I am pleased to present you with Brandeis Innovation’s 2020 Highlights which features our tech transfer and programming activities from the fiscal year starting July 1, 2019. While the year began with much promise, the global pandemic in March 2020 forced our office to transform how we do business while maintaining our support to researchers, inventors, students, and faculty.

Though it was challenging, we were quickly able to shift to remote work. In making this pivot, we also discovered new ways to serve our community that may outlast the pandemic: online events opened up programming to alumni around the globe, digital media replaced print for greater sustainability, and new technologies increased the modalities for accessing our services. All of this led to positive growth, especially in the realm of efficiency, digitization, and global community–building.

Our Sprout, Spark and I–Corps programs continued to support early–stage entrepreneurs, researchers and inventors within the Brandeis community. Our commercialization activities with our full range of services for technology transfer and business development remained strong.

We’re proud of the work that we have done and invite you to explore our many noteworthy accomplishments in the following pages.

Rebecca Menapace
Associate Provost for Innovation and Executive Director, Office of Technology Licensing
Brandeis University is a research leader in the natural, social, physical, and information sciences. Our unique strength is our collaborative spirit.

Brandeis is where Nobel Prize–winning biologist Michael Rosbash and Jeffrey Hall, professor emeritus of biology, cracked the genetic code of circadian rhythms, found in almost all life. It’s where neuroscientist and National Academy of Sciences member Eve Marder studies how neurons adapt to different conditions. And where scientists at the interdisciplinary Materials Research Science and Engineering Center (MRSEC) are devising revolutionary new materials that promise to transform everything from the way we treat disease to build computers.
A History of Innovation

Intellectual Property (IP) created by Brandeis University’s research programs have powered several successful startups, including:

**Syntonix**, acquired by Biogen and spun off as Bioverativ™, developer of two FDA-approved hemophilia drugs: Eloctate™ and Alprolix™; **TheraGenix**, creator of PCR additives to enable better sequencing sample prep; **RC Analytics**, providing data analytics solutions for organizational performance optimization; **Dexela**, producer of Complementary Metal-Oxide-Semiconductor X-ray detection technologies, acquired by PerkinElmer; **ArQule®**, pioneer in small molecules for biomarker-defined oncology and rare disease therapeutics.

Select Brandeis Products in the Market

Partnering with Brandeis University means tapping into our deep expertise in functional foods, neuroscience, research reagents, chemistry, therapeutics, materials science, AI, and data analytics. We have a wide variety of IP and technologies available for licensing. Our diverse portfolio has a strong track record in the market, with 34 active licenses, including:

- **NoCow Energy Bars**: made with coffee flour, a nutritional that preserves the caffeine and antioxidants of coffee
- **Corazonas Heartbars**: Utilizes non-esterified plant sterols to lower cholesterol and promote cardiovascular health
- **Bio-Seeq PLUS**: A portable high precision instrument for detecting trace levels of biological warfare agents through DNA replication
- **Smart Balance®, Earth Balance®, Bestlife™**: All use a Brandeis-developed 1:1 blend of saturated and polyunsaturated fats to improve cholesterol ratios
During 2020, Brandeis Innovation engaged stakeholders in record numbers:

- **793** Event Attendees
- **850** Training Hours
- **1,200** Office Hours
- **240** Mentorship Hours
- **8.2 million** Media Impressions

“Brandeis Innovation provides a bridge between Brandeis innovators and the global innovation community.”

Rebecca Menapace  
Associate Provost for Innovation and  
Executive Director, Office of Technology Licensing
Brandeis Innovation programs serve researchers, inventors, entrepreneurs and industry.

Brandeis Innovation programs support the University’s investigators with a full range of innovation services.

