INVO

Northwestern | INVO
INNOVATION AND NEW VENTURES

INVENTIVE ACTIVITY
FY **2018**

Cover: ***Polymer Nanofiber Composite***
(Mark McClendon & Jacob Lewis,
Prof. Samuel Stupp Laboratory)

An electron microscopic view of a complex material formed by molecules programmed to "self-assemble" the way in which molecules behave in living organisms. This material has been engineered to regenerate cartilage in human joints.

DEAR MEMBERS OF THE NORTHWESTERN COMMUNITY,

At INVO, we hold one clear, unrelenting mission: to bring game-changing innovations into the public marketplace. When we remain consistently focused on that singular objective, when we make decisions with that mission top of mind and collectively pull in the same direction, we know good things happen. Innovations advance in the translational pipeline. New strategic partnerships blossom. Lives change for the better.

This past year, in fact, we celebrated two significant milestones when Exicure—a Northwestern startup leveraging Spherical Nucleic Acid (SNA) constructs to combat cancer and other threatening conditions—and Aptinyx, a biopharmaceutical company discovering and developing innovative therapies for challenging disorders of the brain and nervous system, went public. Both Exicure and Aptinyx demonstrate the power of blending groundbreaking research and a spirited entrepreneurial mindset with intentional support designed to propel development.

Exicure and Aptinyx represent our latest success stories, but we continue strengthening our entrepreneurial ecosystem so even more Northwestern-based innovations can enter the marketplace.

Throughout FY18, we doubled down on expanding our network through partnerships that expose our entrepreneurs to new ideas, people, and resources, confident that a deeper, more diverse network of partners fuels the entrepreneurial journey. To that end:

We entered a partnership with Deerfield Management to launch Lakeside Discovery, a joint venture that provides access to the capital and strategic expertise necessary to drive therapeutic translation.

We expanded our network locally and nationally. In San Francisco, we assembled Northwestern entrepreneurs, startups, and alumni together, while we also led a group of Northwestern faculty to Boston to meet with prospective investors.

We joined 19 top universities as a core partner of Osage University Partners (OUP), a venture capital fund investing exclusively in startups commercializing university research. OUP, which provides capital in addition to mentorship, access to data, and resources, has thus far invested in two Northwestern startups, Aptinyx and an advanced materials company, NuMat Technologies.

We are strengthening and enhancing our network, providing our entrepreneurs access to a valuable array of people, ideas, and resources capable of pushing innovations closer to market. As a result, we can focus on what we do best—innovation—and leverage the scale-up capacity of our partners to ensure that the most promising, most compelling ideas realize their potential.

As we move into FY19, that singular mission—to bring game-changing innovations into the public marketplace—unites us and motivates us. We will continue to build our networks and strengthen the fabric of the Northwestern ecosystem with a resolute and determined focus.

After all, we know the good that can result from such efforts.

Alicia Löffler
Executive Director, INVO
Associate Provost, Innovation and New Ventures
Associate Vice President for Research

WE ARE STRENGTHENING AND ENHANCING OUR NETWORK, PROVIDING OUR ENTREPRENEURS ACCESS TO A VALUABLE ARRAY OF PEOPLE, IDEAS, AND RESOURCES.

210
INVENTIONS DISCLOSED

460
PATENT APPLICATIONS

171
AGREEMENTS EXECUTED

7.7
MILLION IN LICENSING REVENUES, DOLLARS

170
PATENTS ISSUED

9
STARTUPS

NORTHWESTERN
INVENTIVE ACTIVITY

Figure 1 illustrates invention disclosure activity since 2002. In FY18, INVO processed 210 invention disclosures.

Inventorship spans both campuses. Figure 2 represents the distribution of inventive activity by school. The McCormick School of Engineering (McC) and the Feinberg School of Medicine (FSM) have the largest shares, followed by the Weinberg College of Arts and Sciences (WCAS).

Figure 3 shows the distribution of inventions by category. Healthcare Devices, Tools and IT had the largest share of the inventive output. It is important to note that many inventions in the areas of chemistry, computer science, and materials are considered platform technologies with undefined markets. For example, a new software invention might find applications in the future in a variety of markets such as energy, consumer, and biomedical.

FIG. 1
INVENTION DISCLOSURES, 2002–2018

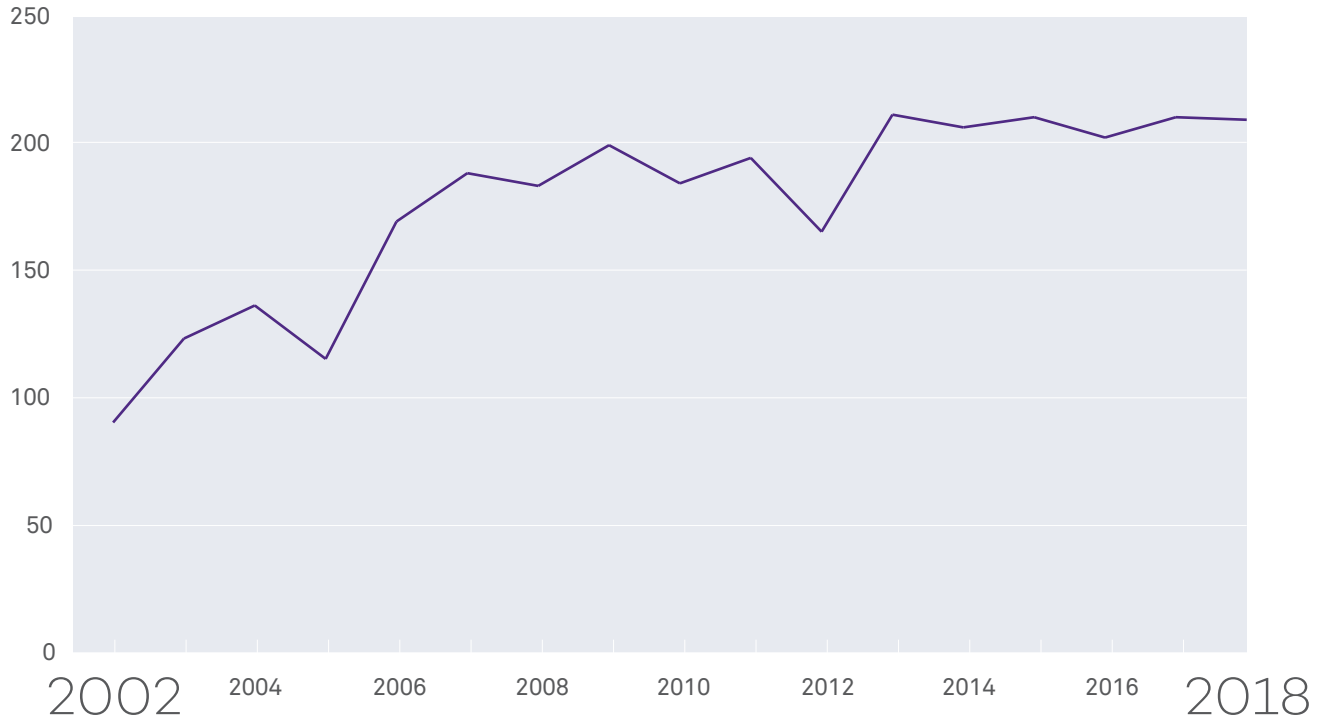


FIG. 2
INVENTIONS BY SCHOOL

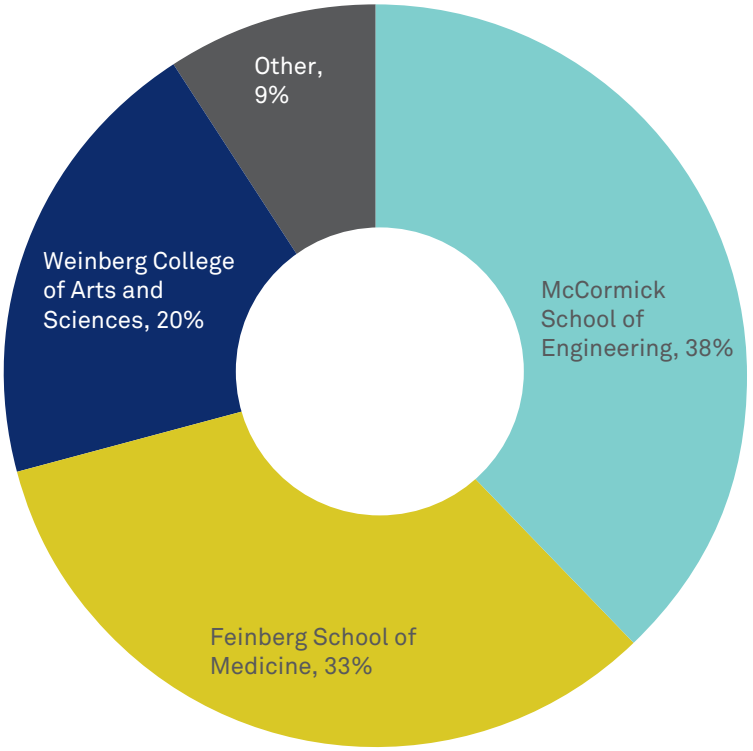
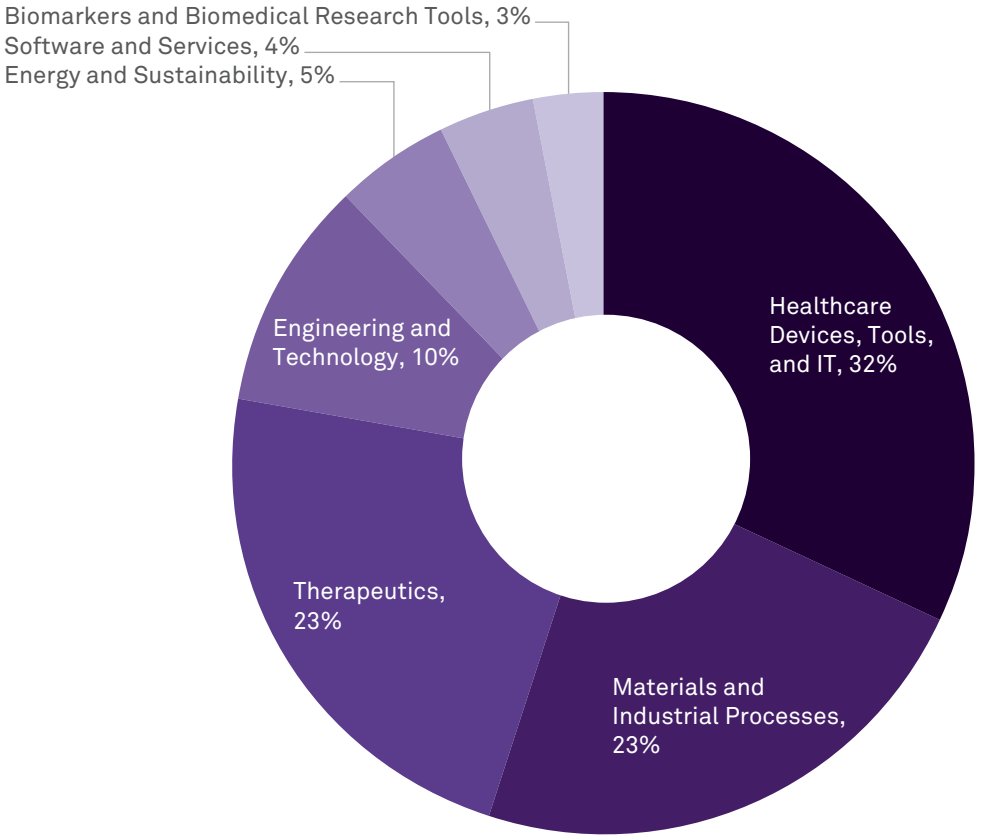


FIG. 3
INVENTIONS BY CATEGORY




RESEARCH
White Knight
FR

IN THE NORTHWESTERN-BASED LAB OF MILAN MRKSICH (McCormick, Weinberg, Feinberg), researchers developed technology for high-throughput biochemical experiments, effectively enabling scientists to conduct 10,000 tests in the same time it once took to run a handful.

In another corner of the Northwestern ecosystem, meanwhile, Mike Jewett (McCormick) continued his work with proteins, which can address important questions in developing the next generation of therapeutics.

And by marrying their respective endeavors, Mrksich and Jewett are now closing in on life-saving discoveries.

Spurred by a grant from the U.S. Defense Threat Reduction Agency, the researchers glued their two labs together and set out to make more effective protein treatments. Using sophisticated instrumentation and robotics, the two labs are now testing thousands of conditions, identifying more efficient solutions, and defining the future of synthetic biology.

"Together with an ambitious group of students, we're creating science that's far greater than the sum of two individual parts," Mrksich says.

At Northwestern, where a culture of collaborative research thrives, University leaders and scholars jointly recognize that the complex, interdisciplinary nature of today's problems requires an interdisciplinary approach to problem solving. Leveraging resources, support, and networks across the University's landscape, Northwestern's enterprising minds are nurturing their innovative possibilities into reality.

