANY SPOTLIGHTS

### CARBON SCIENCE SOLUTIONS (CSS)



Carbon Science Solutions (CSS) is utilizing a University of Kentucky patented process to take bourbon stillage and produce high-quality activated carbons. CSS produces high-quality engineered carbon materials. These materials can be used in the environmental, energy and electronics markets.

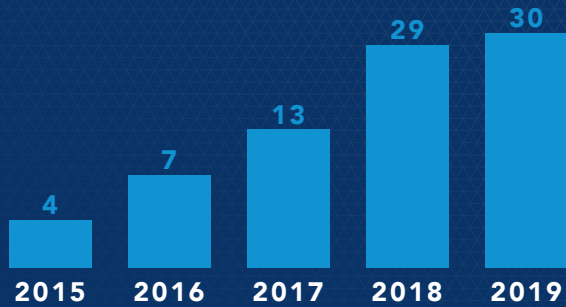
### WILD DOG PHYSICS, LLC



Founded by the College of Medicine's Janelle Molloy, Wild Dog Physics, LLC is changing the approach to cancer care through a Quality Assurance (QA) Device. The QA Device is being developed to provide more precise and efficient cancer care by overcoming some of the challenges in providing high-level cancer care.



# NEW LICENSES AND OPTIONS FY 2015 – FY 2019



INCREASE OVER  
LAST FIVE YEARS:

650%

LICENSE AGREEMENTS  
THAT GENERATED  
INCOME IN FY 2019:

35

## LICENSES AND OPTIONS FOR FISCAL YEAR 2019

### 22ND CENTURY GROUP, INC

Orlando Chambers (College of Agriculture, Food and Environment)  
Robert D. Miller (College of Agriculture, Food and Environment)

### ADVANCED SEMICONDUCTOR PROCESSING TECHNOLOGY, LLC

Zhi David Chen (College of Engineering)  
Ibrahim Yucedag (formerly College of Engineering)

### ALKAHEST (2)

Jayakrishna Ambati (formerly College of Medicine)

### ALTRIA CLIENT SERVICES, LLC

Orlando Chambers (College of Agriculture, Food and Environment)  
Robert D. Miller (College of Agriculture, Food and Environment)

### APPLIED BIOLOGICAL MATERIALS, INC

Chongsuk Ryou (formerly College of Arts & Sciences)

### AVAST THERAPEUTICS, LLC (2)

Luke Bradley (College of Medicine)  
Don Gash (College of Medicine)  
Greg Gerhardt (College of Medicine)

### BLUEGRASS ADVANCED MATERIALS, LLC

Thomas Dziubla (College of Engineering)  
James (Zach) Hilt (College of Engineering)

### CARBON SCIENCE SOLUTIONS, LLC (2)

Stephen M. Lipka (formerly Center for Applied Energy Research)  
Christopher R. Swartz (formerly Center for Applied Energy Research)

### CIRCLE THE GLOBE PRODUCTIONS, INC. (2)

James Griffioen (College of Engineering)  
Seth Parker (College of Engineering)

### COSMOCEL, S.A.

Douglas Archbold (College of Agriculture, Food and Environment)  
Marta Nosarzewski (College of Agriculture, Food and Environment)

### CURIOSITYSTREAM, LLC

James Griffioen (College of Engineering)  
Seth Parker (College of Engineering)

### EXONANORNA, LLC

Mehdi Rajabi (formerly College of Pharmacy)  
Yi Shu (formerly College of Pharmacy)

### FLOW MAX, LLC

Todor Petrov (formerly College of Engineering)  
Andrzej Wala (formerly College of Engineering)

### HERA BIOLABS

B. Mark Evers (College of Medicine)

### KENTUCKY SPECIALTY GRAINS, LLC

David Hildebrand (College of Agriculture, Food and Environment)  
Timothy Phillips (College of Agriculture, Food and Environment)

### KERAFAST, INC (2)

Gregory Graf (College of Pharmacy)  
Louis Hersh (College of Medicine)

### PANGLOSS FILMS, LLC

James Griffioen (College of Engineering)  
Seth Parker (College of Engineering)

### SHARP HEALTHCARE

Nora Warshawsky (formerly College of Nursing)

### TONIX PHARMACEUTICALS HOLDING CORP.

Chang-Guo Zhan (College of Pharmacy)

### UNIVERSITY OF CINCINNATI

Nora Warshawsky (formerly College of Nursing)