In addition, we foster new entrepreneurial activity among students, faculty and staff with unique programs. Our services to the Brandeis innovation community include:

- Evaluating new invention disclosures and managing intellectual property for those with significant market potential.
- Determining commercialization pathways, seeking qualified licensees and structuring licensing deals.
- Supporting development of industry-academic collaborations, partnerships, funding options and materials sharing.
- Maintaining long-term relationships with licensees, assuring compliance with agreement terms and distributing any income generated by licenses in accordance with the University’s IP Policy.
- Funding new ventures and innovations through our Spark, Sprout, and I-Corps programs.
- Mentoring and training Brandesian entrepreneurs through our Virtual Incubator.
- Creating opportunities for visibility through our events and outreach.
2020 Tech Transfer by the Numbers

**Royalties Generated**
($ millions)

2016
2017
2018
2019
2020

**Inventions Disclosed and Patents Granted**
(US and Non-US)

2016
2017
2018
2019
2020

*Inventions Disclosed*  *Patents Granted Worldwide*
2020 Tech Transfer by the Numbers

- 49 Invention Disclosures
- 46 Patents Issued
- 186 Material Transfer Agreements
- 16 Non-Disclosure Agreements
- 34 Active Licenses
“Two geeks with a great idea, and no business underpinnings,” said SparkTank judge Sean Rush about Embedded Helper, a Brandeis startup seeking to make coding more accessible to people of all levels of programmers. Rush, the president emeritus of Junior Achievement, is in a private room deliberating with fellow judges. They have just finished listening to 13 pitches from red algae additives for cow feed to branded reusable straws, and now, they have to make the challenging decision as to how much money to reward each team, if any.

Brandeis innovation hosted its annual SparkTank Pitch Competition in February of this year. SparkTank 2020 consisted of students pitching to a panel of judges for up to $5,000 of funding with the opportunity to earn another $5,000 in the Summer.

The “two geeks” that Rush refers to are undergraduates Philip Bonmassar ’22 and Jacob Smith ’21. They had built a system, Embedded Helper, that organizes Arduino code. Smith had started this project in the Summer of 2019. Smith, who is the president of the Robotics Club and teaches Arduino workshops to Brandeis students at the library, wanted to make programming easier for Arduino users. He has already been using his software to teach high school students how to use Arduino. Within weeks of receiving the judge’s feedback and consulting with mentors, the team had hired a business member, Aria Pradhan ’21, using their Spark funding. Pradhan is a business and economics major and has served as a co-chairperson for Brandeis’s Student Funds Allocations Board. For Bonmassar, Pradhan, and Smith, there is a long way to go and a future of possibility, and they are just getting started. This is their first stint at building a startup, but their collective skillset and willingness to learn has allowed them to pivot into a better product thus far.

“I would have approached the startup process really wrong without Spark and feedback from mentors because I would have focused too much on the solution and the product rather than the problem that we are trying to solve,” said Bonmassar.
Annually, on Average, Brandeis Innovation Funds

- **Sprout**
  - 7 Teams
  - 36 Participants
  - Up to $100,000

- **Spark**
  - 10 Teams
  - 35 Participants
  - Up to $50,000

- **CORPS**
  - 17 Teams
  - 41 Participants
  - Up to $35,000
From LinkedIn to online portfolios, it seems that today’s workforce has a range of technology platforms to choose from when it comes to finding satisfying work and growing their careers. However, one segment of the workforce has been systematically left behind, at least till now: neurodivergent workers. Autistic workers in particular face unique professional challenges in settings that require so-called “soft skills,” which emphasize social interaction. And with soft skills increasingly seen as a competitive advantage, that means solutions are needed - for the worker and in the workplace.

Prof. Joanne Nicholson, a clinical and research psychologist and Professor of the Practice at the Heller School for Social Policy and Management, saw this gap in support for workers with mental health conditions and those who are neurodivergent, especially those in the early stages of their careers. Her solution was to build an app, based on the latest research, that would help employees manage such soft skills as social interaction, planning, and emotional intelligence. The app, WorkingWell, aims to be a suite of digital tools to improve work satisfaction and performance for neurodivergent workers.

By providing widely-recognized productivity tools such as goal-setting, reminders, and self-reflection, WorkingWell adapts digital tools used by many professionals to the unique needs of the estimated 20% of American adults who are neurodivergent.

Joanne brought the idea to Brandeis Innovation on the recommendation of a colleague. Meeting with Associate Provost for Innovation, Rebecca Menapace, she learned about the many supports that the virtual incubator program offers faculty. Joanne and her team participated in the National Science Foundation I-Corps program, which helps researchers identify the commercial potential for their inventions, understand their target market, and build a business model. They also received funding from Sprout, the Innovation Center’s Faculty Spotlight: Joanne Nicholson, Ph.D.
accelerator for bench research. Through both programs, the team received mentorship, training, and support that helped them explore pathways to launching WorkingWell as an app available to the public.