Consider John Rogers (McCormick, Feinberg) and Rhaeos, a startup developing wearable biosensors capable of diagnosing ventricular shunt malfunction. Rhaeos' core technology for blood flow mapping initially emerged from Rogers' lab. Alongside a group of Feinberg neurosurgeons, Rogers' team developed prototypes to address shunt failure and tested designs on the bench and, later, with patients.

With promising results in hand, Rogers and Mike Marasco of Northwestern's Farley Center for Entrepreneurship and Innovation worked with students in a newly launched NUvention Wearables course to explore the technology's commercial potential. Subsequently entering VentureCat, Northwestern's student startup competition, Rhaeos captured top honors in the health and life sciences division. That win has sparked new collaborative opportunities and provided funding that has helped the Rhaeos team finalize device designs, select an outsourced manufacturing flow, and pursue additional patient testing.

"Throughout this journey, we've leveraged connections to McCormick, Feinberg, Kellogg, INVO, and The Garage, and that interdisciplinary network has been critical to our progress," confirms Siddharth Krishnan, a PhD candidate in Rogers' lab who worked closely on the project.

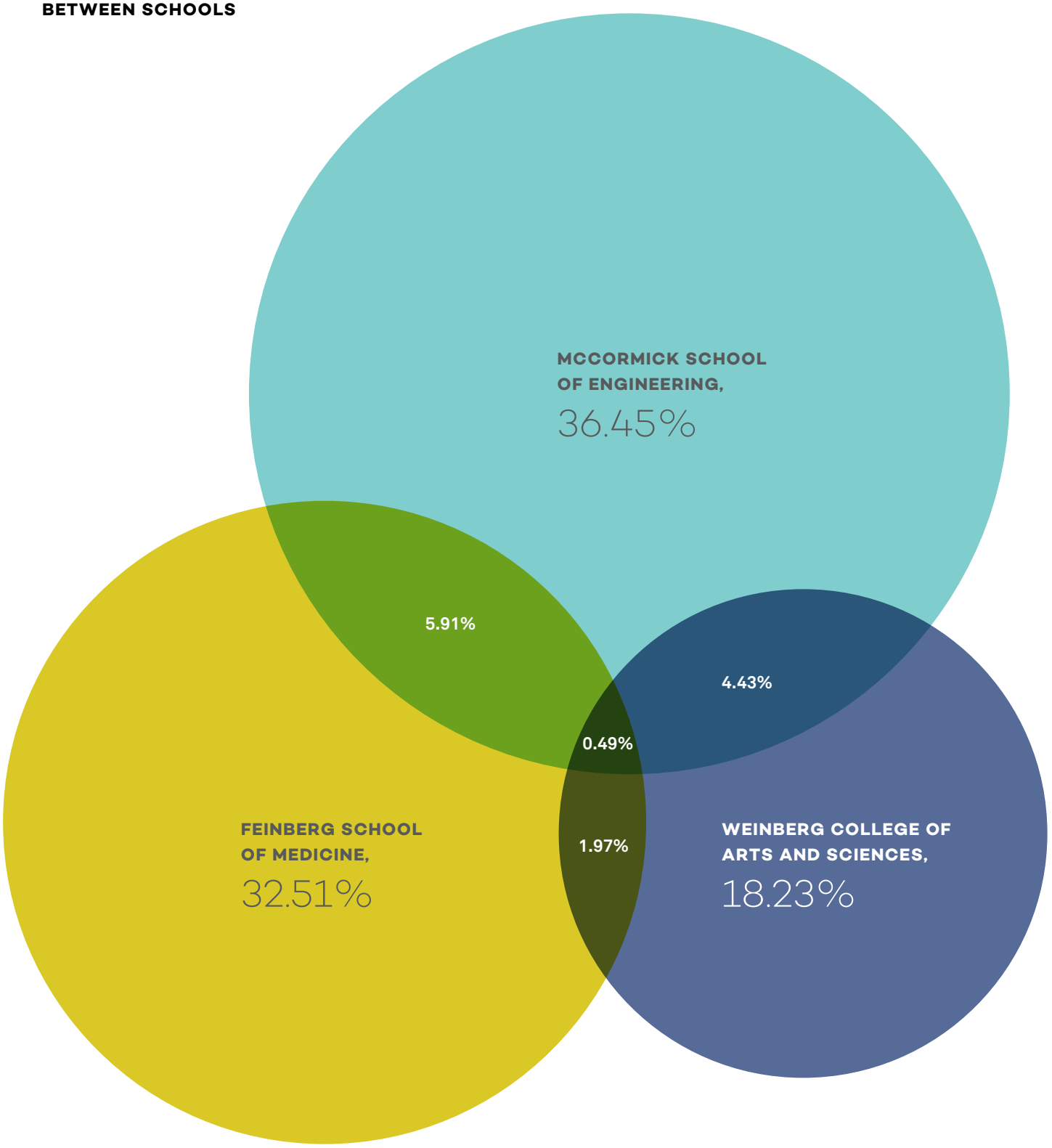
"One special aspect of working at Northwestern is that you can find partners from different fields whose work can transform your own research. Scientific discovery is a challenging process, but when you collaborate with motivated colleagues and work at the intersection of different fields, exciting things happen."—Milan Mrksich, Henry Wade Rogers Professor of Biomedical Engineering, Professor of Chemistry, and Professor of Cell and Molecular Biology

McCormick Prof. John Rogers and INVO Invention Associate Anne-Isabelle Henry discuss critical electronic components for the Rhaeos platform.

OUR SINGULAR MISSION—TO BRING GAME-CHANGING INNOVATION TO THE PUBLIC—UNITES AND MOTIVATES US.

FIG. 4

COLLABORATION BETWEEN SCHOOLS



WE THRIVE AT THE **CROSSROADS OF ACADEMIC RIGOR AND ENTREPRENEURSHIP**

Figures 5, 6, and 7 illustrate invention activity within each school.

FIG. 5
McCORMICK SCHOOL OF ENGINEERING INVENTIONS BY DEPARTMENT

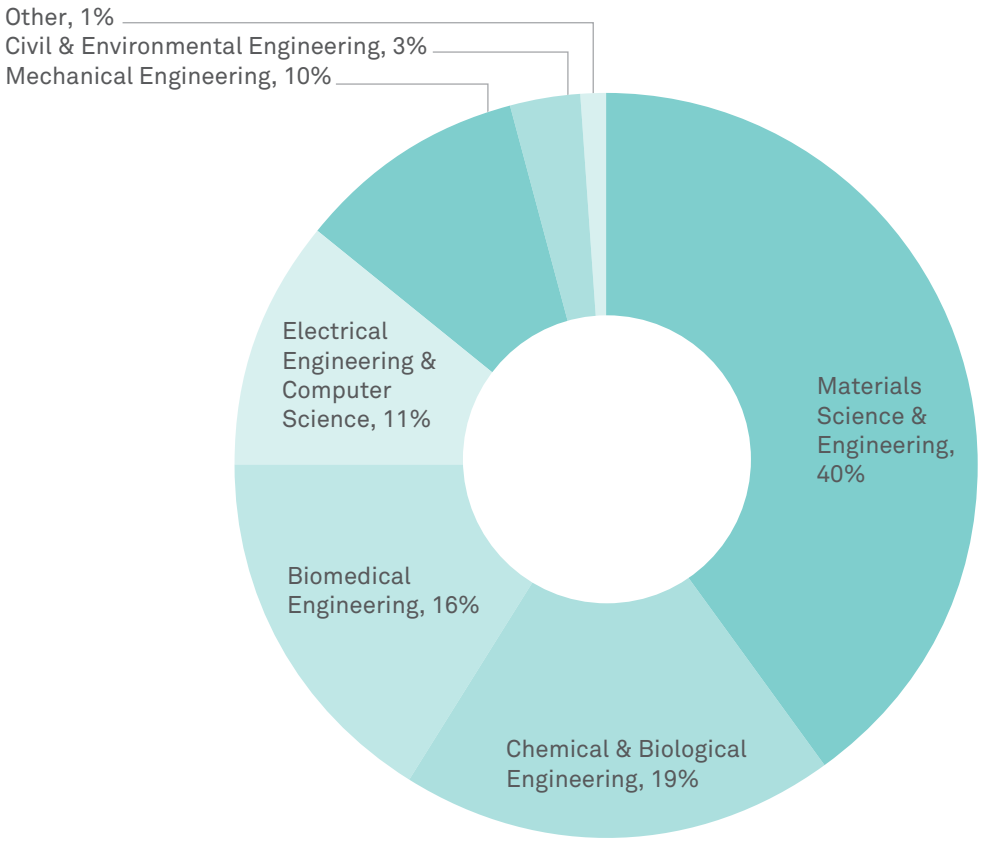


FIG. 6

FEINBERG SCHOOL OF MEDICINE INVENTIONS BY DEPARTMENT

Dermatology, 5%
Physical Med & Rehab, 5%
Preventive Medicine, 5%
Radiology, 4%
Cell & Molecular Biology, 3%
Pharmacology, 3%
Physiology, 3%
Psych & Behavioral Science, 3%
Biochemistry & Molecular Genetics, 2%
Ophthalmology, 2%
Other, 2%
Otolaryngology, 2%
Pathology, 2%
Transplant Surgery, 2%

Emergency Medicine, 1%
Management Information Sys, 1%
Medical Social Sciences, 1%
Obstetrics and Gynecology, 1%
Otolaryngology/Dental Surgery, 1%
Nephrology, 1%
Physical Therapy & Human Movement Sciences, 1%

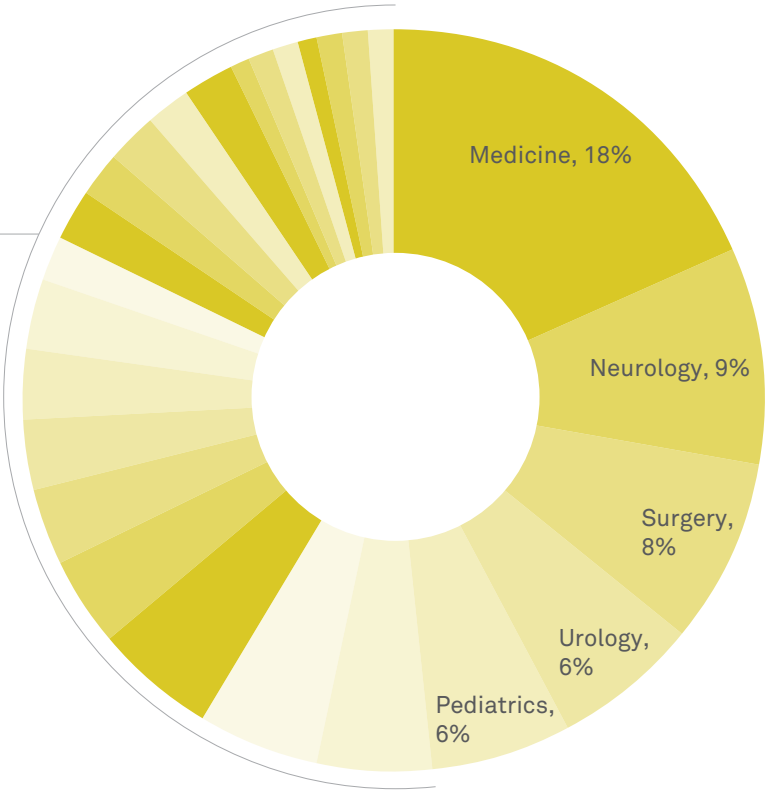
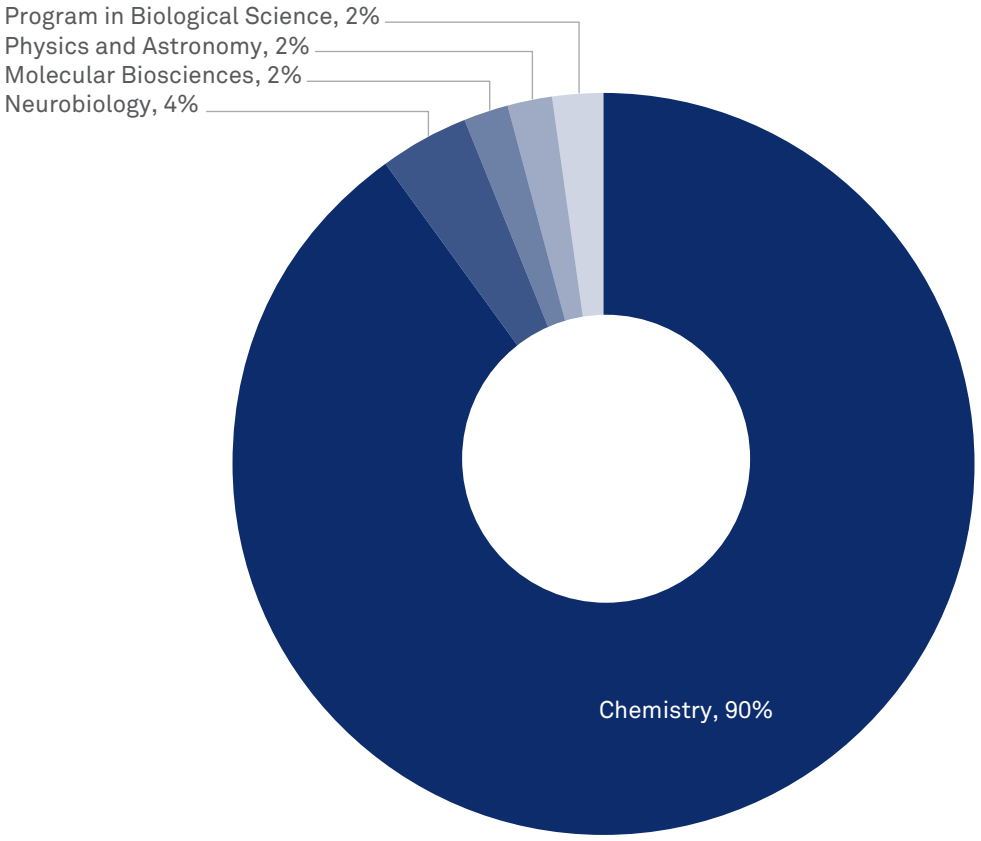


FIG. 7

WEINBERG COLLEGE OF ARTS AND SCIENCES INVENTIONS BY DEPARTMENT




LIAM

AS ALUMNA SARAH AHMAD '18 (MCCORMICK, WEINBERG) worked to bring her mobile app startup to life, she admits she felt overwhelmed and uncomfortable at times.

