



INGENUITY

CENTER FOR RESEARCH INNOVATION
ANNUAL REPORT
NORTHEASTERN UNIVERSITY
2020

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Agility. Resilience. Ingenuity.

This fiscal year, global events tugged at, twisted, and transformed the essence of those three words—words which Northeastern’s culture of innovation are built on. Through a relentless global pandemic and continuous disruption of higher education, the Center for Research Innovation (CRI) has remained agile and resilient, while celebrating and fostering the ingenuity of the university’s robust research network.

In a year filled with unexpected challenges and profound change, the CRI leveraged the diversity of thoughts and ideas within the university, launching a number of new programs that empower our researchers to realize their potential, successfully prosecute a record number of patents, and continue addressing our world’s great challenges.

However, we will not hang our hat on a single successful year. We will apply our grit and wisdom toward what’s to come. This year solidified that we are agile and resilient—and thrive when challenged. We will continue pushing forward in this manner and eagerly await what the future has in store for the Center for Research Innovation.

Ted Werth
Director of Entrepreneurship



INGENUITY REQUIRES
PROTECTION



INTELLECTUAL PROPERTY



CELEBRATING A YEAR OF UNPRECEDENTED GROWTH

The Center for Research Innovation serves as the nexus of innovation and impact, providing Northeastern researchers the ability to address society's challenges through the commercialization of their boldest ideas.

Protecting Northeastern innovation positions technologies for maximum economic and social impact.

