From a novel video game controller, to a new cohort of mission-driven organizations, to the 2017 opening of a state-of-the-art innovation hub, stories of positive change in the Johns Hopkins Technology Ventures (JHTV) community abound.

GEAR, a device designed by three Johns Hopkins biomedical engineering graduate students, allows gamers without the use of their hands to play video games using foot controls. The team has received numerous accolades and worked with the JHTV tech transfer team to obtain a provisional patent.

The Social Innovation Lab (SIL) recently welcomed its fifth cohort. Each of the 10 nonprofits and mission-driven for-profits has already shown traction as they work to better their communities in unique and powerful ways. SIL will provide the mentorship and resources these social entrepreneurs need to bring lasting change to Baltimore and beyond.

Just months after FastForward 1812 opens its doors in East Baltimore, FastForward Homewood will move into its new home. The innovation hub currently located in the Stieff Silver Building will shift operations to R. House in Remington. FastForward Director Brian Stansky says the new innovation hub’s combination of private and shared workspaces, offices and laboratories will help startups plant roots and grow in Baltimore.

Aside from an appreciation of Baltimore, the common denominator for the emergence of these three successful startups is Johns Hopkins Technology Ventures. Each has relied on JHTV for support related to space, funding and services, the key ingredients for startup success.

FastForward Homewood to Get New Purpose-Built Space in Remington

By mid-2017, the FastForward Homewood innovation hub operated by Johns Hopkins Technology Ventures will have a new home in an exciting space designed to help startups grow into successful businesses.

FastForward Homewood, the first innovation hub Tech Ventures developed to support startups with much-needed affordable space, will move from the Stieff Silver Building to R. House, a historic warehouse renovated by Seawall Development. The move puts the innovation hub even closer to the Johns Hopkins Homewood campus, requiring just a 10-minute walk.

The new FastForward Homewood space will occupy 9,000 square feet of the second floor of R. House, which sits in Baltimore’s burgeoning Remington neighborhood. As a bonus, hungry entrepreneurs will have the opportunity to retreat downstairs to the building’s 30,000-square-foot food hall that operates independently of Tech Ventures and features creations from local

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Faculty Spotlight Interview:
Don Zack, M.D., Ph.D., Professor of Ophthalmology

Dr. Don Zack

This article is part of a series highlighting some of the faculty members at Johns Hopkins who are actively collaborating with industry. Zack is on the faculty at the Wilmer Eye Institute at Johns Hopkins and is currently working with Bayer HealthCare to develop a new treatment for age-related macular degeneration.

Don Zack began his Johns Hopkins tenure with a postdoctoral fellowship in glaucoma and molecular biology. During that time, he saw the opportunity to pursue his clinical interest and basic science research in a collaborative setting. That, combined with having family in town, convinced Zack to stay. In 1991, he joined the faculty at the Wilmer Eye Institute. After more than 20 years, Zack gave up his clinical practice at Wilmer and transitioned to full-time research.

Have you collaborated with industry in the past?
Yes, but nothing on the same scale as the Bayer deal. I have worked with Alcon, Allergan, Pfizer and Merck, but those industry collaborations were for relatively small projects in which they provided funding to support the testing of specific compounds.

A donation from Robert Smith, who is one of the namesakes of the Robert H. and Clarice Smith Building, allowed us to purchase Wilmer’s first high-content screening system. This equipment sped up our research efforts related to identifying small molecules for ophthalmic therapeutics. This ultimately led to the Bayer collaboration.

This has been a unique experience. Bayer is doing more than exchanging money for the performance of research. It has invested a huge amount of scientific work and contributed as a real scientific partner in each funded project.

Can you describe the project you are working on with Bayer?
Macular degeneration involves retinal deterioration caused by the death of retinal cells. If these retinal cells do not function properly, vision is not possible. Our Bayer-funded project aims to identify small molecules that promote the survival of these retinal cells. Such a discovery would help people diagnosed with early-stage macular degeneration to lose vision slower, or not at all.

And we’ve made progress. We have discovered an important molecule that mediates retinal cell death, and this could one day be leveraged as a potential drug target in the treatment of macular degeneration.

How has the scientific interaction with Bayer been thus far?
Overall, working with Bayer scientists adds a lot to the projects. In addition to their technical knowledge, they have expertise in high-content screening and access to a wealth of resources for therapeutic development.

This collaboration is a learning experience as the two cultures blend, but both sides are working hard to learn and adapt to each other. Bayer offers its employees the opportunity for sabbaticals to get trained in new and different areas. Throughout the duration of the Wilmer-Bayer collaboration, Bayer employees will spend time at Johns Hopkins in three- to four-month stints.