But entrepreneurial endeavors aren't meant to be easy, the 2018 Northwestern alum reminded herself.

Having initially crafted plans for HotPlate—an app that helps diners discover the best dish at restaurants—during an entrepreneurship class early in her junior year, Ahmad spent much of her final two undergraduate years at The Garage, Northwestern's student startup hub, transforming HotPlate from concept to reality. That journey required fearlessness and resolve, perseverance and pragmatism.

Ahmad learned how to motivate a team, talk tech, and translate user feedback into a more dynamic solution, overcoming moments of doubt, technical hurdles, and anxiety along the way. She became comfortable amid discomfort.

"Every minute creating HotPlate was worthwhile and valuable," says Ahmad, who launched the mobile app in October 2017.

That's all part of the plan at The Garage, where the mission is to build billion-dollar people armed with the resiliency, emotional intelligence, and creativity to be successful in any professional path.

"We're a people incubator," confirms Melissa Kaufman, The Garage's executive director.

Emboldened by a 24/7 co-working space filled with like-minded students from diverse, global backgrounds and various academic disciplines as well as more than 200 professional mentors sharing their battle-tested entrepreneurial insights, students at The Garage weather the ebbs and flows of the startup existence and emerge better, more well-rounded individuals for enduring such trials.

Though Ahmad has since left HotPlate for a full-time position at Oakland-based LifeLink, she acknowledges the allure of entrepreneurship lingers and that any such future adventure will be powered by an undergraduate experience at The Garage that sharpened skills, heightened confidence, and fueled a more enterprising spirit.

"Starting your own company can be a frightening, daunting process, but I learned so much about myself and what I'm capable of," says Ahmad, who majored in Entrepreneurial Design and Chemical Technologies as well as Economics. "When I think of what the future might bring, I know I'm more prepared to be successful and much less afraid of the unknown because of my time at The Garage."

> *"We've had some amazing students come through The Garage with compelling ideas that they strengthened and modified again and again. The value those individuals bring isn't necessarily the end result, the potential billion-dollar company, but rather the entrepreneurial drive and the collaborative spirit they bring to our community and then to all their subsequent endeavors. That's a billion-dollar person."*—Melissa Kaufman, Executive Director, The Garage

Inside The Garage's Workspace, undergraduate students collaborate during a Medill class focused on the Chicago startup scene.

OPENING DOORS TO OPPORTUNITY

AS NORTHWESTERN UNIVERSITY'S ENTREPRENEURIAL ecosystem has expanded over the last decade, there has been a corresponding push to create a dynamic environment that inspires relationship building, fosters skill development, and introduces the University's enterprising souls to career-defining opportunities.

"Given rising interest in the innovation and commercialization lifecycle and how entrepreneurship can advance the world, INVO is mindful of creating robust and unique opportunities that allow individuals across Northwestern to strengthen themselves, their ideas, and their futures."—Sonia Kim, Managing Director of Marketing and Commercialization Education, INVO

Since January 2015, for example, more than 30 scientists—graduate students, postdocs, and others from across the Northwestern landscape—have completed INVO's Practicum program.

Designed for individuals intrigued by careers beyond academic research, the six-month program places scientists in an on-campus internship at INVO, where they are trained to assess Northwestern technologies for their patentability, market potential, and commercialization risks. Expanding knowledge and expertise beyond their particular domains, interns develop a more diverse skill set that positions them for careers in fields such as technology transfer, IP law, industry R&D, and consulting.

"The INVO internship is the single best preparation for a career in patent law or technology transfer that graduate students or postdocs can get at Northwestern. The resulting hands-on experience in the fields of patent prosecution and technology licensing is valued significantly by future employers, much more than 'that last' scientific paper," says Linda Foit, a former intern now working as a patent agent at Fox Rothschild in New York.

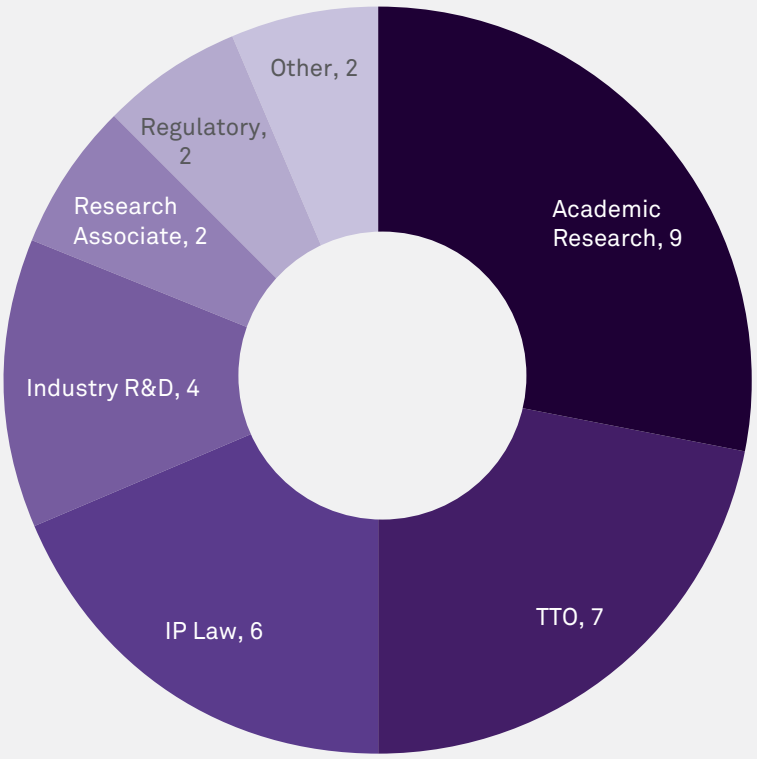
This past summer, meanwhile, INVO completed its second session of INVOForward, an intensive, experiential learning program that guides Northwestern's biomedical entrepreneurs through the often-overlooked, yet critical customer discovery process. Modeled after NIH's I-Corps program, teams spend four weeks interviewing dozens of stakeholders, researching pricing and regulatory strategy, and exploring the market landscape before pitching a "Shark Tank"-like panel.

The first two INVOForward cohorts—fall 2017 and spring 2018 sessions focused on medical devices and health IT, respectively—provided participants a valuable, hands-on experience to strengthen their products' market fit, bolster their value proposition, and better strategize the path to commercialization.

"The INVOForward process allowed us to hear the voices of different stakeholders and customers, and made us think about potential next steps in this process," says Amisha Wallia (Feinberg), who participated in INVOForward to advance the Do-It-Yourself Diabetes Toolkit she developed in collaboration with Northwestern colleagues.

Three former INVO Practicum interns—*(l. to r.)* Jose Martinez (former PhD student in Prof. Michael Wasielewski's lab), Linda Foit (former post-doc in Prof. Shad Thaxton's lab) and Seoan Huh (former PhD student in Prof. CJ Heckman's lab)—are now at Wilson Sonsini Goodrich & Rosati as an IP Analyst, Fox Rothschild as a Patent Agent, and Pfizer as a Regulatory Affairs Associate, respectively.

FIG. 8
POST PRACTICUM JOB SECTORS



BY PROMOTING DIVERSITY IN OUR ECOSYSTEM MORE NORTHWESTERN INNOVATIONS CAN ENTER THE MARKET.

FIGURES 9, 10, 11 represent the gender distribution of tenured and tenure-eligible faculty and the percentage of whom have disclosed inventions during FY 2018.

Weinberg College of Arts and Sciences percentages represent faculty from the departments of Chemistry, Molecular Biosciences, Neurobiology and Psychology.

FIG. 9

MCCORMICK SCHOOL OF ENGINEERING INVENTORS AMONG TENURED AND TENURE-ELIGIBLE FACULTY

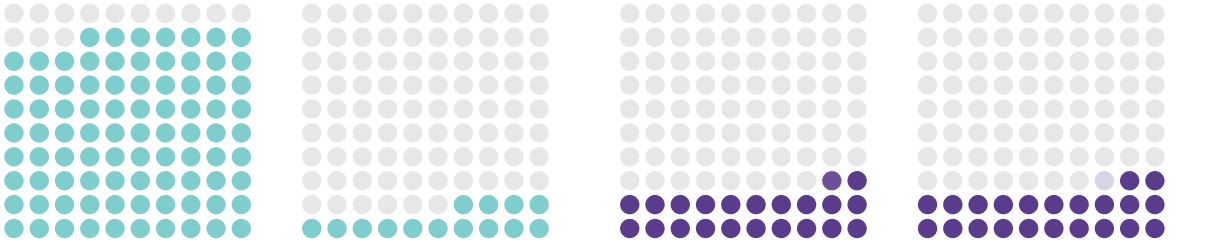


FIG. 10

FEINBERG SCHOOL OF MEDICINE INVENTORS AMONG TENURED AND TENURE-ELIGIBLE FACULTY

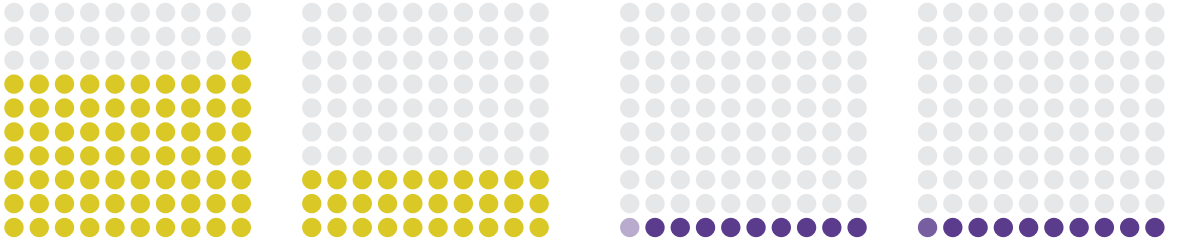
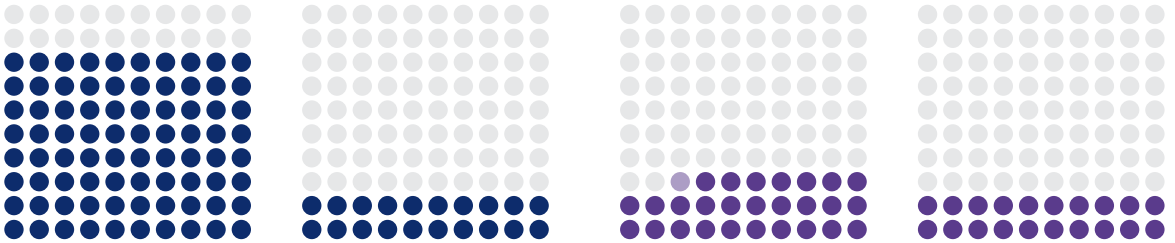


FIG. 11

WEINBERG COLLEGE OF ARTS AND SCIENCES INVENTORS AMONG TENURED AND TENURE-ELIGIBLE FACULTY



FROM CARRYING OUT CRITICAL EXPERIMENTS and raising sufficient capital to conducting clinical trials and passing regulatory hurdles, the path to commercialization in the biomedical space remains littered with obstacles that derail even the most encouraging ideas.

Determined to steer its best innovations to market, INVO has helped craft new strategic partnerships and programs designed to accelerate translation and drive improved patient care.

Lakeside Discovery. In summer 2018, INVO spearheaded Northwestern's partnership with New York City-based Deerfield Management. In the resulting joint venture, Lakeside Discovery, Deerfield has pledged up to $65 million as well as in-depth tactical support to help push selected Northwestern projects toward an Investigational New Drug-ready phase in an expedited manner.

"This is a true partnership that extends beyond funding," says Amie Phinney, director of alliance management for Lakeside Discovery at INVO. "Projects that enter into the alliance are guided by both the University investigators and a team of drug discovery experts from Lakeside who are collectively dedicated to advancing these therapeutic projects."

