

DRIVING INNOVATION FORWARD

*Driving innovations to market.
Promoting collaborations with industry.
Generating revenue that supports future
research activities.*



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MESSAGE FROM THE DIRECTOR

Industry Engagement

One need look no further than the laboratory of this issue's featured innovator, Dr. James Crowe, to demonstrate the benefits to academic laboratories developing strong research and licensing relationships with industry partners. With the support of CTTC and other administrative units on campus, the Vanderbilt Vaccine Center has developed a number of partnerships with companies that provide support for its mission to advance therapies for public benefit. Vanderbilt recognizes the opportunities that exist for deeper engagement with industry, and a strategic goal for CTTC in FY18 is to make greater contributions to developing large scale industry collaborations.

CTTC engages with hundreds of companies every year as part of our efforts to commercialize new technologies generated in our academic laboratories and clinics. For the past half-decade CTTC has sought to better leverage these industry interactions to develop partnerships between our industry partners and our research labs at Vanderbilt. These opportunities have historically taken one of two forms: a company is interested in both licensing a Vanderbilt technology and supporting the inventing laboratory's ongoing research to advance the technology; or a company finds a technology interesting but too early stage and unproven, but is willing to sponsor research in the inventing laboratory to advance the technology to a more proven state.

Connecting industry partners to Vanderbilt research capabilities has become an important means of CTTC contributing to the Vanderbilt

research engine over the past several years, and has generated millions of dollars of support for advancing research projects.

And though the benefits of these "project-level" collaborations have been tangible, we realize that such interactions are episodic in nature and difficult to predict and sustain. This led to exploring new models of industry interaction that can be made more sustainable and lead to multi-faceted collaborations.

These models align well with the vision of Vanderbilt's Office of the VP for Research to engage with industry in deeper, more sustainable ways. CTTC is working under the leadership of the VPR to develop "program-level" industry collaborations - collaborations with industry that involve multiple projects that span across a plurality of Vanderbilt research laboratories in different departments and schools. These program-level collaborations are structured as multi-year collaborations that can provide millions of additional dollars to support Vanderbilt research efforts. As these efforts mature and bear fruit, we look forward to reporting on the impact of these efforts in future editions of Driving Innovations Forward.



Industry Visits

CTTC brings industry to campus to develop collaborative partnerships for the translation of inventions.

Developing industry partners plays a critical role in the translation and commercialization of basic research into products, even more so since the passage of the Bayh –Dole Act. For industry, academia provides an environment to explore riskier, innovative approaches and build scientific knowledge to address complex, unmet medical needs and disruptive technological areas. CTTC looks to play an ever-increasing role in connecting industry scientists with our researchers to develop key scientific relationships that lead to collaboration projects.

As an example of recently developed collaborations, CTTC engaged GlaxoSmithKline to partner on a Vanderbilt-specific RFP program with an opportunity for faculty to receive funding to support advancement of early stage therapeutic programs. The RFP is part of GSK’s program for engaging academia known as DPAC (Discovery Partnerships with Academia), which has helped make GSK one of the world leading “go-to” pharmaceutical partners for universities to explore biopharmaceutical collaborations.

CTTC is also leading an engagement with Johnson & Johnson to strengthen existing academic relationships and build new ones with the Vanderbilt research community. Johnson & Johnson is positioned to both license and support research advancement in a variety of program fields, focusing on therapeutics and diagnostics related to diseases states of strategic interest to the company. To this end, J&J visited with individual researchers to learn about their research activities and explore partnership opportunities in the areas of type II diabetes, NASH, CKD, obesity, and pulmonary hypertension.

FY17 NUMBERS

Revenues from Licensing.....\$9.6M

Invention Disclosures Received....179

U.S. Patent Applications Filed.....239

U.S. Patents Issued.....51

Licenses & Options Executed.....87

New Startup Companies Formed.....8

FEATURED INVENTOR: JAMES CROWE, MD DIRECTOR, VANDERBILT VACCINE CENTER



“We were already working on Zika before the outbreak”

Dengue, Chikungunya, Zika, these are all well-known diseases now, but James Crowe, MD, Director of the Vanderbilt Vaccine Center, and his team were working on cures for these diseases before most of the world even knew we needed them.

“We were already working on Zika before the outbreak, among other viruses,” said Crowe.

How is he able to seemingly predict which mosquito-borne diseases will become the next major outbreak? To already have a plan in place before these viruses become a hot topic? It starts with the capabilities of the Vanderbilt Vaccine Center and his own commitment to public health.