Is it attractive to academic investigators to work with a company like Bayer, which has the ability to translate early-stage research into the clinic and eventually bring the therapies to patients? Johns Hopkins is always looking for partners to move treatments into the clinic. With the high-throughput drug screening capabilities of pharmaceutical companies, the chances of identifying a molecule that will transform treatment of macular degeneration, and ultimately patient outcomes, are greatly enhanced through industry partnership like this one.

What advice do you have for faculty members who are thinking about partnering with industry?
When collaborating with industry, you need to be aware of the company’s needs, strengths and perspective. You may hit some rocks along your path, but keep pushing forward. And remember, the money from these partnerships is not the only benefit. With industry collaborators, you get access to their experts, who are extremely knowledgeable and have access to a wealth of resources.

Innovative Controller Gets Gamers with Limited Use of Their Hands in the Game

M ost video games reward finger dexterity, and this prevents those with no or limited use of their hands from participating. While foot-operated video game consoles already exist, they tend to be clunky and lack the sensitivity of their hand-controlled counterparts.

Three Johns Hopkins graduate students are changing the video game experience for disabled gamers with a device that allows them to play using comfortable, sandal-like shoes equipped with buttons that users can engage with the soles of their feet.

Called Game Enhancing Augmented Reality, or GEAR, the device is “very different from what’s out there right now,” says team leader Gyorgy “George” Levay, who lost his hands to a meningitis infection five years ago.

Unsatisfied with current foot-operated video game consoles, Levay — who considers himself a moderate gamer with no favorite video game in particular — decided to come up with something better during a biomedical engineering class he took last fall for his master’s degree from the Whiting School of Engineering.

From left to right: Adam Li, Gyorgy Levay and Nate Tran
Impact Bootcamp Inspires Baltimore’s Next Social Entrepreneurs

From Johns Hopkins University undergraduates to established professionals, more than 100 people attended the Impact Bootcamp on Oct. 1 to learn how they could bring positive change to their communities.

The all-day event organized by the Social Innovation Lab included four sessions that helped people develop, put into action, market and protect their ideas. Though an eight-hour event could never replace the funding, mentorship, office space and workshops that the six-month Social Innovation Lab program uses to accelerate nonprofits and mission-drive for-profits, the Impact Bootcamp offered a comprehensive introduction.

“The goal for the bootcamp is to provide Baltimore-area residents an opportunity to develop the skills they need to launch and lead projects that will make a difference in the city,” says Social Innovation Lab Director Darius Graham. “In addition to learnings, this day provides them the opportunity to connect with other changemakers and find potential partners.”

Among the attendees was Jenna Shaw, the director of technology and creativity at Baltimore’s Liberty Elementary School No. 64. In April 2016, Shaw started an organization called The Whole Teacher to increase educator retention by providing them health and wellness services.

In addition to being able to better position her organization when she writes or speaks about it, the sessions improved how she maps out short- and long-term goals.

“The bootcamp provided information that people need to have to be successful,” Shaw said. “This is all stuff that once you look at it, it makes a lot of sense. But without a background in social entrepreneurship, this was all new to me, and I had no idea where to find it.”

Chris Guzman, an organizer of the Baltimore Hackathon, echoed those sentiments. He said he will use the information while organizing the next Hackathon scheduled for spring 2017. The community event attracts hundreds of people interested in coding to solve an issue within the community for a chance to win prizes.

“Often, people start out with ideas that are well-intentioned but ineffective,” Guzman said of what he learned at the Impact Bootcamp. “I got a lot of information about how to build off your original idea so that you can implement it.”

Aside from the sessions, Guzman stated the value of engaging with like-minded individuals. “During Bootcamp, we were able to spitball ideas with the people next to us. That really supercharged a lot of people,” he said. “It provided a different perspective on your own project.”

Graham said he saw the potential to drive change in Baltimore everywhere he turned at the event, and that is largely a credit to the attendees’ attitudes. “I was impressed – though not surprised – by the level of passion, dedication and thoughtfulness that all of the participants showed in their efforts to impact others’ lives,” Graham says. “It was a long day with a full schedule, but after it was over, people stuck around or emailed later to share how inspired and energized they were to move forward with their projects.”

The device recently won the $7,500 grand prize in the 2016 Intel-Cornell Cup, in which student inventors were judged on innovative applications of embedded technology. It was a finalist in the 2016 Johns Hopkins Healthcare Design Competition, organized by the university’s Center for Bioengineering Innovation and Design, which is based within the Department of Biomedical Engineering.
At the 2016 Alliance of Science and Technology on Oct. 6, two groups of Johns Hopkins faculty members and a Johns Hopkins startup received awards totaling $100,000. A collaboration between Johns Hopkins and the University of Maryland, Baltimore, the event is designed to increase the number of technologies spun out of the two institutions and expedite their entry into the marketplace.