NIH Centers for Accelerated Innovations (NCAI). In mid-2017, Northwestern joined the Ohio NCAI, an ambitious collaborative venture of more than two-dozen high impact medical research institutions. With a mix of funding and expert assistance in early technology development, NCAI propels the translation of scientific discoveries into medical devices, therapeutics, and health IT technologies that improve patient health in cardiovascular, lung, blood, and sleep disorders.

During the last three rounds, three different Northwestern teams received funding to pursue innovative technologies, including the interdisciplinary team of Dr. Jason Wertheim (Feinberg) and Guillermo Ameer (McCormick) that is developing a targeted antithrombotic agent.

"The NCAI grant is providing us critical help as we develop some early-stage translational data that brings our technology closer to the clinic," Wertheim says.

NewCures. Northwestern's NewCures accelerator program facilitates the development of potential therapeutics from Northwestern labs by helping University researchers craft a strategic development plan that includes defining key pre-clinical experiments for proof-of-concept validation and preparing assets to attract external partners and private-sector investment.

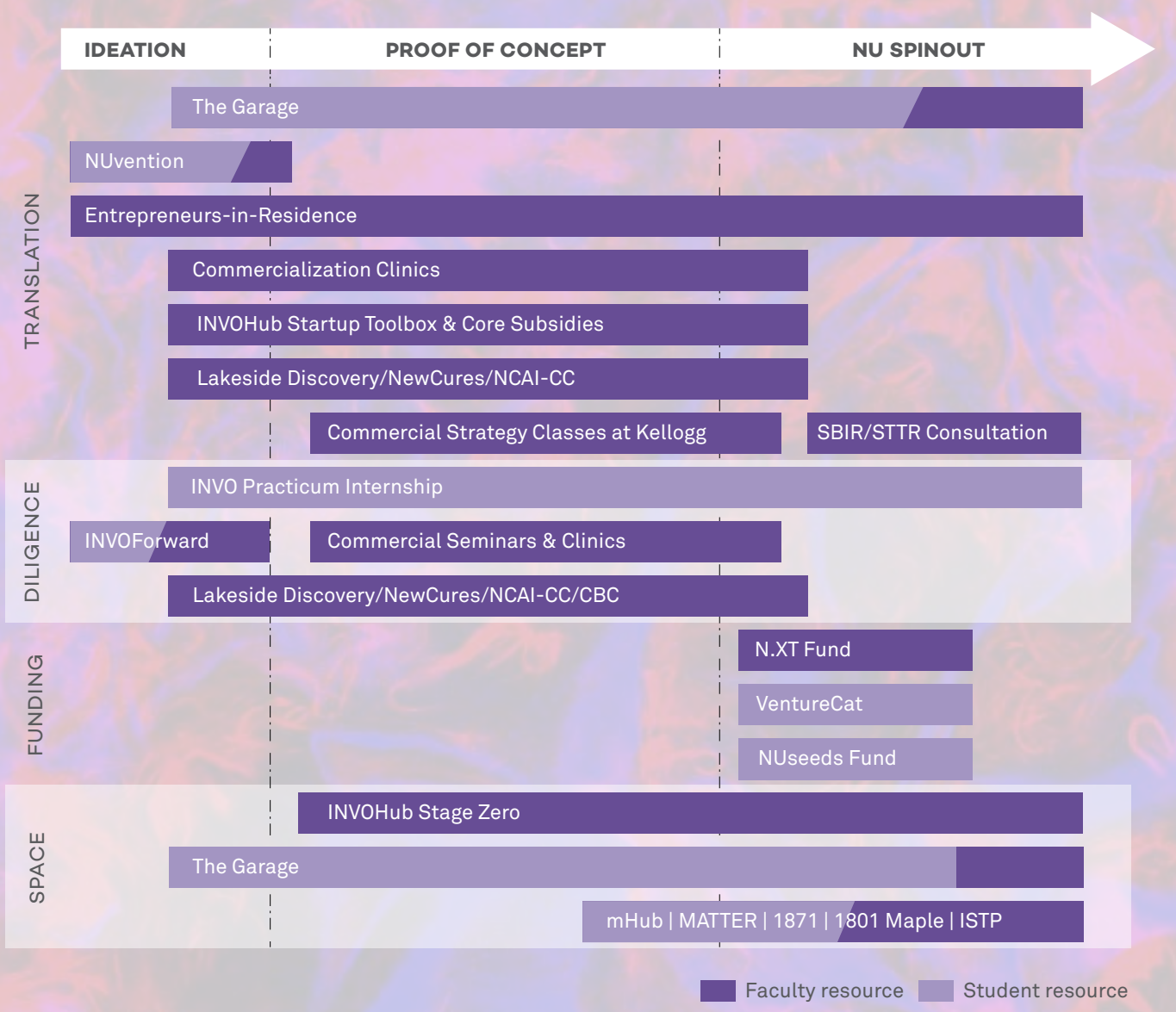
"Knowing the difficulties in translating biomedical innovations, we're connecting Northwestern researchers to as many levels of resources as possible, whether that means providing access to expertise or links to funding that will help a compelling technology continue its progress toward commercialization."—Dimitra Georganopoulou, Director of Commercialization, INVO

Powered by NewCures' support, Dr. Sarki Abdulkadir (Feinberg) is developing small molecule inhibitor drugs that target the major cancer protein MYC, including one particularly promising and novel lead.

"I would not have been able to easily access the wisdom of industry experts or the resources to do high-level medicinal chemistry optimization of our lead without NewCures' support," Dr. Abdulkadir says.

***Chaos* (Wei Ji, Prof. Samuel Stupp Laboratory) A confocal fluorescent microscopic image of injectable composite hydrogel composed of collagen particles and bioactive peptide amphiphile nanofibers which can act as an artificial extracellular matrix and induce potent new bone formation.**

COMMERCIALIZATION RESOURCES AT NORTHWESTERN UNIVERSITY



PATENTS

Patent filing remained stable from FY17. Figure 12 shows patents filed in FY18 per school. Patent filing is consistent with the invention disclosure activity reported in Figure 2. Figure 13 illustrates the breakout of patents filed in FY18. Figure 14 illustrates that patent filings span many disciplines and markets.

Provisional patents: Approximately 60% to 70% of all invention disclosures are filed as provisional patents; approximately 50%–60% are converted into non-provisional patents within a year. Filing a provisional patent application before filing a Utility application presents several advantages:

- Relatively inexpensive, and allows the inventor to spend one year gathering more data resulting in a stronger patent application;
- Allows INVO to conduct a more in depth commercial assessment of the invention and identification of potential licensees; and delays the formal filing date, which results in a later patent expiration date.

Non-Provisional (Utility) patent applications: The filing of a Utility patent starts the official examination process with the USPTO to determine if the invention is patentable. The USPTO review of a patent application can take several years.

PCT applications: A PCT is an international treaty with more than 145 Contracting States. The PCT makes it possible to seek patent protection for an invention simultaneously in a large number of countries by filing a single "international" patent. A PCT application must be followed up within 18 months by entering into national or regional phases to more patents. Foreign prosecutions are very expensive. INVO files in specific countries (National Phase) only when there is a licensee for the patent.

Continuing patent applications (CIP): These are patent applications that follow and claim priority to an earlier filed patent application.

EPO Validation: Granted European patents that are in the process of validation in individual states.

Divisional patent applications: Patent applications with claims that were divided out of the original filed application and which have to be re-submitted as a separate application.