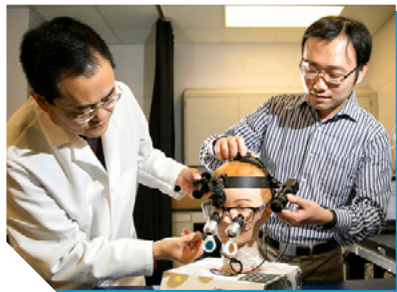
### UNIVERSITY OF KANSAS

Nora Warshawsky (formerly College of Nursing)

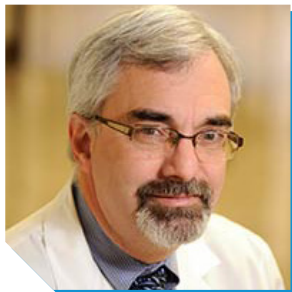
### UNIVERSITY OF THE WEST INDIES

Nora Warshawsky (formerly College of Nursing)

# FY 19 INNOVATIVE TECHNOLOGIES



**GUOQIANG YU, Ph.D.**



**THOMAS PITTMAN, MD**

## Imaging Device for Guidance of Brain Tumor Surgery

Guoqiang Yu, professor in the College of Engineering, Thomas Pittman, professor in the College of Medicine, and Chong Huang, assistant professor in the College of Engineering, developed a wearable, all-in-one fluorescence imaging device to assist with brain tumor surgery. This device, known as the F.Loupe, is much easier to align, maintain and use compared to the large microscope currently being used. The F.Loupe provides personalized medicine and reduces disability and death.

## Novel Bone Biopsy Device

Madhumathi Rao, associate professor in the College of Medicine, Florence Lima, assistant professor in the College of Medicine, and Clay Larkin, student in the College of Engineering, developed a designated bone biopsy sampling needle for metabolic bone diseases. The needle uses proprietary cutting-edge design and the three-part design provides ease of use. Using this device minimizes tissue damage and preserves the microarchitecture of samples. It is a power-driven device that reduces complications and pain for patients.



**MADHUMATHI RAO, MD**



**FLORENCE LIMA, Ph.D.**



**CLAY LARKIN**



**RICK HONAKER, Ph.D.**



**JOSHUA WERNER, Ph.D.**

## Enhanced Recovery of Critical Materials from Coal-Based Sources

Rick Honaker, professor in the College of Engineering, and Joshua Werner, assistant professor in the College of Engineering, have developed inventions that tackle the issue of putting coal mining waste products to work. They are developing methods to extract from the waste many high-value rare earth metals.

## Anticancer Drug

Chang-Guo Zhan, professor in the College of Pharmacy, and Kyung Bo Kim, associate professor in the College of Pharmacy, discovered a novel pyrazole scaffold compound that targets the active site of proteasomes. The lead compound, G4-1, was also shown to be greatly effective in suppressing tumor growth in models of prostate cancer. The drug shows potential to work well in cases where patients have developed resistance to current front-line therapy for multiple myeloma. The backbone design assists in reducing the risk of drug resistance.



**CHANG-GUO ZHAN, Ph.D.**



**KYUNG BO KIM, Ph.D.**







# PATENTS BY TECHNOLOGY AREA

## FISCAL YEAR 2019

### AGRICULTURE

**2314 Use of Non-coding Nucleic Acid for Crop Improvement and Protection Against Microbes**

*Shine Baby, Pradeep Kachroo, Aardra Kachroo, Gah-Hyun Lim*

**2322 Breeding Lines Altria (CAF<sup>2</sup>%)**

*Orlando Chambers, Robert D. Miller*

**2323 Breeding Lines 22nd Century Group (CAF<sup>2</sup>%)**

*Orlando Chambers, Robert D. Miller*

**2324 Gene Silencing Kills Emerald Ash Borer, an Exotic, Invasive Tree-Killing Insect**

*L.K. Rieske-Kinney, Thais Barros Rodrigues*

**2325 Improved Seed Germination**

*Robert L. Geneve, David F. Hildebrand, Jia Wen Tan, Cassidy Wallin*

**2326 Method for Rapid Analysis of Cannabinoids**

*David F. Hildebrand, Julia Cassidy Wallin, Ju-Young Yoon*

**2333 Synthesis and Formulation of Lignin Derived Compounds as Treatment of Plant Diseases**

*Ryan M. Kalinoski, Jian Shi*

**2342 Cytochrome P450s and Uses Thereof**

*Joseph Chappell, Lyle Ralston*

**2345 Seed Gender Determination of Dry Hemp Seeds**

*Robert L. Geneve, David F. Hildebrand, Jia Wen Tan*

**2346 Cannabinoid Analysis by Hyper Spectral Imaging**

*Ali Hamidisepehr, David F. Hildebrand, Daniel L. Lau, Michael Sama, Julia Cassidy Wallin*