The Vanderbilt Vaccine Center impacts global health through fundamental research that fosters development and testing of new vaccines for infectious diseases. A team of scientists and physicians focuses

on work with major human pathogens, especially microbial threats that affect the most vulnerable subjects such as infants and the elderly. Many of the targets studied are particularly important in developing world settings. Research is also conducted related to biodefense and emerging infectious diseases.

As the Director for the Vanderbilt Vaccine Center, James Crowe manages a portfolio of research programs for established and emerging viral diseases affecting human health, many of which affect developing countries.

“I have a long-term personal commitment about impacting health in Sub-Saharan Africa and the developing world,” Crowe explained.

Over his career, James Crowe has developed techniques to identify and produce panels of human monoclonal antibodies from individuals who have survived an infection. These antibodies have advanced the field of viral immunology and function as tools for vaccine development. They

“It’s part of my mission to affect public health.”

also function as natural templates from which to design therapeutic antibodies with desirable properties.

Crowe talked about the advice he was given when he first came to Vanderbilt, “I got a lot of advice when I came here from senior mentors not to pursue the dreams I had of studying the human immune response because it was just too hard. I was just stubborn and decided I was going to do it anyway. Over time we developed techniques for doing human work, we built a large infrastructure, we built a large lab and we did all the things we needed over a fifteen-year period to get to the place we needed to be. And now we’re there. We have a pipeline in which we can make antibodies to anything.”

And with that Vanderbilt Vaccine Pipeline, featuring panels of antibodies to nineteen different diseases for vaccine research, Crowe and his team collaborate with industry to help find cures for devastating diseases.

“The US Government and academic institutions do not manufacture and sell and provide vaccines. So if you want to help people, if you want to change public health, companies are going to be involved. That is just a fact. If there are serious commercial entities who want to do things in the public health sphere, I want to help them get there. It’s part of my mission to affect public health.”

In the last year, nine licenses for antibodies discovered by Crowe and his team at the Vaccine Center were executed. Because of his focus on diseases before they become household names, companies have been able to use those antibodies to get a head start working on products to prevent or cure diseases. Also, since the antibodies are from

humans, which have been naturally exposed to the infectious agent, they are expected to more closely approximate the actual human response to disease than mouse antibodies might.

Crowe says he’s already working on what he and his team think could be the next big outbreak.

“Mosquito-borne viruses are going to happen again. It happened with Chikungunya, Dengue now Zika. So currently, we’re thinking, ‘What is the next mosquito-borne virus that has a good chance of causing a large problem.’ We’re betting on the Mayaro virus that is similar to Chikungunya.”

But it’s not just viruses Crowe and his team are working on. The project that has him most excited now is the Human Immunome Project.

“We have started incorporating next generation sequencing into our workflow, so not only can we take blood and make individual antibodies that become drug leads, we can sequence every antibody in a sample. I started thinking, ‘Wow, not only can we sequence individual samples, what if we could sequence every antibody in someone’s body and know their whole immune system? What if we could know every sequence on the planet?’ That became the dream.”

The Human Vaccines Project liked the idea so much, they made the Vanderbilt Vaccine Center the coordinating center for the international organization. Now the VVC is sequencing every antibody and every T cell receptor on the planet with millions of dollars of support currently. It is projected to be a two hundred million dollar project.

“We’re calling this the Human Immunome Project. I’m reminding people when the Genome Project was done, people said, ‘Why would you sequence all the genomes? What would you do with that?’ And now all of biomedical research is on the foundation of the genomes. The immunome is going to be the same thing. The Human Immunome Project is the most compelling thing we’re doing right now.”

STUDENT SUCCESS

Sinead Miller

Path Ex, Inc.

CTTC provides ongoing mentorship and advice to Vanderbilt students interested in innovation and entrepreneurship. One student-entrepreneur, Sinead Miller, PhD, a former student in Biomedical Engineering and now Research Assistant Professor in that department, launched a new startup company in 2017, and is getting substantial traction with regional entrepreneurial and investment communities.

Miller's company, Path Ex, Inc, is designing a novel system for removal of toxic materials from the blood of infected patients, thereby preventing the onset of sepsis. Sepsis is a major clinical problem, affecting over 1 million Americans per year and accounting for at least 250,000 deaths annually. Patients with sepsis are administered a variety of antibiotics without knowledge of which may treat the bacteria causing the underlying infection. This suboptimal treatment is pursued because the tests currently used to identify the specific bacteria take time to complete. The Path Ex product filters such bacteria out of the blood system, halting the onset or progression of sepsis.