FIG. 12
FILED PATENT APPLICATIONS BY SCHOOL

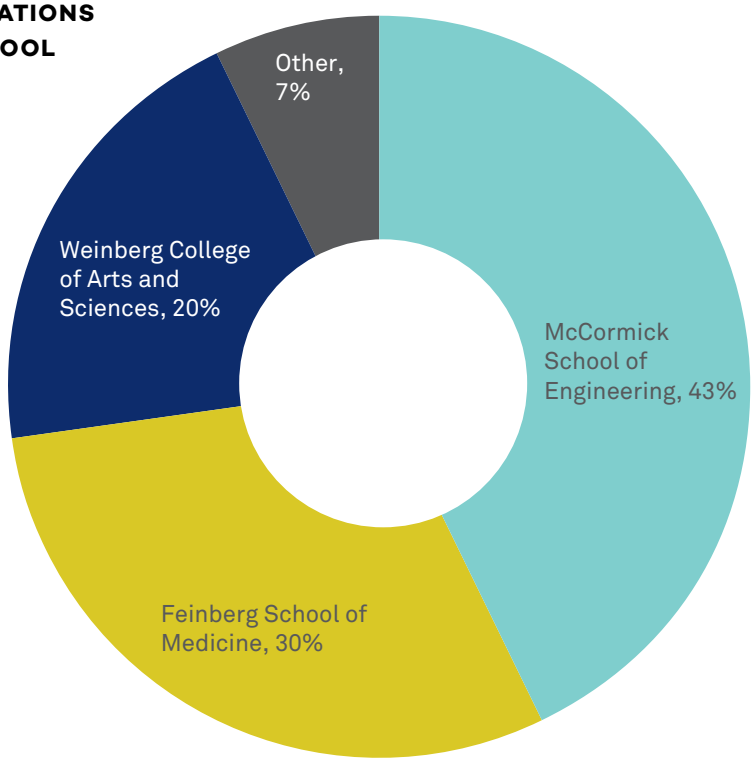


FIG. 13
FILED PATENT APPLICATIONS BY TYPE

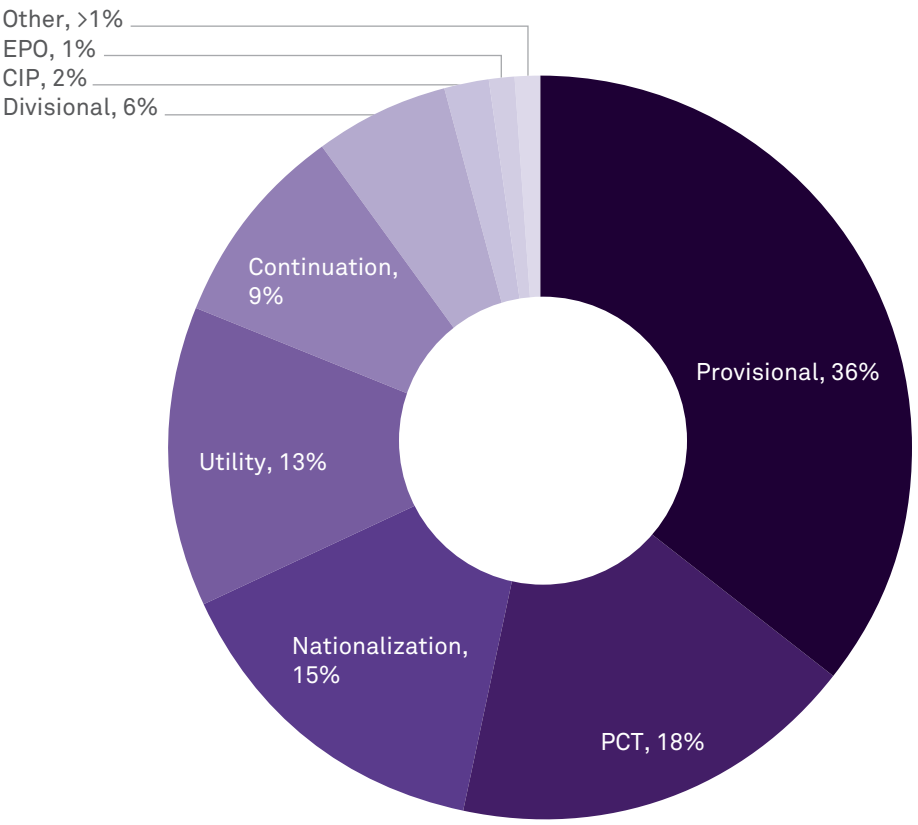
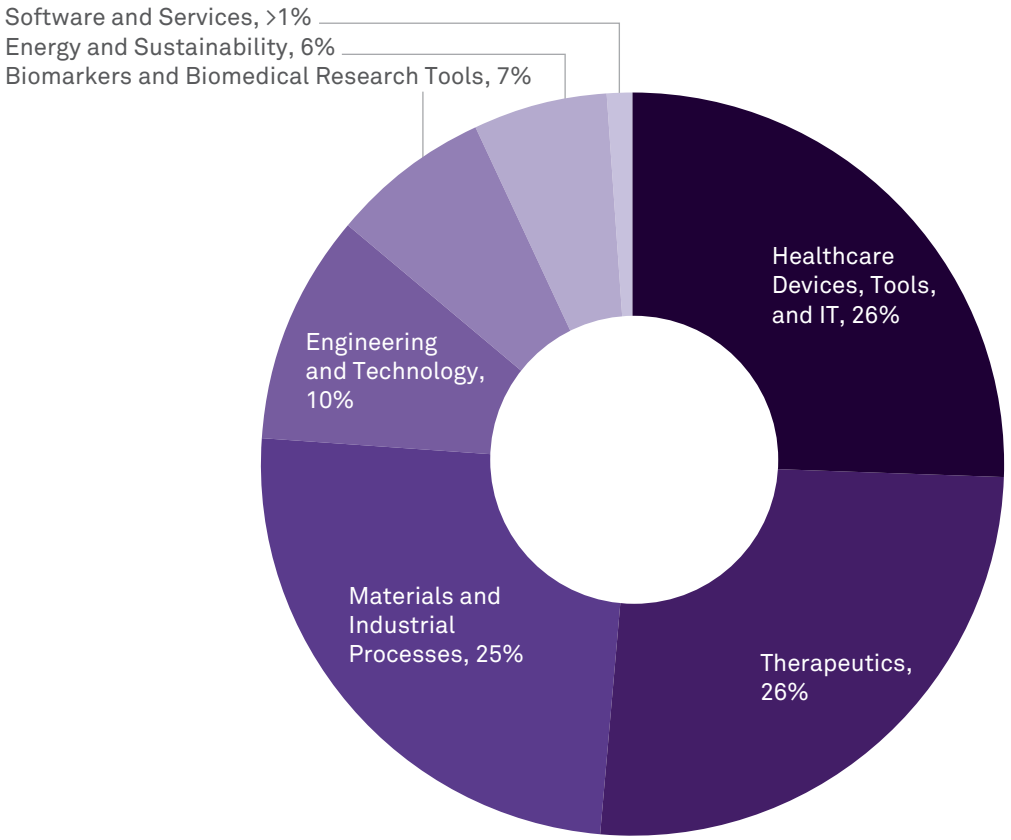
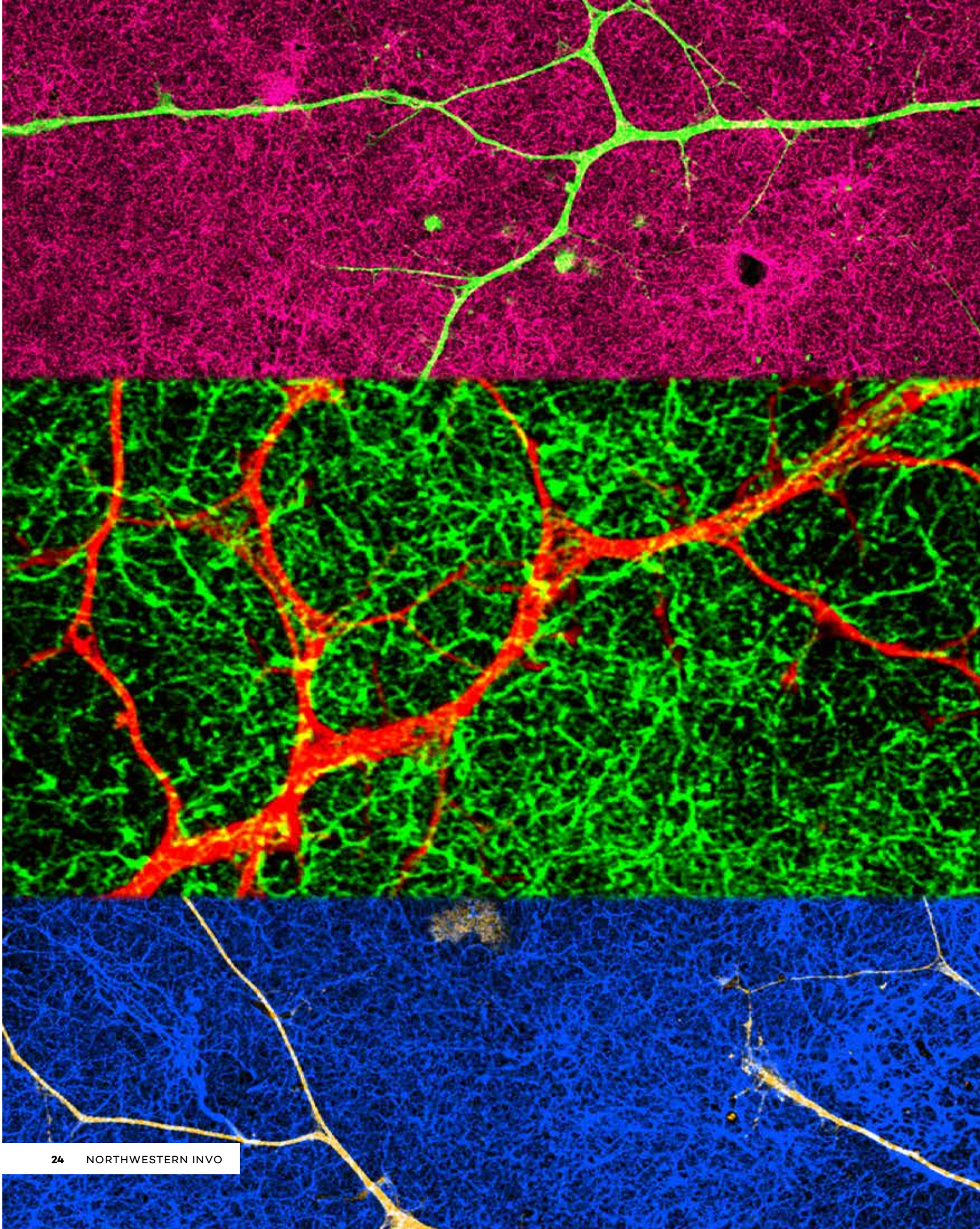


FIG. 14
ISSUED PATENT APPLICATIONS BY CATEGORY



WE FOCUS ON WHAT WE DO BEST—INNOVATION—TO ENSURE THAT THE MOST PROMISING AND COMPELLING IDEAS REALIZE THEIR FULL POTENTIAL.

Among the various programs spearheaded by INVO Executive Director, Alicia Löffler, the June 2018 launch of Lakeside Discovery between Northwestern and Deerfield Management, exemplifies one of the many mechanisms by which INVO displays its commitment to finding ways to help promote Northwestern innovations across the university (l. to r. Deerfield Partner Peter Steelman, Associate Provost Alicia Löffler, Deerfield Managing Partner James Flynn, Mayor Rahm Emanuel, Provost Jonathan Holloway, Dean Eric Nielsen, Prof. Rick Silverman, VP for Research Jay Walsh).



EVERY DAY AT NORTHWESTERN UNIVERSITY, new discoveries arise, new connections blossom, and ideas march closer to reality. Fearlessly challenging the status quo, courageously envisioning ideas that can bring positive change to the world, Northwestern's scholars, scientists, and students imagine a brighter future. Northwestern supports such daring effort. We help innovators find mentors and collaborators, access funding and labs, and collect the knowledge and inspiration necessary to propel ideas into the marketplace. One opportunity inspires the next. One resource feeds another. Innovation is in our DNA.

Mentoring From INVOForward to idea-driving commercialization clinics and extracurriculars like the Zell Fellows Program and Design for America, Northwestern's entrepreneurial ecosystem pairs campus innovators with internal as well as external mentors who help shape, strengthen, and shepherd ideas to market.

Student Groups Student groups such as EPIC, Kellogg Tech Club, the Innovation & Design Association, and the Entrepreneurship and Venture Capital Club energize the campus' entrepreneurial spirit and drive the next generation of game-changing innovators.

Funding Northwestern supports accelerator programs like Wildfire for students as well as NewCures and Lakeside Discovery for faculty, while investment agents like NUseeds and the N.XT Fund power compelling startups toward commercialization.

Events A diverse array of campus events ranging from Elevator Pitch Night to the annual Lewis Landsberg Research Day exposes innovators to continuous learning, collaborative opportunities, and resources designed to fuel entrepreneurial progress.

Academics From Farley Center classes in innovation and entrepreneurship to the pioneering MMM program that pairs a Kellogg MBA with an M.S. in Design Innovation, inventive coursework strengthens students' business fundamentals and sharpens their entrepreneurial edge.

Spaces and Labs Places across the Northwestern landscape—The Garage, the 3D Printing and Rapid Prototyping Lab, INVOHub, and the Phil Kotler Innovation Lab among them—provide entrepreneurs space to accomplish tasks, advance ideas, and inject credibility into their efforts.

"The Innovation & Entrepreneurship Ecosystem is a digital hub that showcases Northwestern's collective efforts and vision across all schools, all programs, and all buildings, helping our stakeholders to navigate the rich array of available resources and to immerse themselves in a dynamic network focused on bringing innovations to market."
—Alicia Löffler, Executive Director, INVO

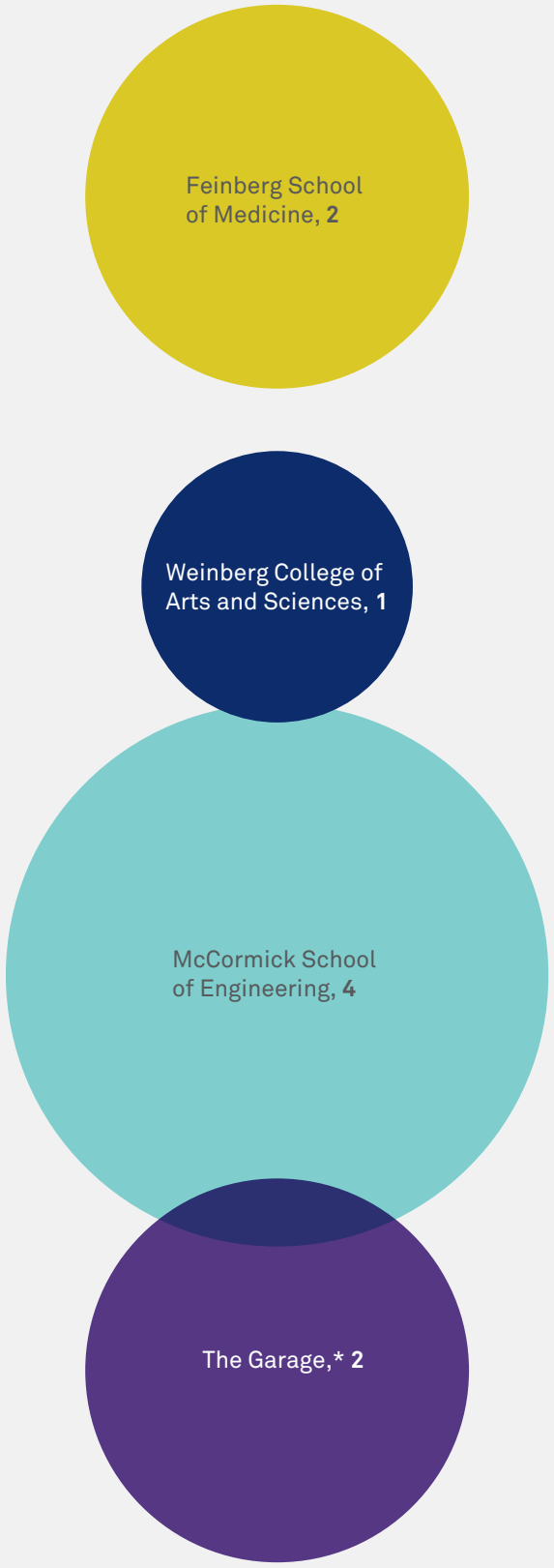
Neurites Growing on an Artificial Matrix **(Zaida Alvarez PInto, Prof. Samuel Stupp Laboratory) A spectral illumination microscopic image depicting human induced pluripotent stem cells-derived motor neurons cultured on different peptide amphiphile supramolecular nanofibers. Cells attach, grow and maturate for over two months on these materials, offering an in vitro platform that provides insights into disease mechanisms and treatment strategies for motor neuron-related diseases such as ALS.**

WHEN WE PULL IN THE SAME DIRECTION GOOD THINGS HAPPEN.

NORTHWESTERN STARTUPS RAISED **MORE THAN $170 MILLION** IN FY18

NU startups raised over $9.5M in SBIR/STTR awards. The average from 2007-2016 was $5.8M. In addition, Northwestern raised up to $65M in commercialization partnerships. (The average over the last decade for NU startups was $6.2M/year.)

FIG. 15
STARTUPS BY SCHOOL



* The Garage has many startups companies, in FY18 Northwestern has financial interest in two.

FIG. 16
2018 STARTUPS TIMELINE

- Feinberg School of Medicine
- Weinberg College of Arts and Sciences
- McCormick School of Engineering
- The Garage

(l. to r.) Jose Fernandez '18 and David Walker (CTO and Co-Founder of Northwestern startup, CDJ Technologies) together hold a 3D printed lattice structure, aiming to revolutionize the future of advanced manufacturing.