### BIOFUELS

**2386 Heisenberg Components Laser Spectrometer for Analysis of Corn Stover**

*Robert A. Lodder*

### BIOMARKERS

**2290 Reg3A, Reg Related Family Members and Soluble E-Cadherin (sEcad) as Biomarkers for Cancer**

*Sabine M. Brouxhon, Ron Bruntz, Matthew Hoover, Stephanos Kyrkanides, Melvyn Yeoh*

### CHEMICAL SYNTHESIS

**2388 Synthesis of U714**

*Robert A. Lodder*

### DRUG DELIVERY

**2297 Extending and Maintaining Micropore Viability of Microneedle Treated Skin with Lipid Biosynthesis Inhibitors for Sustained Drug Delivery**

*Audra L. Stinchcomb*

**2360 RNA Nanostructures for Targeted Drug Delivery**

*Bernard M. Evers, Peixuan Guo, Sijin Guo, Piotr Rychahou, Jon S. Thorson*

**2389 Controlled Release Nanoparticle Formulation for U714**

*Robert A. Lodder*

### ENERGY

**2301 Biodegradable Nanoparticles for Controlled Release of ICP4 Compounds for LEMS**

*Robert A. Lodder*

**2302 Energy Harvesting Based Physically Unclonable Function for IoT and Vehicles**

*Carson Labrado, Himanshu Thapliyal*

**2339 Production of Fuel Pellets**

*Thomas C. Keene, Darrell N. Taulbee*

**2376 Melting Point Depression of Redox-Active Molecules for Increased Solubility in Energy Storage Applications**

*Giorgio Baggi, Susan A. Odom*

### ENTOMOLOGY

**2294 Development of CS-TPP-dsRNA Nanoparticles for Induction of RNAi in the Yellow Fever Mosquito**

*Ramesh Dhadapani, Subba R. Palli*

**2379 Development of Polylysine:epigallocatechin-3-O-Gallate and dsRNA Polyplexes for Control of Mosquitoes**

*Ramesh Dhadapani, Subba R. Palli*

### ENVIRONMENTAL

**2299 An Apparatus to Remove Harmful Species from Flue Gas Desulfurization Blowdown Using Iron-Based Products**

*Keemia Abad, Xin Gao, James Landon, Kunlei Liu, Zilong Ma, Ayokunle Omosebi, Jesse G. Thompson*

**2332 Process and Method for Increased Carbon Shuttling in Algae Cultivation Media**

*Mark Crocker, Kunlei Liu, Moushumi Sarma, Jesse G. Thompson, Leland Widger, Michael Wilson*

**2380 UKY-CAER Compact Absorption Column for CO<sub>2</sub> Capture**

*Kunlei Liu, Heather Nikolic*

**2384 Ash Fouling Free Regenerative Air Preheater for Deep Cyclic Operation**

*Kunlei Liu, Chenggua Ma, Heather Nikolic*

### EQUINE

**2335 IL-6 as a Marker for Fitness and Early Injury Detection in Horses**

*Allen Edward Page, David W. Horohov, John Craig Stewart*

**2364 A Smartwatch Application for Horse Gaits Activity Recognition**

*Enrico Casella, Simone Silvestri*

**2378 PD8409, Equine Placenta Microvascular Endothelial Cell Line**

*Pouya Dini*

### FOOD SCIENCE

**2315 Chocolate Formula Rich in Polyphenols and Low in Fat**

*Sandra Bastin, Lakmani Tharaka Galaniha*

### INDUSTRIAL PROCESSES

**2286 Innovative Manufacturing Methods for Next-Generation Products, Processes, and Systems**

*Ryan Bradley, I.S. Jawahir*



**2293 Optimization, Simulation and Risk Analysis Tools for Multi-Lifecycle Sustainable Product Configuration Design**  
*Ridvan Aydin, F. Fazleena Badurdeen, Adam Jerome Brown*

**2300 High Speed Multi-Axis Shaper Machine Tool**  
*Julius Schoop*

**2330 Smart Polymeric Flocculants**  
*Ricky Q. Honaker, Wencai Zhang*

**2347 High Temperature Oxidation as a Pretreatment Process to Rare Earth Recovery from Precombustion Coal-Based Sources**  
*Ricky Q. Honaker, Wencai Zhang*

**2348 Enhanced Recovery of Critical Materials from Coal-Based Sources using Fluidized-Bed Combustion**  
*Ricky Q. Honaker, Joshua Werner, Wencai Zhang*