From there, WorkingWell went beyond the boundaries of Brandeis to two important external programs that Brandeis Innovation has strong relationships with: MassChallenge and the national I-Corps program. MassChallenge, one of the world’s most prestigious startup accelerators, has long partnered with Brandeis, accepting many of our leading innovators into their startup competition. WorkingWell participated in MassChallenge’s 2020 healthtech cohort, gaining new industry connections. Later, they were accepted into the NSF I-Corps National program, a rigorous 7-week platform for launching the nation’s most innovative university-born technologies. Working alongside startups from MIT, Cornell, and more, they conducted customer discovery to learn more about the needs of workers and workforce development programs. This helped them further expand WorkingWell’s reach, impact, and usefulness to its target communities.

At the same time, WorkingWell won a partnership with the Massachusetts Department of Developmental Services (DDS) to bring the app to local workplaces. That led to the development of a second prototype of the app, this time focused solely on the needs of autistic workers. With each step, Joanne and her team have refined their idea, strengthening its social impact potential. WorkingWell is well on its way to becoming a go-to app for neurodivergent Americans to excel and feel supported in the workplace.

“Thanks to the Brandeis Innovation Center, we have been able to look at our invention in new ways that we had never thought of,” says Joanne. “These programs have really helped us to learn the business side of science. It’s not enough to have a great idea. You also need to have a path to bring it to market, with the right tools to approach your research from the perspective of your customers. Brandeis Innovation gave us that toolset.”

— Joanne Nicholson, Ph.D.
Meet the Current I-Corps Teams

Predictive Model for Food Safety
Christopher Doona, Florence Feeherry, Edward Ross, Kenneth Kustin, Frida Petersen Albert, Maneesh Ramanadham, Kelly Zheng

This invention is a MATLAB based food safety management tool that utilizes a mathematical predictive model for microbiology evaluation of microorganisms. The technology will be particularly beneficial for food shelf life safety analysis within a food supply chain: supplier, manufacturer, distributor, and retailer such as supermarkets.

The technology also addresses the biochemical reasons underlying changes in bacterial population dynamics and provides a way to control target microorganisms when designing product formulations, or when processing foods with parameters as pressures, temperatures, or other agents to achieve effective pasteurization, disinfection, or sterilization of food, for example, in dairy industry.

Beneficially Stabilized Probiotics in Fat-Containing Spreads
Dan Perlman, Sining Sun, Jiujun Zhang, Kanjun Li, Keren Sun

Probiotics have become a major factor in the choice of foods by health-conscious consumers and provide a number of benefits. This invention enables cheaper and faster manufacturing of low water activity fat-containing probiotic spreads and butters made from nuts, seeds and beans, with long-term survival of probiotic particles in the butter and extended shelf life.

The technology introduces a manufacturing method for health butters and spreads made from blending anhydrous probiotic bacteria slurries in vegetable oil prior to crystallization of the structuring fat. No cold storage will be required to maintain probiotic bacterial viability over 12-month, which benefits packaging and transportation.

AdaptaMaze
Shantanu Jadhav, Jacob Olson, John Bladon, Xin Yao Lin, Faye Raymond

Systems neuroscientists strive to understand the brain. The field often records rodents foraging for rewards to learn about learning, memory, and addiction. Currently, behavioral tracks are developed individually by graduate students inexperienced in mechanical and electrical engineering. This practice costs time, money, and limits experiments. The AdaptaMaze system for behavioral rodent experiments is customizable, adaptable, and scalable. The solution allows scientists to complete better experiments faster, advancing our understanding of the brain.
NLP Project
Arnold Kamis, Mahesh Neralkar, Chris Minkwon Choi, Yonah Shafner

Drug development is a complicated and time-intensive and money-intensive process, with the timeline from when a potential candidate is discovered to when it is brought to market, can be as long as 12 years. There have been many computational and machine learning approaches for drug discovery with great success. Our goal is to use the parsing of PubMed abstracts using Natural Language Processing methods to determine drug repurposing candidates given a search term. The first step is to find key features or words that can help us determine if a compound or a drug is a candidate or not. We will do that using known repurposed drugs and then test on novel drugs.