119

INVENTION
DISCLOSURES

up 37% from FY19

210

PATENT
APPLICATIONS

up 13% from FY19

76

GRANTED
PATENTS

up 47% from FY19

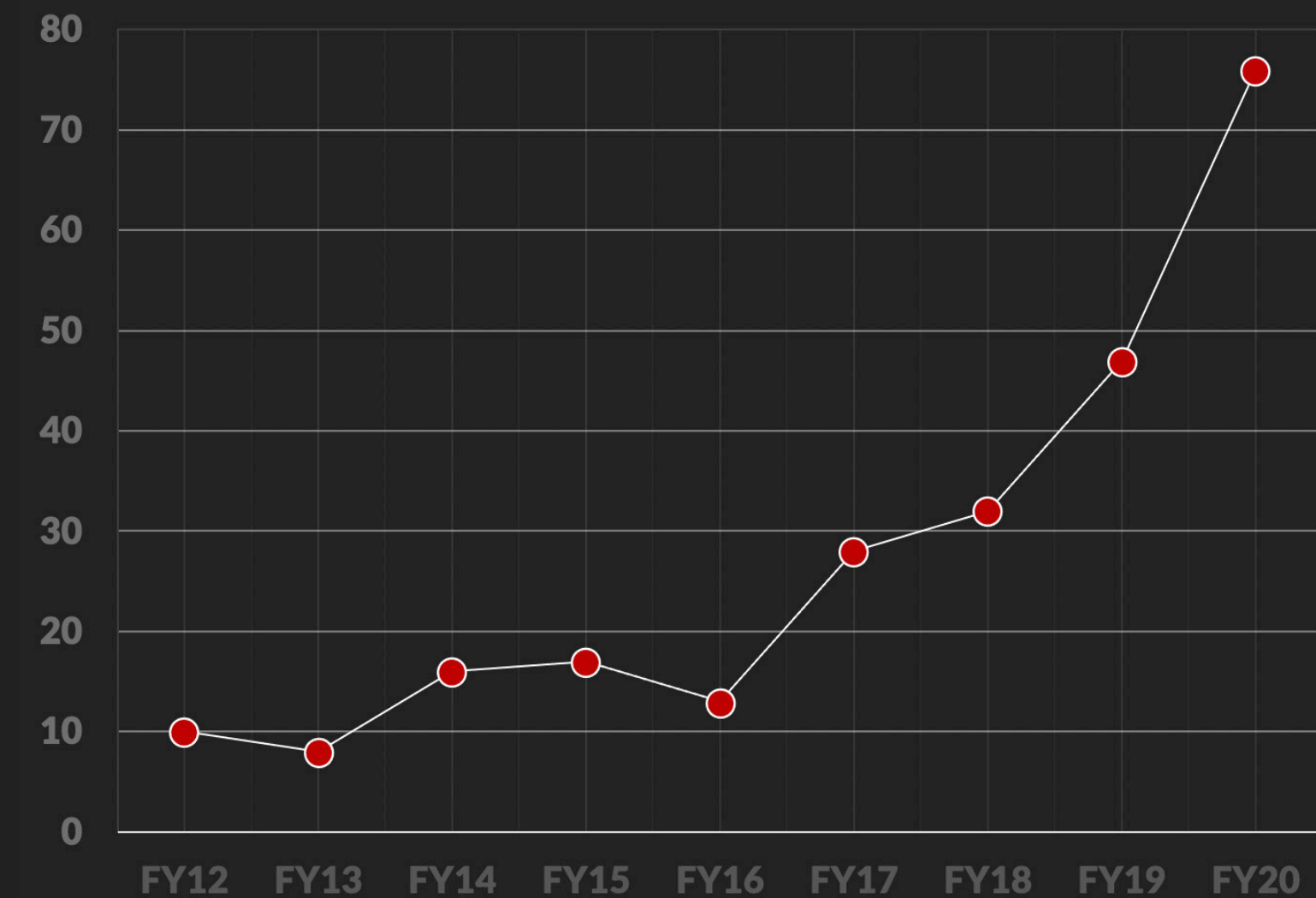
LIGHTNING IN A BOTTLE

Ever since President Joseph E. Aoun announced Northeastern's ambitious academic plan in 2016, the CRI has grown exponentially. The excitement around the university's research imperatives caused a significant increase in patents issued—Northeastern innovators have been awarded 196 patents, with 76 granted in FY2020 alone.

FIVE YEARS IN THE TOP 100

Since its inception in 2010, the **National Academy of Inventors** has published a list of the top 100 universities to have been granted U.S. utility patents from around the world. From 2015–2019, Northeastern has held a place on this top 100 list.

PATENTS ISSUED



INVENTORS AWARDED PATENTS

BOUVE COLLEGE OF HEALTH SCIENCES.....
 SPIRO_PAVLOPOULOS
 RAYMOND_BOOTH
 NIKOLAI_ZVONOK
 MICHAEL_MALAMAS
 MANSOOR_AMIJI
 KUMARA_SUBRAMANIAN
 GANESHSINGH_THAKUR
 ALEXANDROS_MAKRIYANNIS

COLLEGE OF ENGINEERING.....
 ZHENYUN_QIAN
 YUNG JOON_JUNG
 YUN RAYMOND_FU
 YIANNIS_LEVENDIS
 TOMMASO_MELODIA
 THOMAS_WEBSTER
 RIFAT_SIPAHI
 REBECCA_CARRIER
 RANDALL_ERB
 PURNIMA_RATILAL-MAKRIS
 NICOL_MCGRUER
 MING_WANG
 MATTEO_RINALDI
 MARVIN_ONABAJO

COLLEGE OF ENGINEERING (CONTINUED).....
 MAHSHID_AMIRABADI
 LAURA_LEWIS
 JOSE_ANGEL_MARTINEZ-LORENZO
 JEFFREY_RUBERTI
 HANCHEN_HUANG
 GREGORY_KOWALSKI
 EDMUND_YEH
 EDGAR_GOLUCH
 DEBRA_AUGUSTE
 CRISTIAN_CASSELLA
 CONSTANTINOS_MAVROIDIS
 CHARLES_DIMARZIO
 CARLOS_HIDROVO_CHAVEZ
 CAREY_RAPPAPORT
 BRADLEY_LEHMAN
 AUROOP_GANGULY
 AHMED_BUSNAINA