**2350 Device for Characterization of Material Properties under Realistic Process Conditions**  
*Julius Schoop*

**2351 High Speed Multi-Axis Shaper Machine Tool**  
*Julius Schoop*

## **MATERIALS**

**2298 Ordered Nanotubes on Two-Dimensional Substrate Consisting of Different Material**  
*Mathias J. Boland, Mohsen Nasser, Douglas R. Strachan*

**2312 Gold Catalyst for Oxidative Depolymerization of Lignin**  
*Mark Crocker, Justin K. Mobley, Yang (Vanessa) Song*

**2317 Turbid Point Monitoring Method for Reliable Manufacturing of Perovskite Solar Cells**  
*Zhi D. Chen, Feng Wang*

**2327 High-Capacity Reductant Solid-Phase Polyacrylamide Resins**  
*John Andrew Hitron, Xianglin Shi*

**2358 Continuous Wet-Spinning Process for the Fabrication of PEDOT:PSS Fibers with High Electrical Conductivity, Thermal Conductivity and Young's Modulus**  
*Ruben Sarabia Riquelme*

**2367 Linear Flow Semi-Quantitative Analysis**  
*Rancie Wayne Hannah*

**2382 Recombinant Single Chain Antibody (Nanobody) to Glutathione S-Transferase**  
*K. Martin Chow, Louis B. Hersh, Craig W. Vander Kooi*

## **MECHANICAL DEVICES**

**2340 Combination Tool for Electrodiagnostics**  
*Justin Huber*

## **MEDICAL DEVICES**

**2311 A Device for Quality Assurance of Medical Accelerators**  
*Janelle Molloy*

**2370 Antegrade Retrograde Reconstruction Intramedullary Nail (ARRN)**  
*Arun Aneja, Shea Comadoll, Lornxo Deveza, Boshen Liu*

**2375 Bone Biopsy Needle (For use with Handheld Power Driver)**  
*Clay Larkin, Florence Lima, Madhumathi Rao*

**2377 Velopharyngeal Acoustic Tracer**  
*Michael T. Johnson, Kevin B. McGowan*

**2385 Doxycycline-Enhanced Surgical Adhesion Barrier Device**  
*Mark Suckow*

## **RESEARCH TOOLS**

**2309 Tumor Samples, Patient Derived Xenograft (PDX) and Cancer Cell Samples**  
*Bernard M. Evers*

**2320 CBRL**  
*Chongsuk Ryou*

**2328 An Optimized Resin-Assisted Reduction and Capture Method for the Study of Reversibly-Oxidized Cysteines**  
*John Andrew Hitron, Xianglin Shi*

**2361 Module that can be Added to an Inverted Microscope to Enable High Throughput Total Internal Reflection (TIRF) Microscopy**  
*Nicholas Armendarez, Jason DeRouche, Christopher I. Richards*

## **SCREENING TEST**

**2291 QUILS: Quality Implementation of Lung cancer Screening Index**  
*Kristine Damron, Jennifer Redmond Knight, Timothy Mullett, Christina R. Studts, Jamie L. Studts, Allyson Yates*

**2310 Collagen P4H1 inhibitor and its use**  
*Shike Wang, Ren Xu*

## **SEMICONDUCTORS & ELECTRONIC DEVICES**

**2334 Gravitone**  
*Kevin D. Donohu, Matthew P. Ruffner, Michael J. Sikora*

**365 Methods of Making High Performance Electrodes**  
*Yang-Tse Cheng, Jiazhi Hu, Xiaosong Huang*

## **SOFTWARE**

**2307 InformBot**  
*Nicholas Proferes, Shawn Walker*

**2308 MyoGrowth: Software for Simulating Muscle Growth**  
*Kenneth S. Campbell, John J. McCarthy, Chase Vickery*

**2316 Using Artificial Intelligence to Assess In Vitro Drug Response**  
*Mei Gao, Joseph Kim, Miranda Lin*

**2338 Work Related Communication Training Program (WoRC Training Program)**  
*Ming-Yuan Chih, Peter Andrew Meulenbroek, Yongwook Song*

**2369 www.FindHelpNowKY.org - Real-Time Addiction Treatment Locator**  
*Terry Lee Bunn, Sarah M. Eustice, Heather Jackson, Tyler Jennings, Amber Kizewski, Sarah E. McKee, Dana Quesinberry*

**2372 ChartParse**  
*Christopher Bentley*

**2383 A Machine Learning Algorithm for Predicting Clinical Outcomes and Identifying Drug Targets in Ischemic Stroke**  
*Qiang Cheng, Justin Fraser, Keith R. Pennypacker*

## **THERAPEUTIC AID**

**2331 The Cellie Coping Kit**  
*Meghan L. Marsac, Anne Vinsel*

## THERAPEUTICS

**2287 Use of the PHSCN Peptide (ATN-161) to Reduce Blood-Brain Barrier Breakdown and Confer Protection from Inflammatory Demyelinating Disease**