APPENDIX

BIOMARKERS AND BIOMEDICAL RESEARCH TOOLS PIPELINE

1 BIOMARKERS \ 2 NUCLEIC ACID \ 3 ANTIBODY \ 4 CELL LINE \ 5 ANIMAL MODEL \ 6 MISCELLANEOUS

- Available for Licensing
- Non-Exclusive License/Option
- Exclusive License/Option

1—BIOMARKERS

Perinucleolar Compartment as a Cancer Marker
Marker for Chronic Pelvic Pain I
PNC Cancer Diagnostic (non-breast cancer)
MCP-1 as a Target for Chronic Prostatitis/ Chronic Pelvic Pain Syndrome
Biomarkers for PTSD and Depression
Biomarker for Colitis
Lamin B1 is a biomarker for replicative senescence
Fluorescent Sensors for Zinc
Use of Maspin as an Anti-ROS Scavenger Against Cell Proliferation, Inflammation, and Aging
A Genetic Marker for ALS
Genetic markers in GRB10-DDC region (or 7p12.2) predict Treatment Resistant Schizophrenia in Caucasians
PTSD Blood Test
Depression and Treatment Response Predictor
Genetic markers to predict Treatment Response of Treatment resistant Schizophrenic Caucasians
Serotonin2c Receptor Polymorphisms for Antipsychotic Drug Response In Schizophrenia
Molecular Control over Exosomes for Isolation, Quantification, Tracking, and Therapy
Detection of Ab reactivity towards deamidated proinsulin for risk prediction and diagnosis of type 1 diabetes
A pre-school biomarker for literacy
Biomarkers to Predict Treatment Response to Antipsychotic Drugs
Blood biomarker analysis for early detection, treatment response and disease progression of breast cancer
Biomarker for Early Stage Cancers
Biomarker for Female Egg Quality
Biomarkers for Prostate Disease
Imaging for Steroid
Cardiac Stress Test with MRI
Biomarkers associated with treatment response in malignant glioma patients with high levels of STAT3 signaling
mRNA Expression Signatures in Liver Transplant Rejection and Graft Injury
Molecular Signature in the Peripheral Blood for Sub-Clinical Acute Kidney Transplant Rejection
Neural Biomarkers in Nasal Exhaled Breath
Lipid Denaturation as a Marker and Therapeutic Target of Ovarian Cancer Stem Cell
Platform-And Sample-Specific Molecular Signatures of Kidney Transplant Rejection
Biological Marker For Auditory Processing (Bio-MAP)
Marker for Neuromuscular Disorders
Neurodegenerative Disease Biomarkers

2—NUCLEIC ACID

Rapid Detection of an Anthrax Biomarker by Surface-Enhanced Raman Spectroscopy
Clock gene cDNA
Timeless gene cDNA
pAN1: ElectroTfm of Clostridium
pHT plasmids
Enhanced Gene Expression for Gene Therapy Applications
RNA-directed DNA Cleavage & Gene Editing
Copolymer Networks for Separating DNA
Separation Mechanism for Microchannel Electrophoresis
Nuclear Lamins Expression Vector
hsp70.1pr-luc Plasmid

3—ANTIBODY

Metabolic Antibody Discovery and Development
Anti-macrophage monoclonal antibodies (CD31, CD87, CD15)
HSF1 and HSF2 antibodies, rat
PGSL-1, mouse
alpha 3 laminin, mouse
hu Tau C-term, mouse
Tau Tyr18 nitrosylated, mouse
Antibody for Tubulointerstitial Nephritis
TOC-1 mouse antibody
Scarpulla Lab Antibodies - 6 Antibodies
BRAP Antibody
Influenza M2 protein, mouse
CD 13 antibody mouse
HSP-70 antibodies mouse
Vascular endothelial cell Ag, m
mtHSP-70, BiP/grp 78 mouse
Importin beta1, mouse
Tau Isoforms, mouse
Tau N Terminus, mouse
TNT1: Tau PAD region, mouse

4—CELL LINE

Stem Cell Therapy to Generate Cholinergic Neurons
Retinal Muller Cell line
MM.1 Myeloma cell lines
E. coli from human prostate
S.cerevisiae H4S47C
HSV-2 333/Gal and HSV-1 KOS/tk12

BIOMARKERS AND BIOMEDICAL RESEARCH TOOLS PIPELINE *(CONT.)*

1 BIOMARKERS \ 2 NUCLEIC ACID \ 3 ANTIBODY \ 4 CELL LINE \ 5 ANIMAL MODEL \ 6 MISCELLANEOUS

- Available for Licensing
- Non-Exclusive License/Option
- Exclusive License/Option

5—ANIMAL MODEL

Triple transgenic mice for triggering inducible hepatocyte apoptosis

Dyrk1a conditional knockout mice

Mutant Mouse Line C57BL/6J-Slc2a4twiggy

Mutant Mouse Line C57BL/6J-Fahswing-shift

SOD Tg mice

Mt Clock Tg mice

MLCK 210 KO mice

Knockout Mouse Model Of Cognitive Deficits

BMP4 Tg mice: FOP

Per2 Luciferase Tg mice

Transgenic Mouse for Amyloid Pathogenesis

Clock Tg mice: diabetes

hSOD1G93A-UeGFP Tg mice: ALS

hTAAR Tg mice

6—MISCELLANEOUS

Method for Screening P. Aeruginosa Strains

Detergent-free membrane solubilization

Marker for Chronic Pelvic Pain Syndrome

Hydraulically Actuated Patch Clamp Electrode System

Assessment of Oocyte Quality by Inorganic Signatures

Tracking Reporter Gene

Small Molecule Antiviral Therapy

Mechanism-Based Small Molecule Cross-Linkers of HECT E3 Ubiquitin Ligase - Substrate Pairs

Cell-Free Yeast Protein Synthesis

Development of an Ex Vivo Female Reproductive Tract in a 3D Microphysiologic Setting

Method for Making Ribosomes

Irreversible tethering with drug-like fragments to the protein surfaces

Ex Vivo Female Reproductive System

Non-toxic cell staining probe

Substrate replenishment and byproduct removal improve yeast cell-free protein synthesis

Proof of Concept of Engineering a Yeast Receptor to Detect New Peptide Ligands

Integrated microfluidic tissue culture system for use with female reproductive tissues

Making Tethered Ribosomes

Irreversible inhibitors of Nedd4-1 polyubiquitination

UbiFlu-Novel Class of Fluorescent Probes to Screen for Inhibitors/Activators of HECT E3, RBR E3 and NEL Ubiquitin Ligases

Methods for Improved in vitro Protein Synthesis with Proteins Containing Non Standard Amino Acids

Acinetobacter Baumannii Transposon Library

Methods for Activating Natural Energy Metabolism for Improving Yeast Cell-Free Protein Synthesis

Method of in vitro ribosome synthesis and evolution

Novel Photocrosslinking Reagents to Map Protein Protein Interfaces in Vitro

Cell-free protein synthesis driven metabolic engineering (CFPS-ME)

Neuronal cell line with suppressed endogenous sodium current

Olfactory based virtual reality with sub-second timescale control of odor stimulus

A Highly Productive One-Pot System for the Incorporation of Non-Standard Amino Acids into Cell-Free Synthesized Proteins

A method to create a library of electrophilic compounds for screening using virtual docking and experimental approaches

Nanopatterned Extracellular Matrices Enable Cell-Based Assays with a Mass Spectrometric Readout

Two gRNA method for homologous recombination-based gene targeting

Methods for Improved Preservation of ECM Proteins During Detergent-Based Decellularization of Organs

Reverse Transfection Technique

Scalable Cell Sorting via Motility

Enhancing Gene Silencing by RNAi

3D Transfected Cell Arrays

High Throughput Transcription Profiling

Raman Spectroscopy for Anthrax Detection

Exosome Targeting

Scaffolds for Artificial Ovary

Cell-free glycoprotein synthesis (CFGpS) in prokaryotic cell lysates enriched with glycosylation machinery

An Elevated-Pressure, Freeze-Thaw Method For Lipsome Gas Encapsulation

Proteasome adaptors - degradons

Raman Biosensor for Multianalyte Detection

Partition Layer for Raman Nanobiosensor

Elastic Backscattering Spectroscopic Microscopy

Markers of Neoplasia in the Proximal Colon

Nanocytological and Molecular Analysis of Fecal Colonocytes for Colon Cancer Screening

Faster and more efficient two step sequence specific nucleic acid capture

HEALTHCARE DEVICES, TOOLS, AND IT PIPELINE

1 CONCEPT \ 2 LAB PROTOTYPE \ 3 COMMERCIAL PROTOTYPE \ 4 HUMAN TESTING \ 5 APPROVAL & "MARKET"

- Available for Licensing
- Non-Exclusive License/Option
- Exclusive License/Option

1—CONCEPT

Left Ventricular Apex Surgical Technology
Nanostructures for Alzheimer's Diagnosis
Hybrid Prosthetic Vacuum Pump for Transfemoral Amputees
Hemodialysis Needle with a Safety Tip
Central Dialysis Catheter Avoiding Fibrin Sheath Formation
Adjustable Banding Device for AVF
Impedance planimetry for Assessment of Cervical Ripening during induction of labor
Materials that Promote Bone Regeneration
A Novel Medical Device that Differentiates Stroke from Acute Balance Disorders
Ambulatory blood pressure Device
Method to Measure Perfusion and Leakage in a Single Neurological Scan
Novel iPSC Derived Endothelial Cell Line for Translational Research
Catheter for Gene Therapy

2—LAB PROTOTYPE

Low Power Cochlear Implant
Electronic Biochip System
Nanofabricated Glucose Sensor [SWCNT Glucose Monitor]
Anthrax Detection
Macromolecular MRI Contrast Agents
Micro Drug Delivery Device
Female Fertility Test
Biocompatible Hydrogels
Extra-Strength Hydrogel Adhesives
Ex Vivo Female Reproductive System
UTI Management
Biodegradable Drug Delivery
Peptide Conjugated MRI Contrast Agent
Photodetector for Infrared Imaging
Partition Layer for Raman Nanobiosensor
First In Vivo Surface-Enhanced Raman Glucose Sensor
Analysis of Multiplexed Bead-Based Assays
Protein-Based Contrast Agents for MRI
Equilibrium-Point Prosthetic And Orthotic Ankle-Foot Devices
Imaging & Therapeutic Nanoconjugates
Method For Preparing High Aspect Ratio Peptide Amphiphile Fibers
Parylene membranes for drug delivery
Multimodal T1-T2 MRI Contrast Agents
Cartilage Coupled PeptidePolymers
Cell Therapy for Diabetes
Liquid Cast Biodegradable Drug Delivering Arterial Stent
Sealants for Fetal Membrane Repair
Nanodiamond Conjugates
Hybrid Prosthetic Leg
App for Movement Disorders
Novel Chalco-Halides for Imaging
Materials for X-Ray & Gamma Ray Detection
Nanoparticles for Diagnosis and Therapy
pH Responsive Self-Healing Hydrogels
Left Atrial Appendage Occluder Device
Optical Coherence Photoacoustic Microscopy
iSOCT
Soluble Membrane Protein Libraries in Nanodiscs
AF Electrogram Analytics Software
At-Home Test to Predict Ovarian Reserve and Onset of Menopause
MRE Passive Driver
IVC Filter Removal
Structured Illumination Microscopy
Evaluating Impact of Oxidative Stress on AF Electrograms
Heavy Metals in Dried Blood Spots
Myoelectric Computer Interface for Rehabilitation
Targeted therapy for the prevention of restenosis
Scar-Free Tissue Regeneration
Gas Sensor for Smart Chest Tube Drainage
Optical Microscopy Technique to characterize tissue and material
Bioscaffolds for Replacement Ovaries
High Precision Diagnosis of ADHD Based on Functional Neuroimaging Data
Cardiac Tissue Ablation
Extracellular Matrix with Anticoagulant Properties for Tissue Engineering
3D printed Intraocular lens
3D printing of a customizable accommodating intraocular lens
Mobile Opioid Dosing simulator
3D Printing of Endovascular Stents
Thermoresponsive Cell Adhesive Biore-sorbable Dressing
Atrial Fibrillation Diagnostic Software
Naso-Seal Device
A Biological Marker for Concussion
A Heavy Metal Blood Collection Card for Screening Newborns and Children
Printing 4D Composite Scaffolds for Bone Generation
Microfluidic platelet bioreactor
Agility Trainer

HEALTHCARE DEVICES, TOOLS, AND IT PIPELINE *(CONT.)*

1 CONCEPT \ 2 LAB PROTOTYPE \ 3 COMMERCIAL PROTOTYPE \ 4 HUMAN TESTING \ 5 APPROVAL & "MARKET"

- Available for Licensing
- Non-Exclusive License/Option
- Exclusive License/Option

Resorbable Wireless Bone Stimulator

Lung-inspired microfluidic platelet bioreactor

NICU2HOME smartphone application

Self-assembled Nanovirus

Normalization of MRI for Imaging of Gene Expression Signatures

Probability Maps Predicting Healthcare Needs for Geographic Regions

Portable Raman Spectroscopy and Related Methods for Monitoring Drugs

Engineered Red Blood Cell-based Biosensors

BDNF Mimetic Peptide Amphiphiles

Optical and Acoustic Imaging

Soft Materials for Bioprinting

A Non-Invasive Diagnostics Platform for Measuring Glucose Levels in Saliva

Detecting walking aids with sensors

Quantification of Cerebral Perfusion with MRI

Virtual Electrophysiologic Test

Auditory Test

MRI-Perfusion and Diffusion Mismatch

SNR Improvements for Multi-Slice MRI

Raman Biosensor for Multianalyte Detection

Northwestern Anagram Test (NAT)

Northwestern Assessment of Verb Inflection (NAVI)