COLLEGE OF SCIENCE.....
 SWASTIK_KAR
 SRINIVAS_SRIDHAR
 SLAVA_EPSTEIN
 SANJEEV_MUKERJEE
 ROBERT_HANSON
 NEEL_JOSHI
 MICHAEL_POLLASTRI
 MENI_WANUNU
 LATIKA_MENON
 KE_ZHANG
 JONATHAN_TILLY
 HEATHER_CLARK
 DORI_WOODS

INVENTED HERE! NOMINEES

The purpose of Invented Here! is to celebrate New England innovators, along with their inventions and stories. Through this program, the **Boston Patent Law Association (BPLA)** transforms the nation's relationship with science and technology, and provides educational opportunities that inform the public of these fascinating projects.



INVENTED HERE! NOMINEE

REBECCA CARRIER

PROFESSOR, CHEMICAL ENGINEERING

LAB:

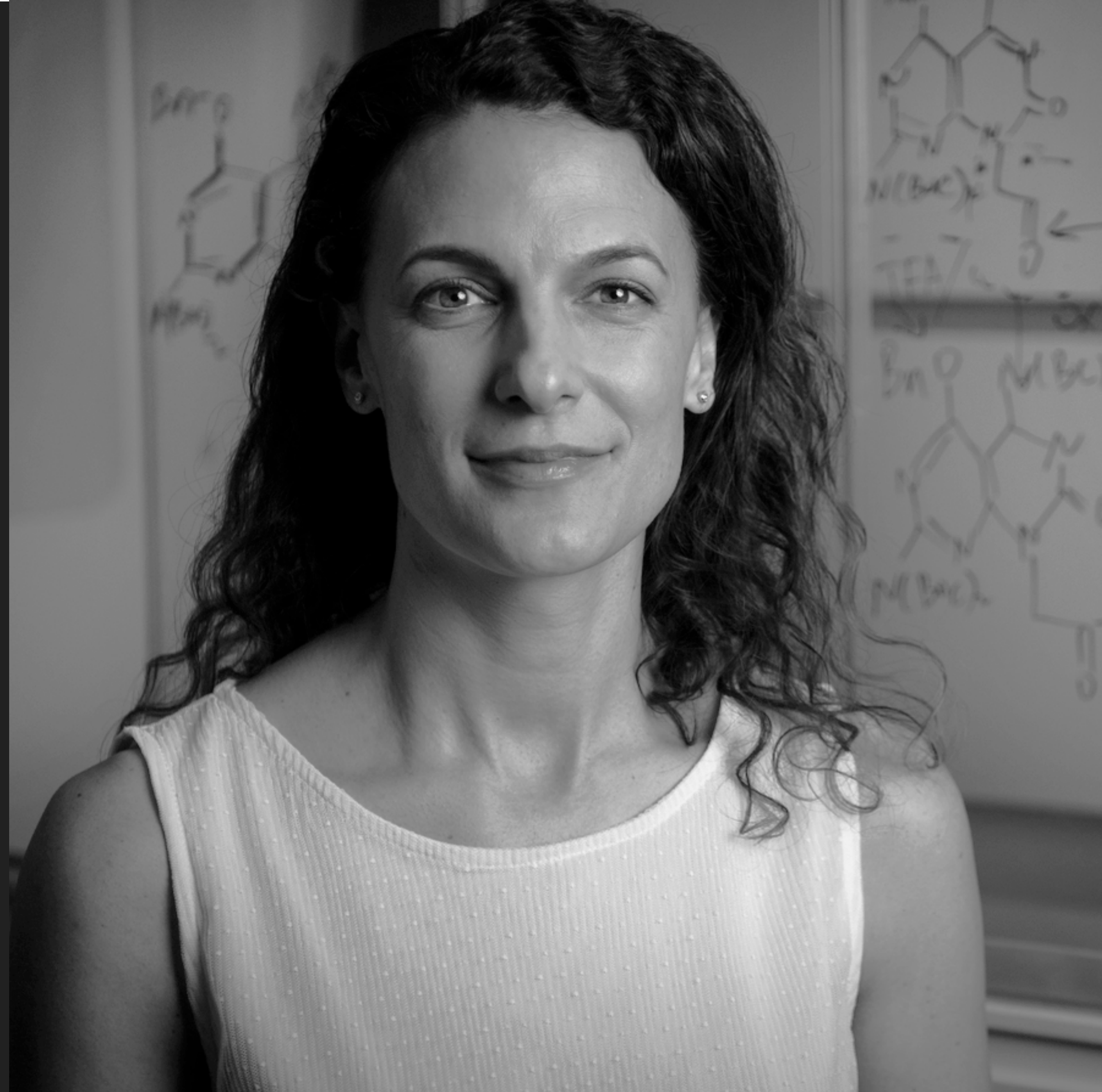
ADVANCED DRUG DELIVERY RESEARCH LABORATORY