*Gregory J. Bix, Richard Milner*

**2288 Macrolide Neuroprotectants**

*John Gensel, Steve Van Lanen*

**2289 A New Dual-action Medication to Cause Double-Trouble for Tuberculosis**

*Sylvie Garneau-Tsodikova, Nicole Neeltje van der Wel*

**2292 Heterologous Production of Curcuminoids in Mammalian Cells**

*Daniel W. Pack, Logan Warriner*

**2295 Aminoglycosides as Therapy for Progranulin-Mediated Familial Frontotemporal Dementia**

*Haining Zhu*

**2296 Proteasome Inhibitors with Cyclic Peptide Backbones**

*Deepak Bhattarai, Kyung Bo Kim, Min Jae Lee, Zachary Miller*

**2303 Silica Nanoparticles Functionalized for Opioid-Binding as a Treatment for Overdose**

*Luke H Bradley, Barbara Knutson, John M Littleton, Stephen Rankin*

**2304 Lapatinib Can Be Used as a Non-Addictive Pain Medication**

*Chang-Guo Zhan, Fang Zheng, Shuo Zhou, Ziyuan Zhou*

**2305 Methylpropanedihydrazide (MDPH) Compounds for Menkes Syndrome**

*Robert A. Lodder*

**2306 Nanotube Delivery Device for MPDH Compounds for Menkes Disease**

*Robert A. Lodder*

**2313 Highly Selective and potent Inhibitors of CYP1B1**

*Edith C Glazer, David K Heidary*

**2318 Headache Medication**

*Abigail Dority, Jeremy Dority*

**2319 Aureloic Acid Derivatives and Methods of Use Thereof**

*Robert A. Lodder*

**2321 Antieneoplastic**

**N-Arylbenzenesulfonamides Function as Mitochondrial Uncouplers, AMPK Activators and Wnt-Signaling Inhibitors**

*Roberto Gedaly, Chunming Liu, Brett T Spear, David S Watt, Yang Yang-Hartwich, Wen Zhang*

**2336 New Therapeutic Strategies Using Ethopropazine or its Analogs for Treatment of Heroin Abuse**

*Chang-Guo Zhan, Fang Zheng*

**2337 Ras-Like GTPases Proteins and Antibodies**

*Douglas A Andres*

**2341 Pharmaceutically Active Pyrazolo-Pyridine Modulators of DCN1-Cullin Neddylation**

*Rodney Kip Guy, Jared Hammill, Hoshin Kim*

**2343 Methods and Materials for Making Antibiotic Muraymycin Cs**

*Zheng Cui, Steven Van Lanen*

**2344 ABCD2 Antibody**

*Gregory Graf*

**2349 N-Aryl Benzenesulfonamides as Protonophores for the Treatment of Cancers, Metabolic Diseases and Traumatic Brain Injury**

*Roberto Gedaly, Chunming Liu, Francesc Marti, Brett T Spear, Patrick G Sullivan, David S Watt Yang Yang-Hartwich, Wen Zhang*

**2352 Novel Combination of Crizotinib with Chloroquine for Inhibition of Diverse Lung Tumors**

*Ravshan Burikhanov, Vivek M Rangnekar*

**2353 Novel Drug Combination for Inhibition of Therapy Resistant Lung Tumors**

*Ravshan Burikhanov, Vivek M Rangnekar*

**2354 A Novel Prostate Apoptosis Response-4 (Par-4) Protein Entity with an Extended Duration of Action for Therapeutic Treatment of Cancer**

*Kyungbo Kim, Vivek M Rangnekar, Chang-Guo Zhan, Fang Zheng*

**2355 Liposomal Azithromycin for Immunosuppression Therapy**

*Ahmed K. Abdel-Latif, Ahmed Al-Darraj, David Feola, Vincent J Venditto*

**2356 Ceramide Mimics for Treatment of Alzheimer's Disease**

*Erhard Bieberich*

**2357 An Immobilized Multi-Enzymatic Halogenation System**

*Michael D. Burkart, Sylvie Garneau-Tsodikova, James J. La Clair, Shogo Mori, Oleg V Tsodikov*