HydroGel
Bing Xu, Quixin Zhang, Christian Gochez, Levi Goldfarb

A hydrogel—as the name suggests—is a gel that consists of over 90% water. Although mixtures with such a high concentration of water are usually liquids, certain solutes are able to cross-link with enough tensile integrity to form an internal mesh, allowing water to take on a 3-dimensional, semi-solid structure. These solutes vary, but Dr. Xu’s lab combines short peptides with small bioactive molecules that then self-assemble into what is essentially an interlaced peptide web, able to retain a significant amount of water within a few seconds. This hydrogel exhibits distinct properties such as instant formation, biocompatibility, and oxygen-permeability, which render it great potential in the emergency medical industry.

Support with Research
The Office of Technology Licensing provides support in the form of mentor introductions and training sessions.

Customer Discovery Funding
Up to $3,000 is provided to each team for expenses related to customer discovery and equipment or materials.

Eligibility for Future NSF Funding
Teams that successfully complete I–Corps training become eligible to apply to the NSF I–Corps Teams Program to receive additional support—in the form of mentoring and funding (up to $50,000)—to accelerate the translation of knowledge derived from fundamental research into emerging products and services that can attract subsequent third-party funding.

Working Well
Joanne Nicholson, Kush Singh, Wentao Li, Bertha Asare

WorkingWell (WW) is a research-based, feasibility-tested mobile app to help people with mental illness succeed at and sustain employment. WW users set and achieve goals, establish routines, learn to get along with others, and develop coping skills contributing to workplace success and tenure. WW fills the gap between what we know about mental illness and employment and what we do about it, to enhance individual outcomes and reduce employer/employee assistance, state agency and provider costs.
Meet the Current SPROUT Teams

**AdaptaMaze**

Jacob Olson, Shantanu Jadhav, Chris Leplla, John Bladon, Faye Raymond, Xin Yao Lin, Mattias Karlsson

Observing the behavior of rats in well-designed mazes is key to studying how mammal brains work. However, creating effective mazes that can also be replicated precisely by other researchers is expensive; using more informally-constructed mazes makes it harder to replicate experiments. AdaptaMaze solves this problem with an affordable modular maze that includes all current standard behavioral components, including reward delivery, cues, and automatic barriers. AdaptaMaze can change configurations quickly (<30 minutes), enabling behavioral experiments on multiple automated mazes in the same space within a single day. The features will enable experiments not currently viable with inflexible behavioral mazes, all without the costs that come with behavioral maze design. With AdaptaMaze, scientists can complete better experiments faster, letting them do what they do best - advancing our understanding of the brain.

**Radiopaque Endoscopic Tattoo for Lesion Marking at Colonoscopy**

Andrea Fribush, Bing Xu, Jiaqi Guo, Rong Zhou

Accurate marking of specific anatomic sites of lesions discovered at colonoscopy is critical for marking tumor for surgery and for follow-up testing. Spot-Ex, a sterile carbon black suspension which is injected during colonoscopy into the lining of the colon at the tumor site, is the clinical standard which is widely used around the world for permanent endoscopic marking, also called tattooing. It offers excellent tissue stability and durability, but is invisible to X-ray or CT scan. This project will develop a new marker that could be detected by routine preoperative CAT scan and at laparoscopy, and maintain equal staining darkness and tissue stability to Spot-Ex. This would aid the surgeon in precise and efficient tumor localization and removal. For lesions that do not require removal, in the colon or in other regions such as the upper gastrointestinal tract, this marker would aid in long-term followup of lesions that need to be observed.

**Mannosidase Inhibitors in HIV Vaccination**

Issac Krauss, Mahesh Neralkar

Many pathogens such as HIV, Ebola, and Hepatitis C Virus are coated with high-mannose carbohydrates. In the case of HIV, it is well-documented that these carbohydrates can become a target of potent and broadly neutralizing antibodies in some infected individuals. Krauss’ team used directed evolution to design high-mannose carbohydrate vaccines that closely mimic the surface of HIV. This novel method for HIV vaccine creation uses versions of these carbohydrates to encourage antibody formation, in particular when the vaccine is used in conjunction with a therapeutic agent.