EXPERTISE:

DRUG DELIVERY; INTESTINAL ENGINEERING; MICRO BIOME-HOST INTERACTIONS; MUCOSAL TRANSPORT; TISSUE ENGINEERING

PATENT SPOTLIGHT:

DEVICE FOR CONTROLLED APICAL FLOW IN CELL CULTURE INSERTS





INVENTED HERE! NOMINEE

JEFFERY RUBERTI

PROFESSOR, BIOENGINEERING

EXPERTISE:

TISSUE ENGINEERING OF LOAD-BEARING MATRIX (BONE, CORNEA);
BIOREACTOR DESIGN; MULTI-SCALE MECHANOBIOCHEMISTRY; STATISTICAL
MECHANICS; ENERGETICS MICROSCOPY; HIGH-RESOLUTION IMAGING;
BIOPOLYMER SELF-ASSEMBLY

PATENT SPOTLIGHT:

MECHANOCHEMICAL COLLAGEN ASSEMBLY



INVENTED HERE! NOMINEE

BARBARA LEE WASZCZAK

PROFESSOR, PHARMACEUTICAL SCIENCES

EXPERTISE:

ELECTROPHYSIOLOGY; NEUROPHARMACOLOGY; NEUROBIOLOGY;
BEHAVIORAL NEUROSCIENCE; NEUROBIOLOGY AND BRAIN PHYSIOLOGY;
NEUROPHYSIOLOGY; NEURODEGENERATION; NEURODEGENERATIVE DISEASES;
CELLULAR NEUROSCIENCE; IMMUNOHISTOCHEMISTRY

PATENT SPOTLIGHT:

METHODS FOR DELIVERY TO THE CENTRAL NERVOUS SYSTEM OF NUCLEIC
ACID NANOPARTICLES TO TREAT CENTRAL NERVOUS SYSTEM DISORDERS



InnoEd

WHERE INNOVATORS LEARN

ABOUT

InnoEd is where Northeastern innovators learn from experts about protecting intellectual property, launching startups, and commercializing technologies.

COLLEGES REPRESENTED

- BOUVE COLLEGE OF HEALTH SCIENCES
- COLLEGE OF ENGINEERING
- COLLEGE OF PROFESSIONAL STUDIES
- COLLEGE OF SCIENCE
- COLLEGE OF SOCIAL SCIENCES AND HUMANITIES
- D'AMORE-MCKIM SCHOOL OF BUSINESS
- KHOURY COLLEGE OF COMPUTER SCIENCES
- SCHOOL OF LAW

102

FACULTY, STUDENTS, AND STAFF ATTENDED EVENTS

FOUR EVENTS

CRAFTING INVINCIBLE DISCLOSURES

INVESTOR INSIGHTS

IP DISCOVERY SESSION

IP FOR ENTREPRENEURS



INGENUITY IS AMPLIFIED THROUGH
APPLICATION



COMMERCIALIZATION





ABOUT

GapFund360 catalyzes state-of-the-art technologies, advancing Northeastern innovation through prototyping, validation, and industry input.