**2362 A Topiramate-Phentermine Combination for Cocaine Use Disorder**

*Craig R Rush*

**2366 Manipulating Glycogen in Alzheimer's Disease, Epilepsy, Traumatic Brain Injury, and ALS as a Treatment**

*Matthew S. Gentry, Frank G. Gilliam, Lance Johnson, Peter Nelson, Ramon Sun*

**2368 Re-Purposing a Lipid-Lowering Agent Lomitapide for Cancer Therapy**

*Yunfei Li, Zhishan Wang, Chengfeng Yang*

**2371 Developing Ultra-Small Miriplatin Nanodots for Cancer Therapy**

*Yunfei Li, Zhishan Wang, Chengfeng Yang*

**2374 LOX/COX inhibitors Celecoxib and Zileuton in Epilepsy Therapy and Zileuton in Epilepsy Therapy**

*Bjoern Bauer, Anika Maria Sophie Hort, Brent Scot Sokola*

**2381 Selective Antimicrobial Zafirulkast Derivatives Against *P. Gingivalis***

*Sylvie Garneau-Tsodikova, Octavio Gonzalez*

**2387 Use of U714 in Treatment of Myelofibrosis**

*Robert A. Lodder*

## TRAINING TOOLS

**2329 Silicone Based Human-Like Artificial Skin and Muscle Layer Simulation Model**

*DeShana Collett, Samuel Powdrill*

**2359 Renal Biopsy Trainer**

*Neil Bradford Horsley, Elias Ramsey Nassar*

**2373 Nursing Mama**

*Rebecca Collins, Katharine MacMillan*



# INVENTION REPORTS BY TECHNOLOGY AREA

## FISCAL YEAR 2019

### AGRICULTURE

#### 10,106,826 Rerouting the Photorespiration Pathway in Plants for Increasing Bioproduct Yield

Joseph Chappell, Yong Kyoung Kim, Hong Ma, Donald Ort, Shuhua (Joshua) Yuan, Xinguang Zhu

#### 10,184,118 Cytochrome P450s and Uses Thereof

Joseph Chappell, Lyle Ralston

#### 10,184,119 Cytochrome P450s and Uses Thereof

Joseph Chappell, Lyle Ralston

#### 10,292,353 Alteration of Tobacco Alkaloid Content Through Modification of Specific Cytochrome P450 Genes

Steven W. Bowen, Ralph E. Dewey, Lily Gavilano, Balazs Siminsky,

### BIOMARKERS

#### 10,288,626 Secreted Tumor-Associated Cytochrome as a Blood-Based Biomarker for Cancer

Rolf Joseph Craven

### DRUG DELIVERY

#### 10,022,366 Extending and Maintaining Micropore Viability of Microneedle Treated Skin with Lipid Biosynthesis Inhibitors for Sustained Drug Delivery

Priyanka Ghosh, Audra L. Stinchcomb

### ENERGY

#### 10,103,402 Liquid Phenothiazine Catholytes for Non-Aqueous Redox Flow Batteries

Matthew D. Casselman, Aman Preet Kaur, Susan A. Odom,

#### 10,153,510 Non-aqueous Redox Flow Batteries including 3,7-perfluoroalkylated Phenothiazine Derivatives

Matthew D. Casselman, Corrine F. Elliott, Aman P. Kaur, Susan A. Odom,

### ENVIRONMENTAL

#### 10,213,734 Method of Increasing Mass Transfer Rate of Acid Gas Scrubbing Solvents

Cameron A. Lippert, Kunlei Liu, Joseph E. Remias

#### 10,252,216 Reduction of Amine Emissions from an Aqueous Amine Carbon Dioxide Capture System Using Charged Colloidal Gas Aphrons

Xiaoqing Li, Kunlei Liu, Jesse G. Thompson

#### 10,322,367 Method of Development and Use of Catalyst-Functionalized Catalytic Particles to Increase the Mass Transfer Rate of Solvents Used in Acid Gas Cleanup

Cameron A. Lippert, Kunlei Liu, Leland R. Widger

### MATERIALS

#### 10,312,081 Synthesis of Metal Oxide Surfaces and Interfaces with Crystallographic Control Using Solid-Liquid-Vapor Etching and Vapor-Liquid-Solid Growth

Beth S. Gupton, Lei Yu

#### 10,155,359 Lightweight Thermal Management Material for Enhancement of Through-Thickness Thermal Conductivity

Matthew C. Weisenberger

### MEDICAL DEVICE

#### 10,238,436 Temporary Fracture Stabilization Device

Steven J. Lawrence

### OPHTHALMOLOGY

#### 10,294,220 Compositions and Methods for Treating Retinal Degradation

Jayakrishna Ambati, Kameshwari Ambati, Benjamin Fowler

#### 10,300,057 Compositions and Methods for Treating Retinal Degradation

Jayakrishna Ambati, Benjamin Fowler

### SEMICONDUCTORS & ELECTRONIC DEVICES

#### 10,134,995 Water Processable N-type Organic Semiconductor

Camila F. Gomez, Ruben S. Riquelme, Matthew C. Weisenberger

### THERAPEUTICS

#### 10,071,982 Method of Treating Neuropathic Pain

Peter A. Crooks, Linda P. Dwoskin, Joseph R. Holtman, J. Michael McIntosh, Elzbieta Pogonowska Wala