Lipid Nanoparticles for Measuring Chronic and Acute Response to Exercise

Biomimetic High Density Lipoprotein Nanoparticles for Human Performance

Motorized Software: Controlled Calibrator

Central Line Insertion Training Curriculum

CA Diagnostic with Microscopy

Endoscopic CA Diagnostic

Hearing Aid Interface

HIV Diagnostics

Medical Adhesives

Colorectal Cancer Screening Device

Bedside Wound Pulse Lavage

Point of Care Diagnostic Tool

Childress Ankle

Bedside Pulse Lavage Project Modifications

Sticky Flare

Device for Isolating an Analyte from a Sample

Implanted Surgical Film to Reduce Post Surgical Complications

High Throughput Partial Wave Spectroscopic Microscopy

Wearable for Ambulatory Blood Pressure Monitoring

3—COMMERCIAL PROTOTYPE

pH-Sensitive Drug Delivery Polymers

Brain Wave Processing to Enhance Sleep

Synthetic Antigen Compositions to Detect antiphosphatidylethanolamine Antibodies

Automated fMRI for Clinic

Northwestern Assessment of Verbs & Sentences (NAVS)

Northwestern Naming Battery (NNB)

Point of Care Protein Diagnostics

Polymers for Vascular Disease

Pre-Free Colon CA Screening

Robotic Arm for Orthopedic Surgery

Vocal Cord Medialization

RF Ablation Probe

Radio Frequency Soft Tissue Ablation System

Noise Based Coding in Cochlear Implants

Advanced retinal blood flow measurement

App to Help with Depression and Anxiety

A "Skin-like" Wearable Sensors for Sweat Loss Analysis

4—HUMAN TESTING

Rehabilitation Robotics

Adaptable Ankle Foot Prosthesis

Diaphragm-based Hybrid Prosthetic Vacuum Pump for Transfemoral Amputees

Treatment of Underlying Forms (TUF)

Method and User Interface for Hearing Aid Control

Silica Polymer Pen Lithography

5—APPROVAL & "MARKET"

Surgical Cement Mixer Apparatus

Particles For Detecting Intracellular Targets

3D Surgical Suture

Esophageal Panometry

Panometry

THERAPEUTICS PIPELINE

- Available for Licensing
- Non-Exclusive License/Option
- Exclusive License/Option

1—NEW TARGETS

Scar-Free Tissue Regeneration
Hydrogel Wound Dressing With Cu Ions
Thermoresponsive Adhesive Dressing
Exosomes: Cholesterol Modulation
Diagnosis of Major Depressive Disorder
Tricyclic carbogenic molecules as anticancer agents
Nitric Oxide Releasing High Density Lipoprotein-like Nanoparticles

2—HIT TO LEAD

Ion Channel Manipulation: Parkinson's
Stem Cell Signaling Molecules for Cancer Therapies
Peptide Vaccine for Lupus
Kinase Inhibitors
b lactamase Inhibitors: Antibiotics
CD154 Trimer Stabilization: Immunity
MLCK Inhibitors
Epstein-Barr Virus Inhibitors
Multiple Sclerosis Therapy
Compounds: Neurologic Disorders
Malaria Prophylaxis
Maspin: Bone Disorders
Immunotherapy: Macular Degeneration
Megakaryocytic Leukemia Treatment
Plaque Digestion: Cardiovascular
Nanostructures for Medulloblastoma and other CNS cancers
AMPA Receptor Antagonists: Neurologic Diseases
Therapeutic for Chronic Pelvic Pain Syndrome
Sensitization to Steroids
Bladder Regeneration
GLUT Antagonists: Cancer 1
Bladder Regeneration
Small Molecules against ALS
Female Fertility Treatment
GLUT Antagonists Cancer 2
Nitric Oxide Synthase Inhibitors
HIV Therapeutics
Ras and Rap1 Protease for Cancer Treatment Applications
CXCR4 Modulators
Kinase Inhibitors: Cancer
Small Molecule Inhibitors of C-Myc
FFAR2 Agonists: Type 2 Diabetes
Nanomolecules for the Treatment of Inflammatory Bowel Diseases
Inhibitors: Leukemia
Antibiotic-Coated Nanoparticles
Gene Therapy: Anti-Depression
Megamolecule Synthetic Antibodies
Inhibitors for Triple Negative Breast Cancer
Aromatic heterocycles Inhibitors of Mnk1 and 2
Molecules to Treat Inflammation
Protective Agonists to counter adverse cardiac remodeling
Novel RNA Therapeutic Candidate for Fibrotic Diseases
p38MAPK Modulators of CNS Pathology and Cognition
PLK4 inhibitor for pediatric embryonal tumors
Targeted Drug Delivery Using Extracellular Vesicles
Statin for Hearing Loss Prevention & Therapy
Soft Materials for Bioprinting
Chromatin Therapy to Sensitize CA Cells
S.epidermidis Lipotechoic Acid (SELTA) for immune modulation
Treatment of Levodopa-Induced Dyskinesias
Potential New Modulator of Angiogenesis

3—LEAD OPTIMIZATION

Peptide Amphiphiles for Neurite Outgrowth
Peptides: Cancer
p53 Reactivators: Cancer
Stem Cell Factor to Treat Stroke
Triggered Release Arsenic: Cancer
Gene Silencing Enhancers
Liposomes for Bioactive Gas Delivery and Methodology
Heparin-Binding Peptide Amphiphile
Heparin-Binding Peptide Amphiphile for Cardiac Conditions
Inhibitors Of The Epstein-Barr Virus Mediated Fusion And Entry Process
Thermoresponsive Adhesive Dressing
Inhibitors Of The Mevalonate Pathway Of Streptococcus Pneumoniae
Haem Peroxidase Functions As A Natural RNAi Inhibitor
Peptides for PEDF
Numonafide: Cancer Therapy
Flavanones & Chromanones: Cancer
Urinary Tract Infection Vaccine
Preventing Scar Formation
Preventing Symptoms of Urinary Tract Infection
Preventing UTI Symptoms
Nanoparticulate Arsenic Platinum Drugs

THERAPEUTICS
PIPELINE *(CONT.)*

- Available for Licensing
- Non-Exclusive License/Option
- Exclusive License/Option

Small Molecules: Parkinson's Disease
Neuroprotective Therapeutics
Human Melanoma
NOS Targeting: Neurodegeneration
Pro-Drugs: Streptococcus
Arsenoplatins for Cancer Treatment
Sirtuin Inhibitors
Maspin Protein Mimics for Cancer Treatment
Combination Therapy for Treatment of Cancer
FGF23 Normalizing Methods
Herpes Virus Vaccine and Oncolytic Vectors
Bacterial NOS Inhibitors as Antibiotics
Amino-alkoxyester-linked peptides with anti-angiogenic and anti-cancer activity
High density lipoprotein functionalized magnetic nanostructures (HDL-MNS) as theranostic agents for cardiovascular diseases
Inactivators of Toxoplasma gondii Ornithine Aminotransferase for Toxoplasmosis and Malaria
Using Toxic Short Interfering Rnas as a Tool to Kill Cancer Cells
Treating Prader-Willi Syndrome and Seizure Disorders
Autophagy-inducing small molecule to treat amyloid deposition and memory loss
Targeting of MLL1 proteolytic cleavage by taspase1
Potential treatment of corneal vascularization
Metarrestin-Metastasis (autophagy)
Development of GLUT4 Selective Inhibitors for Cancer Therapy
Polysomes (Drug Delivery)
Using Triplet Repeat siRNAs to Selectively Kill Cancer Cells
Potent Inhibitors of Nitric Oxide Production for Treating Neurodegenerative Disorders
Small Molecules against Hepatocellular Carcinoma
Novel Active ACE2 Fragments
Inhibitors of SOD1 Aggregation for the Treatment of ALS
Neurodegenerative Disease Therapy
Use of Mitotically Inactivated Embryonic Stem Cells for Tissue Repair
G Protein Inhibitors: Cardiovascular
3crx98-Metastasis
Peptide-coupled Nanoparticles to Treat Autoimmune Disease, Transplant Rejection & Allergy
Method to Prevent Allograft Rejection
Combination Therapy for Cardiac Arrhythmias
Peptides: Immune tolerance
TGFb Inhibitor Transgene
Gene Therapy: Atrial Fibrillation
Combinations of NMDAR Modulating Compounds
Inhibiting Cancer Cell Motility
Carbohydrate Enhanced Nanoparticles for Immune Modulation
GABA Aminotransferase Inactivator for Addiction and Hepatocellular Carcinoma
Gaucher's Disease (Glucoceribrosidase)
MW-150-Alzheimers (p38 kinase)

4—PRECLINICAL

NOS Portfolio Inhibitors
Glycosides for Cancer
Chronic pelvic pain vaccine
Nanodiamonds for Imaging and Drug Delivery
E. Coli Isolated from Human Prostate
Self-Assembling Nanovirus
Scaffolds for nNOS Inhibition
MAPK Compounds: CNS Disorders
Medical Food
Inflammation Modulator
HDL-like Nanoparticles: Infection
Metarrestin-Akzheimers, Drug Tolerance
Super Elongation Complex Disruptors diminish transcriptional rates
GABA Analogues: Hepatocellular Cancer
Topical Wound Treatment
Glucocerebrosidase Modulators
Treatment of dermatologic conditions
Alzheimer Immunotherapy-Oligomers of Amyloid beta
Alzheimer Immunotherapy-ADDLs
Nanoparticle Supported Lipid Bi-Layer Bio-Mimetic Structures
Gold Nanoparticles for Templated Nanomaterials
Compositions and Methods for Antigen-Specific Tolerance
Organ Transplantation
9-ING-41-Cancer
Nanoparticle Supported Lipid Bi-Layer Bio-Mimetic Structures
Tau Monoclonal Antibodies
Small Molecules to Block SOD Aggregation to treat ALS

5—CLINICAL TRIALS

Method to Control Dopaminergic Neuron Pacemaking

THERAPEUTICS
PIPELINE *(CONT.)*

- Available for Licensing
- Non-Exclusive License/Option
- Exclusive License/Option

Therapeutic Methods in Insulin Production

Isradipine: Parkinsons

Lead Compounds For Neurodegeneration and Neuroinflammation

Small Molecules for Tourettes Syndrome

GLYX-13: Depression and Pain

Gene Regulation with NP-Nucleic Acid

Gold Nanoparticles For Therapeutics

Gene Regulations with Polyvalent siRNA-Nanoparticle Conjugates

Antisense Molecules for Wound Healing

CPP-115, irreversible inhibitors of aminobutyric acid aminotransferase

Cellular Delivery of Small and Macro-Molecules with Liposomal Spherical Nucleic Acids

6—APPROVAL

Lyrica: Fibromyalgia

7—PLATFORM/MOA/METHOD

Polymers for pH Sensitive and Targeted Delivery of Anticancer Drug

Modular Extracellular Sensors for Cell-based Biosensors

Sirt1 Gene Therapy For Improved Wound Healing

Antibacterials

Composable Mammalian Elements of Transcription (COMET)

Engineering Customized Cellular Functions

Novel intravitreal injection treatment for glaucoma

ENERGY AND SUSTAINABILITY PIPELINE

1 RESEARCH \ 2 RESEARCH VALIDATION \ 3 COMMERCIAL VALIDATION \ 4 MARKET

- Available for Licensing
- Non-Exclusive License/Option
- Exclusive License/Option

1—RESEARCH

- Photocatalyst
- Epoxidation of Unsaturated Hydrocarbons
- Solar Cell Coating
- Solid State Solar Cell
- All-Carbon Counter Electrode
- Carbon Nanoparticle for Energy Storage
- Cathode for Li Ion Batteries
- Doped SnSe single crystals with ultralow thermal conductivity and high thermoelectric performance
- Deriving hydrogen from bioalcohols in water without producing greenhouse gases
- Protective cathode coatings for lithium-ion batteries
- Li-rich layered oxides for cathode active materials
- Nanocomposites for Energy Storage
- Lead-Free Solar Cells
- Tin-Based 'Perovskites' for Solar Cell Production
- Synthesis of Porous Amorphous Metal Sulfide Ion Exchangers
- New Ion Exchange Column Technology for Water Purification
- New Semiconductor Materials for Room Temperature Radiation Detection
- Porous Cyclodestrin Polymers
- PbTe Composite Material for Thermoelectric Devices
- New Class of Molecular Iodosalts for Use in Next Generation Solar Cells
- Organic Photovoltaics w/Nickel Oxide
- PAH Scavenger System (ExBox)
- Crumpled Graphene Coated Si Nanoparticles

2—RESEARCH VALIDATION

- Methane/Nat Gas-Powered SOFC
- Silver Cathode Li-Ion Batteries for Medical Devices
- Integrated Solid Oxide Fuel Cells
- Novel Batteries for Medical Devices
- SMOFC Battery Cathode
- Removal of Heavy Metal and Radioactive Pollutants from Water
- Microporous Polymeric Organic Frameworks
- Solid Oxide Fuel Cells
- Algorithm for Electric Charging Station Placement
- Heavy Metal Removal and Gas Separation
- Graphitized Li-Ion Batteries
- MOFs for Silver Capture
- Water Detoxification Method

3—COMMERCIAL VALIDATION

- Photocatalytic Composite
- Cathode for Li Ion Batteries
- Gas-absorbing Metal Organic Frameworks
- Si Nanoparticles for Rechargable Lithium Batteries
- Gold Isolation Method
- GLi ion exchange materials from brines and seawater