Gapfund360 awarded over \$600,000 to initiatives that represent BCHS, COE, COS, and KCCS —generating five spinouts.

PHASE I AWARDEES

HYPOXIA-INDUCING CRYOGELS: A HASSLE-FREE AND LOW-COST HYPOXIC CELL CULTURE SOLUTION

SIDI BENCHERIF, THIBAUT COLOMBANI, ZACHARY ROGERS

PHYSICS-INFORMED NEURAL NETWORK PLATFORMS FOR TARGETED DESIGN AND MANUFACTURING OF SOFT MATERIALS

SABA JAMALI, MOHAMMADAMIN MAHMOUDABADBOZCHELOU

A-EYE: A NANOTECHNOLOGY AND AI-ASSISTED ARTIFICIAL CONE CELL CAPABLE OF COLOR AND SPECTRAL RECOGNITION

SWASTIK KAR, SARAH OSTADABBAS, DAVOUD HEJAZI

SCANDROP TECHNOLOGY FOR PRECISION SINGLE-CELL ANALYSES OF CANCER IMMUNOTHERAPIES

TANIA KONRY, GIOVANNI UGOLINI, SAHELI SARKAR

PRODUCTION OF CHEMOTHERAPEUTIC DRUGS FROM THE PERIWINKLE PLANT

CAROLYN LEE-PARSONS

AI-POWERED WIRELESS NETWORK OPERATING SYSTEM

TOMMASO MELODIA, SALVATORE D'ORO, LORENZO BERTIZZOLO, LEONARDO BONATI

PHASE II AWARDEES

CONTACTLESS WIRELESS ENERGY TRANSFER: ANYWHERE, ANYTIME CHARGING SURFACES

KAUSHIK CHOWDHURY, YOUSOF NADERI, UFUK MUNCUK, KAI LI, JERRY GU

UNIQUELY ENGINEERED NONTOXIC MN-FERRITE SUPERPARAMAGNETIC NANOPARTICLES FOR MAGNETIC RESONANCE IMAGING

VINCENT HARRIS, PARISA ANDALIB

BATTERY-LESS INFRARED SENSOR TAGS FOR RELIABLE OCCUPANCY SENSING (BISTROS)

MATTEO RINALDI, ZHENYUN QIAN, SUNGHO KANG

NEW PROGRAM SPOTLIGHT

PRIMED FOR LAUNCH: THE SPARK FUND

In late 2020, The Center for Research Innovation will launch the Spark Fund, an evergreen fund dedicated to investing in technologies from Northeastern's colleges, institutes, and research centers. This platform provides innovators the resources to catapult their early-stage ventures and the critical tools to push their research toward commercial success.

VENTURE CREATION

In FY2020, the CRI played an integral role in the introduction and development of **12** transformational businesses—a significant jump from the seven launched last year.

FOUNDERS AND SPINOUTS

Albert-László Barabási	.....	Foodome
	.....	Nomix Life Sciences
Carolina Mattsson	.....	Money Analytix
David Medina	.....	Syncell Biotechnology
Jose Martinez-Lorenzo	.....	MatrixSpace
Ke Zhang	.....	pacDNA
Kim Lewis	.....	Daros
	.....	Flightpath Biosciences
Leila Deravi	.....	SeaSpire
Raymond Fu	.....	Ainnovation Labs
Tania Konry	.....	NeorahDX
Thomas Webster	.....	Interstellar Therapeutics



**STARTING A COMPANY IS COMPLEX.
ACCELL360 SIMPLIFIES.**

Launched this year, Accell360 offers a comprehensive suite of vetted resources corresponding to each phase of the research-based venture life cycle. These resources empower Northeastern innovators to realize the commercial potential of their technological discoveries.