**Functional Heat Storage Materials for Heating Engine Oil**

Mihael Gerkman, Grace Han, Alejandra Gonzalez, Yuran Shi

In areas where temperatures often drop below -10 °C, such as the northern US and Canada, cars have trouble starting up due to viscous oil. Keeping oil warmer overnight often involves using energy-intensive heaters. This novel material is capable of storing the waste heat generated by a running engine between -30 and 50 °C for up to one month, making it possible to keep engine oil warm without running a heater for the purpose, saving energy and extending the life of the engine. Han’s team has developed and tailored a group of phase change materials for this purpose with their 2019 Sprout award. They will continue the project by scaling up the synthesis of new materials and developing the initial prototype. The project was featured in Chemical and Engineering News.
WorkingWell
Joanne Nicholson, Chris Burns

WorkingWell (WW) is a mobile app designed to provide support for people with behavioral health (BH) conditions in the workplace. Currently, the app focuses on adults (age 16 to 64) with Autism Spectrum Disorders (ASD) who, in collaboration with employers, employment specialists, educators, or caregivers, will set goals, establish routines, and improve interpersonal relationships. WW-ASD will focus specifically on coping skills promoting the transition from education to employment, workplace success, and job tenure. WW-ASD will reduce costs associated with preparing, hiring and supporting employees with ASD by shifting from in-person-only supports, provided by company, agency or school personnel, to a technology-based solution, as an adjunct or independent source of support.

From global warming to infectious disease, Brandeis innovators are creating breakthroughs that have the potential to improve the lives of millions around the world.

Rebecca Menapace
Associate Provost for Innovation and Executive Director, Office of Technology Licensing
Meet the Current SPARK Teams

**NourChemie**
Alexander Berlin (Graduate Student, Heller), Isabelle Kaplan (Graduate Student, Heller), Sokunpharady Kao (Graduate Student, Heller), Kumba Gaye (Graduate Student, Heller), Amir BenAmeur (Graduate Student, Heller)

NourChemie is a holistic waste management solution that converts organic waste into clean energy and soil supplements. They plan to assemble a management plant incorporating extant biogas generation technology, biogas cleaning technology, and a public-private partnership with the government of Sfax, Tunisia, to collect organic waste from the local fishing and olive oil industries. They will convert this waste into Renewable Natural Gas which they will sell directly to a local natural gas plant, and Biochar fertilizer which they will sell back to the olive oil plantations where they collect waste.

**UniSelfCare**
Frances Maher (Undergraduate Student, Biology), Alex Rodriguez (National Human Genome Research Institute), Klodeta Janaqi (Graduate Student, Brandeis IBS), Daniel Hariyanto (Undergraduate Student, Computer Science)

UniSelfCare is a free innovative app platform that serves as a central hub for managing self-care activities that improve mental wellbeing, which can increase both work productivity and quality of social relationships. Users can access free self-care resources such as the self-care rewards platform, self-care/mental health guides, self-care calendar/tracker, a journal, mindfulness games, and other resources. Users will have the opportunity to submit requests for other self-care resources they would like to see on the app. The self-care rewards platform connects users with small businesses branded as “self-care spaces” to get “self-care points” to be redeemed for gift certificates at partner businesses as a reward for engaging in self-care.

**StudyEng**
Eddy Vien (Graduate Student, Heller), Dinar Kharisma (Postdoc, Heller), Brontte Hwang (Graduate Student, Heller)

StudyEng is a for-profit social enterprise dedicated to providing affordable and quality English test preparation materials for TOEFL and IELTS, an English test required for anyone wanting to study abroad in western universities, and is focused on undergraduate university students who come from a lower socioeconomic background. Because it is expensive to get private tutoring and join an English course in Indonesia, StudyEng is mainly online-based, allowing it to reach many different students from all over Indonesia. It will also offer tutoring services for a slightly higher price—but still affordable—to provide a range of services for students depending on their budget and needs.