4—MARKET

- Novel Recycling through Solid State Shear Pulverization

ENGINEERING AND TECHNOLOGY PIPELINE

1 RESEARCH \ 2 RESEARCH VALIDATION \ 3 COMMERCIAL VALIDATION \ 4 MARKET

- Available for Licensing
- Non-Exclusive License/Option
- Exclusive License/Option

1—RESEARCH

Silver Cathode for Lithium Batteries
Zirconium-Oxide Tunnel Barriers
Two Qubit Gate
Molecular Quantum Interference and Electronic Devices
Improved Nonlinear Optic Glassy Fiber and Thin Film
Bipolar Magnetic Junction
Broad Frequency Electric Field Sensor
Ultralow Power Carbon Nanotube Logic Circuits
Doped Tin Selenium Single Crystals
New Class of Molecular Iodosalts for Use in Next Generation Solar Cells
Tin Based Perovskites for Solar Cell Production
High-Speed Magnetic Memory Device
Dielectrostrictive Sensors for Shear Stress Measurement
Complementary VT-Drop Ambipolar Carbon Nanotube Logic
Printable Graphene Inked Supercapacitors
Gold Nanoparticle for Enhanced Optics and Optoelectronics

2—RESEARCH VALIDATION

Efficient Thin-Film Synthesis
p-type Transparent Conductors
Thiophene-based materials for optoelectronics
Scanning Near-Field Thermoelastic Acoustic Holography
Low Voltage Organic Electro-optics
Atomic Force Electroluminescence Microscopy
Waveguide Modulators
Magnetic Field Sensors
Bridge Enhanced Nanoscale Impedance Microscopy
Microscopy for Current Flow
Hot Pressing Method for Transistors
Printable Dielectrics for Electronic Devices
High Energy Density Nanocomposites
Transparent Conducting Graphene-Silica Thin Films
2D Nanomaterial Sorting
Organic Transparent Electrodes
Multifunctional Nanocomposites
Polycrystal Memory Foam for Energy Applications
Integrated On-Chip Thermocouple Array
TEM Nanostructure Characterization Device
Chalco-Halides as Semiconductor Detectors
Metal Oxide Thin Films
Low-Cost Semiconducting Single-Walled Nanotubes
Magnetic Diode Based Programmable Logic
Organic Ferroelectronics
Transverse Thermoelectrics
Spin-Diode Logic Family
Emitter-Coupled Spin Transistor Logic
Contactless Probe for Detecting Buried Conducting Layers
Planar Photonic Jet
All-Carbon Spin Logic
Gate tunable p-n heterojunction diode
Computing Logic Family
Novel Protective Polymers for Circuitry
Novel Separator for Electricity Storage Devices
Novel Logic Family w/Nanowire Transistors
Lead-Free Solar Cells
Deducing Charge Density Gradients in Doped Semiconductors
Antiambipolar Heterojunctions from Semiconductors
Gate Tunable Nanoscale Memristors
Tracking Circuit for Hardware Security and Reconfiguration
Using Radio Signals to Improve WiFi Connectivity
Wireless Devices for Virtual Reality Applications
High Speed/Low Dose Multi-Objective Autonomous Scanning Materials Imaging
Portable cell-free molecular sensing platform
Repurposing Blu-Ray Discs for Photon Management
Triple-Stripline Method for Tin-Film Conductivity Characterization
Electron Microscope Imaging Software System for Crystalline Materials
Additive manufacturing of inverse-designed devices for the control of electromagnetic radiation
Arrays of Wireless Sensors and Actuators for Virtual Reality Applications
SAVI: Synthetic Apertures for High Resolution Visible Imaging
Method for Time of Flight Imaging

3—COMMERCIAL VALIDATION

Nanoscale Self-Assembled Dielectrics
Organic Electro-Optic Chromophores

ENGINEERING AND TECHNOLOGY PIPELINE *(CONT.)*

1 RESEARCH \ 2 RESEARCH VALIDATION \ 3 COMMERCIAL VALIDATION \ 4 MARKET

- Available for Licensing
- Non-Exclusive License/Option
- Exclusive License/Option

Superlattice Dielectrics

Hybrid Thin-Film Transistors

Silole-Containing Polymers

Conductive Tin and Zinc-Doped Thin Films

Self-Assembled Organic Nanodielectircs

Transparent Nanowire Transistors

Organic Photovoltaics w/Nickel Oxide

Barium Titanate Waveguides

Transparent Conducting Oxides [Nanoscale Doping for Transparent Conducting Oxides]

Stretchable Si Integrated Circuits

Organic Semiconductors

3D Printing of Nanocomposites

Wireless Skin Hydration Sensor with Methods and Uses

4—MARKET

Electrostatis Multitouch Haptic Display

High Conductivity Graphene Inks

Graphene Ink for Gravure Printing

MATERIALS AND INDUSTRIAL PROCESSES PIPELINE

1 RESEARCH \ 2 RESEARCH VALIDATION \ 3 COMMERCIAL VALIDATION RESEARCH \ 4 MARKET

- Available for Licensing
- Non-Exclusive License/Option
- Exclusive License/Option

1—RESEARCH

Self-assembly of Oligo Amphiphiles
Controlling Charge Injection in OLEDs
Proximity Sensor Based on Cantilever
Nanoscale Self-Assembling Organic Dielectrics
Superlattice Dielectrics
Novel Organic Self-Assembled Nanodielectrics
Production of Substituted Imidazole Molecules
Ductile Magnesium Alloys
Synthesis of 2-Aryl Indoles
Polysulfide compounds for environmental remediation
Novel X-Ray and X-Ray Detector Material
High Temperature Steel
Efficient, Versatile and Non-Toxic Nanoparticle Thin Film Processing Method
Semiconductor for Hard Radiation Detection at Room Temperature
Purification Method of Semiconductors for Hard Radiation Detection Materials
Anti-Microbial Supramolecular Structures
A Cut-and-Paste Approach to 3D Architectures with Graphene Oxide Paper
Crumpled Graphene Balls

2—RESEARCH VALIDATION

Carbon Nanotubes for Photocatalysis
Organic Photovoltaic Cells
Polycrystal Memory Foam for Energy Applications
Polymeric Organic Frameworks
Materials for X-ray and Gamma Ray Detection-II
Metal Oxide Thin-Film Electronics
Synthesis of Layered Metal Sulfide Ion-Exchangers
p-type Transparent Conductors
Nano Fountain Pen
Nanoscale Subsurface Imaging
Arrays for X-Ray Optics Lamination
Electro-Optic Modulator
Mesoscale Metallic Pyramids With Nanoscale Tips
Hole Array Films
High Energy Density Nanocomposites
Ceramic Composite
Magnetic Shape-Memory Foam
Laser-Assisted Oxide Nanopatterning
Atomic Force Photovoltaic Microscopy
2D Nanomaterial Sorting
Maskless Nano-Patterning
Nanoscale Doping for Transparent Conducting Oxides
Flash Reduction of Graphic Oxide to Graphene
Multifunctional Nanocomposites
Fluorescent Imaging of Graphene-based Materials
Isolation of single-walled nanotubes
Graphene Concentration Method
Enhanced Strength Cement Composites
Low-Cost Semiconducting Single-Walled Nanotubes
Nanoparticle Sorting Method
Graphene-Titania Nanocomposite Photocatalysts
Novel MOF based on Azolium Salts
Water Processable Graphene Oxide
Whisker Sensor
Single Photon Detectors & Imagers
Adhesive Hydrogels
Plant Polyphenoal Coatings & Methods
Laser-Induced Plasma Micromachining (LIPMM)
Zinc Sensor for MRI
Gas-Phase Deposition in MOF
Tri-Pyramid Robot
Synthesis of Priviledged 7-Membered Ring Molecules
Extra Strength Magnesium Alloys
DOPA-Melanin Films
Thickness Sorting of 2D Nanomaterials
Hydrogel Wound Dressing With Controlled Ion Release Properties
In Situ Photocatalytic and Thermocatalytic Activities
Nanodiamond Particle Complexes
Optimized Gamma-Prime Strengthened Austenitic TRIP Steel
ECM Scaffolds for Pluripotent-Derived Cells
Films & Foams for Solvent Filtration
Method to Prepare 2D InSe Semiconductor
Substrate Independent Coatings
Si Nanoparticles for Batteries
Gold Isolation Method
Adhesive Polymer Coating
Nanoporous Materials
Route to Diazeperopyrenium Dication

3—COMMERCIAL VALIDATION

Polymeric Blends formed by Solid State Shear Pulverization
Method of Epitaxial Growth of MgO

MATERIALS AND INDUSTRIAL PROCESSES PIPELINE *(CONT.)*

1 RESEARCH \ 2 RESEARCH VALIDATION \ 3 COMMERCIAL VALIDATION RESEARCH \ 4 MARKET

- Available for Licensing
- Non-Exclusive License/Option
- Exclusive License/Option

Organic Silicate Matrices for Remediation
Novel Materials for Polymer Light Emitting Diodes
Controlling Charge Injection in OLEDs
Crosslinkable Polymer Dielectrics
Unconventional Electro-optic Chromophores
Conductive Tin and Zinc-Doped Thin Films
Organic Semiconductor Materials
Hydrogels for improved tissue graft survival
Graphene Oxide Paper
Transparent Nanowire Transistors
Improved Power Conversion For Organic Photovoltaics
Micro-Textured Surfaces
CNT Reinforced Cement
Organic Photovoltaic Cells
Anti-microbial hydrogel coatings
Micro-surface Texturing System
Kinetic Separation of Olefin/Paraffin with MOF
Nanotube Reinforced Cement
Fabrication of Metal Composite Thin Films
High Accuracy Double-Sided Incremental Forming
Novel Ni-Based Alloys
Majority Graphene 3D-Printed Composites
Stress Manipulated Coating for Figure Reshape of Optics Mirrors
Intense Pulsed Light Annealing of Graphene Inks
Rapid 3D Printing Process for Solid Oxide Fuel Cell Fabrication
Flexible Incremental Shaping of Tubes and Rods
A Fatigue Strength Predictor for Steel Alloys
Double-Sided Incremental Flanging
Global Thermal Control of Additive Manufacturing
Method to Improve Paint Production with Titanium Oxide
Self Assembled Bioadhesives
Electron-Blocking Layer For Improved Organic Photovoltaics
Silole-Containing Polymers
Semi-conducting Nanotubes
Graphite Nanoplatelet Dispersion
Nanoporous Materials
Nanocomposite Film and Paper Production
Al Superalloys for High Temperatures
Gradient Spray Coating Polymer Pen Arrays

4—MARKET

High Conductivity Graphene Inks
Graphene Ink for Gravure Printing
Graphene Ink for Screen Printing
Advanced Alloy Materials by Integrated Computational Materials Engineering
CD-MOFs for Storage of Active Ingredients

SOFTWARE AND SERVICES PIPELINE

1 RESEARCH \ 2 RESEARCH VALIDATION \ 3 COMMERCIAL VALIDATION \ 4 MARKET

- Available for Licensing
- Non-Exclusive License/Option
- Exclusive License/Option

1—RESEARCH

Rapid On-Off Division Duplex for Wireless

2—RESEARCH VALIDATION

Automatic Camera and Display

Interactive Chef

Minimum Area Retiming

Indoor Localization Through Visual Cues

MINT (Materials Interface)

Top Down Proteomics Software Libraries

Fourier-domain Mobility Spectrum Analysis (FMSA)

Net Theater

A Method for Acquiring Intentionally Limited Data and the Machine Learning Approach to Reconstruct It

System and Method for Multi User Two-Way Ranging

VirtualCar: Computational simulation of self-propelling automobiles for aerodynamic design

Private Data Networks: Federated Databases for Mutually Distrustful Data Providers

Radio Resource Management in Large Wireless Networks

Communication System for Rotorcrafts

Protection for IP piracy

My Dream Team: Social Networking Platform to Build Project Teams

Street-Level IP Geolocation Technology

3—COMMERCIAL VALIDATION

MATLAB-to-C Translator

Finding Trending Topics on Social Media

REPET (REpeating Pattern Extraction Technique)

Twitter Profiling Method

Social Media-Based Preference Determination and Recommendation

Real-time Privacy Leakage Detection

Fidelity Software

Sequential Action Control for Predictive Optimal Control

SAFE (Situational Awareness for Events): A Data Visualization System

6DoS (Six Degrees of Separation): Understanding Your Network

Real-Time Patient Volume Predictor for More Accurate Hospital Staffing

Intelligent Audio Software

4—MARKET

A Method to Search Audio Synthesizers Using Vocal Imitation

AppShield: Data Access for Enterprise Mobility Management

Northwestern Assessment of Verb Inflection (NAVI)

A Scalable Trustless Blockchain Distribution Network

Artificial Intelligence & Writing

Administrative Network Manager

Advanced Encryption System

Algorithm to Produce High Performance Steel & Alloys

Digital Language Lab

Marketing Algorithm Based on Social Media

Optimization Software

Chematica:Chemical Networks for Risk Assessment and Management

Motorized Software-Controlled Calibrator for Acoustic Probes

Integrated Scheduling Software

Northwestern | INVO

INNOVATION AND NEW VENTURES

invo.northwestern.edu
@INVOatNU

1800 Sherman Avenue, Suite 504
Evanston, IL 60201