Miller has participated in Vanderbilt entrepreneurship educational programs and regional competitions to assist startups, including IM-PACT, Tech Venture Challenge, 36/86 and Zero to 510k (Memphis). Most recently Dr. Miller won the Louisiana Startup Prize business plan competition.



Sinead Miller, who recently earned her Ph.D. in biomedical engineering, discusses her company with mentor Robert Webster, associate professor of mechanical and electrical engineering. (John Russell/Vanderbilt)

AUTM Transactional Academic Comparables Tracking (TransACT) Database



For more than 7 years, the Association of University Technology Managers (AUTM) has been developing a licensing transaction comparables database known as TransACT. This first of its kind database includes de-identified licensing transactions between universities and industry in a wide range of fields. Unlike other databases that provide aggregated values of single deal terms, like royalty rates, TransACT provides full detail of individual deals, allowing the user to see the variability and trade-off between all financial terms in such licensing transactions. The idea for TransACT was first promoted by Alan Bentley, Assistant Vice Chancellor and head of CTTC, and then developed by Chris Harris, Director of Licensing at CTTC, among others throughout the country.

Today, the TransACT database has over a thousand university to industry licensing transactions, entered by almost 150 different institutions from around the world. Academic institutions supply deal terms to the database annually, in return for yearly free access to TransACT for their institution. Non-participating academic institutions as well as industry representatives and the general public are able to purchase access to TransACT for a yearly fee (price dependent upon the volume of deals then current in TransACT).

STARTUP SUCCESS

Startup companies based on Vanderbilt technology have done well. Below are two companies who recently completed their second round of capital raising:

IQuity, Inc.

IQuity is a life science technology company that was launched in 2015. The company licensed technology developed at Vanderbilt by Dr. Thomas Aune, Founder and Scientific Advisor, and Dr. Chase Spurlock, CEO. It is creating products that leverage machine learning methods to deliver breakthrough RNA diagnostics and analytics. One of its first products, Isolate, utilizes the company's proprietary algorithms to test for autoimmune diseases with over 90% accuracy and allows providers to shorten the diagnostic process for autoimmune disease and related conditions. The company raised \$2,000,000 in 2015 and an additional \$2,400,000 in 2017 to support the creation and staffing of a clinical lab in downtown Nashville. The company will also receive funding of up to \$1,300,000 from federal SBIR and NIH grants and have a applied for \$150,000 more in state matching funds based on the SBIR grant.

nPhase, Inc.

nPhase, Inc., a next generation cloud technology company that is commercializing the "Research Electronic Data Capture" (REDCap) software developed by Dr. Paul Harris and others in the Department of Biomedical Informatics at Vanderbilt University Medical Center, closed on its second round of investment in June of this year. The company's product, REDCap Cloud, is experiencing broad adoption around the globe by major academic research centers and life science companies who require a robust electronic data capture application that is 21 CFR Part 11 validated to support regulated clinical research. The funds raised will be used to scale sales, marketing and client implementation teams and to continue development of the REDCap Cloud suite of e-clinical software as a service applications.

Innovation and Investment Partnering Forum:

Next Generation Surgical Devices and Systems

Vanderbilt University has built a critical mass of nationally recognized researchers working at the crossroads of surgery and engineering. This group of researchers created the Vanderbilt Institute for Surgery and Engineering (VISE), leveraging their collective intellectual talent and technical innovation with the proximity of the Vanderbilt Engineering and Medical schools. They have created what is regarded as among the very best environments in the country for performing the research that is transforming surgery in the 21st century.

Recognizing Vanderbilt's unique expertise in developing novel surgical devices and systems, Vanderbilt's Center for Technology Transfer and Commercialization (CTTC) collaborated with VISE to hold an event for investors, entrepreneurs, and industry representatives that highlighted VISE-related technologies and is coincident with the annual VISE symposium this past December.

The Forum consisted of a one-hour panel discussion focusing on successful techniques used to evaluate, conduct due diligence and invest in next generation surgical devices and systems. The panel featured prominent national investors who are experts in this field. The panel discussion was followed by an interactive small-group breakout exercise led by the expert panelists whereby attendees had the opportunity to evaluate several advanced surgical devices and systems for investment potential. Following the panel and breakout sessions, there were a series of live technology demos and a poster session featuring some of VISE's newest and most promising advanced surgical technologies.

The Innovation and Investment Partnering Forum was held on Wednesday, December 13th, and immediately followed by the annual VISE Symposium. The VISE Symposium is in its 6th year and featured a prominent external speaker (Eben Rosenthal, MD - Stanford Cancer Center Medical Director), a scientific poster session, and a cocktail reception.