**Claster**
Iris Hao (Undergraduate Student, Business), Hangyu Du (Undergraduate Student, Computer Science), Huiyan Zhang (Undergraduate Student, Economics, Sicheng Chen)

Claster aims to make peer tutoring more standardized and thus more efficient. Findings show that students in entry level science classes have a strong need for tutoring. Peer tutoring is a competitive alternative of professional tutoring because it is more affordable, flexible, and peer tutors can share their experience taking the same class. The team has made a website as a prototype product, a platform that supports tutor matching and discussion. In the future, Claster plans to launch a mobile version of the product. The website and app will be able to incentivize peer to peer communication and provide students with better and affordable study aid through peer tutoring.

SPARK

Brandeis’ SPARK Program is designed to encourage and support entrepreneurial activity within the Brandeis community, including students (graduate and undergraduate), postdocs, faculty and staff. The awards are intended to help bring ideas and entrepreneurial ambitions to life.

SPARK
**Alga Viva**

Kathryn Dix (Graduate Student, Heller), Ilter Cakmak (Graduate Student, Heller), Torey Hart (Graduate Student, Heller)

AlgaViva is a for-profit social enterprise whose mission is to mitigate climate change while advancing the livelihoods of small scale farmers in coastal Latin American and Caribbean communities. AlgaViva partners with struggling fishing cooperatives in order to facilitate a transition to sustainable seaweed farming. The product—red seaweed—will then be sold to animal feed manufacturers in the United States because adding just a sprinkle of seaweed to a cow’s diet reduces methane gas production by over 50%!

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**Embedded Helper**

Philip Bonmassar (Undergraduate Student, Mathematics), Jacob Smith (Undergraduate Student, Mathematics)

Arduino is an open source platform for electronics prototyping used by many researchers and Universities. Arduino Libraries are the best way to share, organize, and store Arduino computer programs. Embedded Helper, an Arduino class generator, is a tool which converts Arduino Sketches into Arduino Libraries. From an arduino sketch, it makes: a library, along with keyword and example files. It also generates comments and standardizes good programming practices. This tool could save advanced programmers the time of typing out a class from a sketch, and could be used to encourage good programming practices like private variables. In addition, this tool could help programmers who might not format their code for easy sharing to do so.

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**Polify**

Jacob Radparvar (Graduate Student, Heller/Tufts), Benjamin Pockros (Graduate Student, Heller/Tufts)

Polify is an application that helps university students understand their health benefits and connect with local providers. The application will inform students of their copay, coinsurance, and contribution towards deductibles in a friendly, digestible format. Polify will be a tool for students to identify local providers, learn about covered services, and read reviews about providers from other students on campus. Polify can also be a tool for university health centers to send out notifications about flu-shots, blood drives, and campus wellness events. Polify has the potential to become a student’s all-encompassing portal for managing their health.

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**SPARK was a life-changing experience. It’s one of the best things to happen at Brandeis.**

Charlie Kim, '19
Founder, SpeechFlow

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**iMyoFit**

Shen Wang (Graduate Student, Neuroscience), Vivekand Vimal (Staff, Biology), Tim Hebert (Staff, Maker Lab), Hazal Uzunkaya (Staff, Maker Lab)

iMyoFit will provide cheap technology to the average weight lifter, physical therapists and trainers that detects electromyography (EMG) signals from muscles and provides real time visual and vibrotactile feedback on the extent of muscle activation. Their novel software will provide cutting edge analytics on performance, learning and retention that is obtained from current research in motor science.

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It was a great experience for me and I actually landed my summer internship at a biomedical device company because of it.

Yawai Soe, MBA '19
"We bring together interdisciplinary teams because it is diversity, in all its forms, that sparks the best thinking."

Rebecca Menapace
Associate Provost for Innovation and Executive Director, Office of Technology Licensing

Diverse Projects, Common Goals

In FY ’20, Brandies Innovation teams represented a cross-section of the fastest-growing tech sectors today:

- Sustainability: 16%
- Functional Foods: 10.5%
- AI: 26%
- Robotics: 5.5%
- EdTech: 5.5%
- Biotech: 10.5%
- HealthTech: 26%
Cultivating a community through Innovation
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