UNIVERSITY SPINOUTS



- 1 **BASIC RESEARCH**
- 2 **USE-INSPIRED RESEARCH**
- 3 **PROOF-OF-CONCEPT**
- 4 **PRE-SEED**
- 5 **EARLY STAGE INVESTMENT**
- 6 **GROWTH**

SPINOUT SPOTLIGHT

DEEPCHARGE

KAUSHIK CHOWDHURY, PH.D | CO-FOUNDER, PRESIDENT

YOUSOF NADERI, PH.D | CO-FOUNDER, CEO

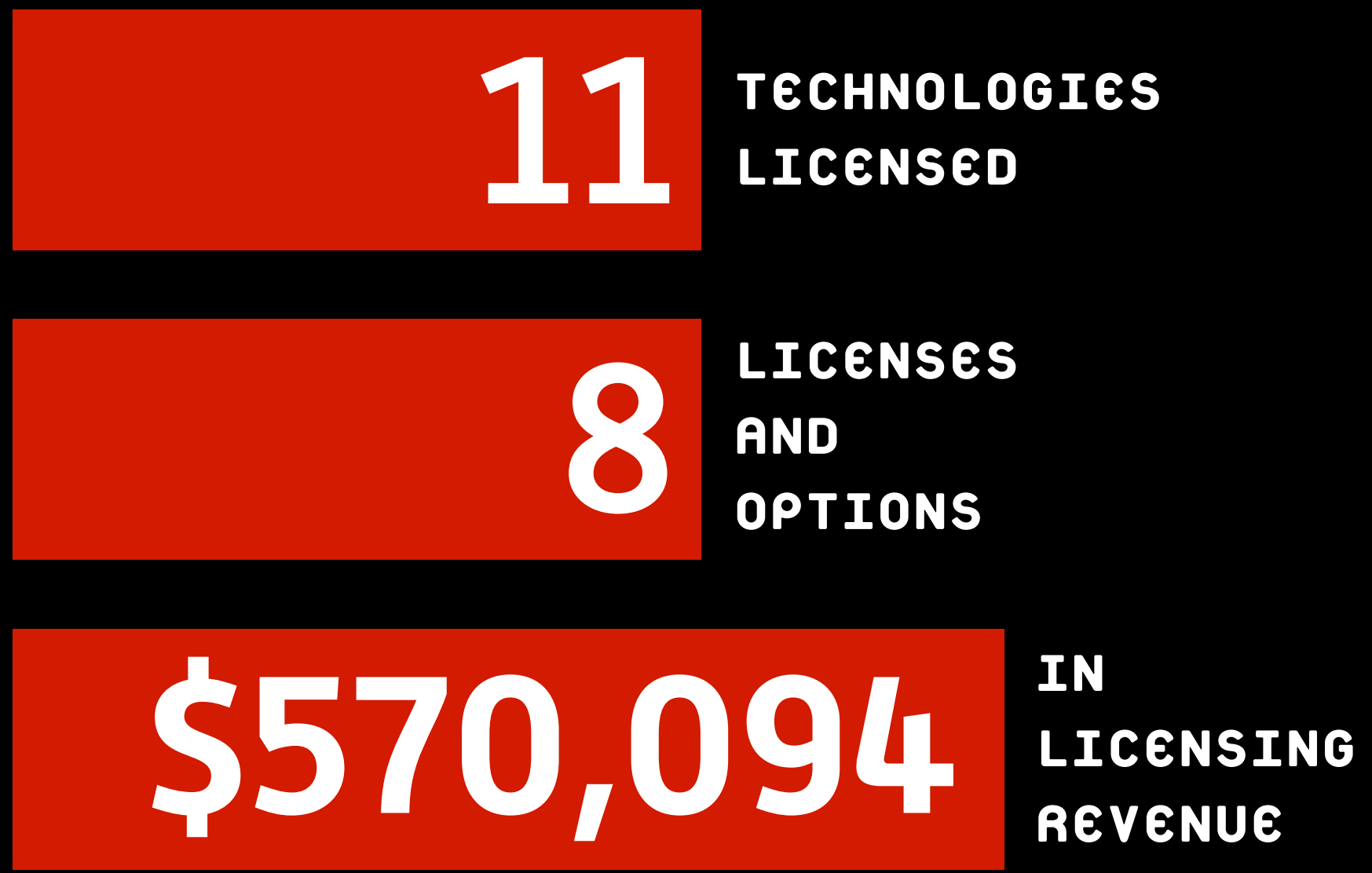
The world runs on wireless devices—cell phones, laptops, and tablets are everywhere. These days, being connected on the go seems to come as naturally as breathing. Unfortunately, wireless devices do not run endlessly. There are some options for wireless charging, but many of these devices are limited to a single device or are specific to a single type of device, thus providing little advantage over wired chargers. Using advances in device detection and wireless transmissions, DeepCharge has developed novel technology that puts wireless charging above all other competition. Using high-tech multi-hop transmitters and smart AI software, DeepCharge can turn entire surfaces into charging stations capable of supporting multiple devices with different hardware, providing simple and seamless charging without wires. With DeepCharge, charging a smartphone is as simple as putting it on the table. This kind of simplicity is what humans look for today.