#### 10,160,960 Mutants of Cocaine Esterase

Donald Landry, Chang-Guo Zhan

#### 10,173,968 Bishydrazone-Based Antifungal Agents

Sylvie Garneau-Tsodikova, David S. Watt

#### 10,188,743 Cytisine-Linked Isoflavonoid Antineoplastic Agents for the Treatment of Cancer

Svitlana P. Bondarenko, Mykhaylo S. Frasinuk, Chunming Liu, Vitaliy M. Sviripa, David S. Watt, Wen Zhang

#### 10,208,000 EIS Inhibitors

Gylvie Garneau-Tsodikova, James E. Posey, Oleg V. Tsodikov

#### 10,251,890 Use of Parthenolide Derivatives as Antileukemic and Cytotoxic Agents

Peter A. Crooks, Craig T. Jordan, Xiaochen Wei

#### 10,253,035 EIS Inhibitors

Sylvie Garneau-Tsodikova, Oleg V. Tsodikov

#### 10,301,320 Compositions and Methods of Modulating 15-PGDH Activity

Monika Antczak, KiBeom Bae, Amar Desai, Stanton Gerson, Sanford Markowitz, Bruce Posner, Joseph Ready, James K. V. Willson, Hsin-Hsiung Tai, Sung Yeun Yang, Youngyou Zhang

### WATER TREATMENT

#### 10,245,558 Green Synthesis Nanocomposite Membranes

Dibakar Bhattacharyya, Subhas K. Sikdar, Vasile Smuleac, Rajender S. Varma

# REGIONAL PARTNERSHIPS



## **EXECUTIVES-ON-ROSTER (XOR) PROGRAM**

The University of Kentucky (UK) through the leadership of OTC launched the Southeast and the Midwest Executives-on-Roster (XOR) platforms and programs. The Southeast XOR partners 14 Southeastern Conference (SEC) universities and the Midwest XOR partners 13 Midwest universities to broaden access to experienced entrepreneurial talent and to match that talent to university-affiliated startups in need of executive management.

The program had its first successful match in May 2019 between Lexington-community startup Smart Rotation and entrepreneur Michelle Klumb.



## **REGIONAL BIOMEDICAL TECHNOLOGY ACCELERATOR HUB**

UK, lead academic institution, regional partners and XRateHealth partnered together through a grant awarded by the National Institute of General Medical Sciences (NIGMS) to develop a regional biomedical technology accelerator hub. The hub will be one of four NIGMS-funded hubs to help IDeA states accelerate early-stage biomedical technology from laboratory to market. The goal is to enhance the capacity to move scientific results from academic institutions into commercialization, and to promote sustainable culture of biomedical entrepreneurship within IDeA states.



## **OVALS**

UK OTC partners with universities as a consortium. OVALS (formerly known as Ohio Valley Affiliates for Life Sciences) brings several regional universities in the Ohio Valley/Midwest together to share best practices for the advancement of university life sciences technologies, and to focus on best practices for technology transfer. We hosted the OVALS Conference in June 2019, which brought university alumni, philanthropy and tech transfer offices together from several universities to discuss how best to work with one another. Ian McClure, executive director, was chair in FY 2019.





# COMMUNITY PARTNERSHIPS



## COMMONWEALTH COMMERCIALIZATION CENTER (C3)

OTC began work with the Cabinet for Economic Development's (CED) KY Innovation office and the University of Louisville to lead the development of a Commonwealth Commercialization Center (C3). C3 is a new approach to resourcing all commercialization and intellectual property needs across the Commonwealth's public universities and colleges. The Center was launched in November 2018 with a team being hired in early 2019 and services beginning to be offered to the state's public universities and colleges in the summer of 2019. Within 6 months, the team identified and was working to protect and advance more than 15 inventions from these institutions. Further, the statewide university partnership was instrumental in winning the NIH REACH grant award (KYNETIC).



## REGIONAL INNOVATIONS FOR STARTUPS AND ENTREPRENEURS (RISE)

OTC received the opportunity to manage UK's role under the Regional Innovation for Startups and Entrepreneurs (RISE) initiative from the Kentucky Cabinet for Economic Development (CED). Under this role, the New Ventures team was created and has provided a direct line to working more strategically with the Lexington community, and providing services to both UK and Lexington startups. Under RISE, we work with community partners through StartupLEX, SPARK and the Bluegrass Angels.