LICENSING

Commercializing technologies via industry licenses and Northeastern spinouts impacts the home, the workplace, and the commons—generating tangible solutions fostering health, safety, and sustainability.



INGENUITY IS TRANSMUTED THROUGH
AGILITY



RESILIENCE AS RESPONSE
TO COVID-19



COVID-19 REPURPOSED RESEARCH

Even in the face of one of the most daunting public health crises this generation has seen, Northeastern innovators refused to back down, developing new testing methods and pivoting their research toward solving the most pressing healthcare challenges.

ISCENT

Breath-based testing for COVID-19 and other medical conditions

NIAN SUN

NEORAHDX

Novel accurate and rapid COVID-19 testing

TANIA KONRY

TRANSVERSAL THERAPEUTICS

Saliva-based testing for COVID-19 and other medical conditions

MING WANG

[NAME PENDING]

Breath-based testing for COVID-19

JEFFERY RUBERTI



RISE



RESEARCH
INNOVATION
SCHOLARSHIP
ENTREPRENEURSHIP

ABOUT

RISE is the premier showcase for Northeastern's impact-oriented research community. With the rapid onset of COVID-19, the RISE team made a bold decision to transform RISE into a virtual event: charting new territory before virtual events became the "new normal." Students, faculty, staff, university leadership, RISE Judges and Sponsors embraced this challenge with resilience and creativity. Armed with ingenuity and determination, the pivot proved a groundbreaking success enabling a truly global celebration of the university's accomplishments.

SPONSORS

ROGERS CORPORATION

VERRIL

CALDWELL INTELLECTUAL PROPERTY LAW

FOLEY HOAG

HAMILTON BROOK SMITH REYNOLDS

KACVINSKY DAISAK BLUNI (KDB)

MINTZ

SCHNEIDER ELECTRIC

BY THE NUMBERS

RISE PRESENTATIONS 343

RISE PRESENTERS 800+

RISE JUDGES 159

PRESENTATIONS BY COLLEGE

BCHS 118

CAMD 29

COE 78

COS 71

CPS 18

CSSH 13

DMSB 5

KCCS 13

AWARDS

RISE \$9,500

COLLEGE & DEPARTMENT-BASED \$16,000

TOTAL AWARDED TO STUDENTS \$25,500



RESILIENCE SPOTLIGHT

NEORAHDX

BEN BULKLEY, CEO

DR. TANIA KONAY, CSO

Viral testing has received significant attention with the rise of the COVID-19 pandemic. A fast-acting test that can be deployed in remote locations can make the difference between containing an outbreak or widespread infection. NeorahDX has developed a diagnostic test kit for detecting COVID-19 that does not require capital equipment to produce accurate results. The test kit uses a colorimetric design making it easy for technicians to determine test results at the site where the sample was taken. The versatile and fast-acting nature of NeorahDX's design brings rapid testing capabilities to places where they are needed most.





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