# ENGAGEMENT

## FACULTY EDUCATION PROGRAM

Over fiscal year 2019, OTC expanded its reach to educate faculty on the services and the programs we offer, and what faculty needs to know about agreements and disclosing an invention. In fiscal year 2019, we participated in New Faculty Orientation and in the Center for Clinical and Translation Science (CCTS) conference, and conducted faculty education sessions for Chemistry, Engineering, Pharmacy and Radiology among others.

To schedule a faculty education session, send an email to [otcinfo@uky.edu](mailto:otcinfo@uky.edu).



## NEW PROGRAM: OTC AMBASSADORS

OTC created a new program for undergraduate students called OTC Ambassadors. This program gives students the opportunity to work in the New Ventures team where they help plan, operate, and execute programs and initiatives.



## NEW EVENT: UK WOMEN INNOVATORS NETWORK (UKWIN) CONFERENCE

- The UK Women Innovators Network (UKWIN) held its first annual conference in October 2018. The UKWIN program has a mission to increase the number of UK women who participate in innovation and to provide resources to both UK and Lexington women innovators.



## NEW EVENT: UK STARTUP NETWORK RECEPTION

- OTC held an event in November 2018 to celebrate the UK Startup Network and provide an opportunity for idea sharing and networking between UK and other Lexington startups. The UK Startup Legacy Book 1998-2018 was introduced at this event. The Legacy Book has a listing of all UK Startup companies formed during 1998-2018.



## NEW EVENT: UK ENTREPRENEUR SHOWCASE

- In March 2019, OTC partnered with the UK Alumni Association and UK Philanthropy to host the first annual UK Entrepreneur Showcase. The Showcase provides an opportunity for UK innovators, alumni entrepreneurs and student researchers to discuss their experiences and make connections. During this event, OTC presented Dr. Lee T. Todd Jr. with the first annual Lee T. Todd Lifetime Achievement Award for Entrepreneurship.



**MONTHLY EMAIL NEWSLETTER**

The OTC newsletter, Commercialization Connect, helps connect readers to OTC programs, partnerships, services, events and other news.

Commercialization Connect has grown to reach almost 5,000 UK faculty, staff, leadership, alumni, stakeholders, and other interested parties in the community, state and region.



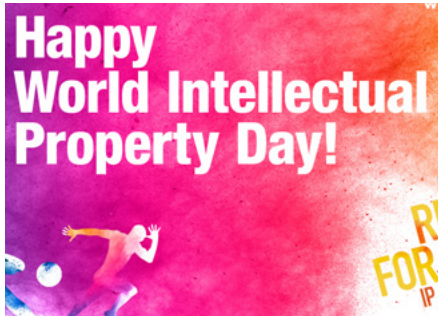
**WEEKLY EMAIL NEWSLETTER**

As a key stakeholder in the Lexington startup community, UK OTC is an organizing partner of StartupLex, a brand that connects, supports, and promotes the startup ecosystem. The UK OTC team, on behalf of StartupLex, publishes StartupLex News & Events - a weekly email newsletter that draws attention to engagement opportunities in Lexington and beyond that are of interest to Kentucky startups and entrepreneurs, including those commercializing UK-owned technologies.



**PATENT PALOOZA!**

- The third annual Patent Palooza! was held March 2019. Recognition was given to innovators who received patents, license deals, researchers and startup companies who received SBIR/ STTR grants, UKAccel graduates, and innovators being recognized by the National Academy of Inventors (NAI). It was a fun and well-attended event celebrating the accomplishments of our faculty innovators.



**WORLD INTELLECTUAL PROPERTY DAY**

- OTC celebrated its second World Intellectual Property (IP) Day on April 26, 2019. The event theme was Reach for Gold: IP and Sports. OTC provided refreshments while sharing relevant information on University of Kentucky's intellectual property data, and the variety of intellectual property that plays a part in sports.



**UPCOMING EVENTS:**

- UK ENTREPRENEUR SHOWCASE  
July 23, 2020  
2:00 p.m. – 4:00 p.m.
- PATENT PALOOZA!  
October 7, 2020  
4:00 p.m. - 6:00 p.m.
- WORLD INTELLECTUAL (IP) DAY  
April 26, 2020
- UK WOMEN INNOVATORS NETWORK (UKWIN) CONFERENCE  
March 24, 2021





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[twitter.com/uk\\_otc](https://twitter.com/uk_otc)



[youtube.com/channel/UCahBn3PBPunJ\\_tmmmv1KeeA](https://www.youtube.com/channel/UCahBn3PBPunJ_tmmmv1KeeA)