The Johns Hopkins winners are as follows:

**Academic Award**
Aaron Chang, a former Innovation Fellow in the Department of Biomedical Engineering, received $25,000 for Renalert, a system that prevents acute kidney injury.

**Abell Foundation Award**
School of medicine professors John Murphy and William Bishai received $50,000 for their work to develop a Treg-depleting cancer immunotherapy.

**Maryland Department of Commerce Life Prize Award**
Omar Ahmad, the director of innovative engineering at the school of medicine, and John Krakauer, the director of the Center for the Study of Motor Learning and Brain Repair, helped co-found Max and Haley LLC, which won $25,000. The company is developing hardware, software and treatment protocols to improve stroke rehabilitation.

Congratulations to Quantified Care, the winner of Boston Health 2.0’s Start-Up Stand-Up event. On Sept. 27, the startup founded by a group of Johns Hopkins students presented its multimedia approach to care coordination to a large audience and distinguished panel of judges before taking home the Boston Health 2.0 Stand Up Award trophy. Quantified Care participated in the DreamIt Health Baltimore accelerator.

On March 14, Johns Hopkins Technology Ventures (JHTV) will take the stage at South by Southwest. The conference in Austin, Texas, invited Darius Graham, director of the Social Innovation Lab, to lead a session titled “Lessons on Building an Urban Ecosystem.” During this session, he will share the lessons JHTV has learned from its recent efforts to help build a robust ecosystem that supports entrepreneurs and innovators.

If you’ve visited FastForward East and thought, “This place is snazzy,” you’re not alone. Inc. named the innovation hub one of the 15 snazziest offices in the Baltimore area. The Inc. expert praised FastForward East for its “exposed and high ceilings accompanied by the bright colors [that] immediately make the space pop.” Check out the complete list here!
Personal Genome Diagnostics (PGDx) announced its participation in the Cancer Moonshot initiative that Vice President Joe Biden has championed. PGDx, founded in 2010 by cancer researchers at The Johns Hopkins University, will focus on the emerging field of cancer liquid biopsies. With its participation, PGDx aims to move forward the development of a framework that increases the clinical utility of liquid biopsies and allow faster FDA approval of safe and effective blood profiling technologies. Read more here.

The National Cancer Institute of the National Institutes of Health recently awarded Papgene a Fast-Track Small Business Innovative Research award to commercialize a test for the surveillance of recurrent bladder cancer. Papgene, a tenant at FastForward Homewood, will initially receive about $300,000 but could receive an additional $1.9 million if it demonstrates the accuracy of the test and its clinical validity. Read more here.

Glyscend has enjoyed an amazing fall. First, the company founded by three Johns Hopkins University students and two Johns Hopkins clinicians won second place at the 2016 Diabetes Innovation Challenge. Then on Nov. 14, it was named one of three winners of the World Without Disease Quickfire Challenge. In taking second place at the 2016 Diabetes Innovation Challenge, the tenant of FastForward East was one of more than 60 applicants in the showcase run by T1D Exchange, an organization that accelerates research related to Type 1 Diabetes, and medical device incubator M2D2.

Glyscend won one of three Quickfire Challenge awards as part of a field of more than 470. With the win, Glyscend receives $500,000 and a residency at Johnson & Johnson Innovation I JLABS. The challenge is designed to find comprehensive solutions for disease areas of significant global impact.

Glyscend aims to extend the therapeutic benefits of bariatric surgery to a wider population of patients with type 2 diabetes with a completely noninvasive approach. Glyscend has now won over $1.1 million in awards and grants since May 2014. You can get more details here.

NBC did a series of stories that focused on the importance of entrepreneurship to the city of Baltimore featuring Johns Hopkins University President Ronald J. Daniels, Sonavex CEO David Narrow and City Garage CEO Tom Geddes. Read about Baltimore’s $5 billion bet on entrepreneurship, and watch how City Garage and FastForward are already changing Baltimore’s startup landscape at the 23-minute mark.

PathoVax beat out more than 500 businesses and startups to become one of six finalists at the 43North pitch competition, earning it $500,000. The Baltimore-based company is using technology licensed from Johns Hopkins to develop a vaccine that aims to prevent cancers associated with HPV. The company plans to use the money for R&D pipeline expansion and to recruit new talent for its team. In September, the company was one of 45 startups selected for the Slush Pitching Competition in Singapore.

Quantified Care, Tissue Analytics and Windmil Therapeutics are among 45 companies that will compete for venture funding at the Impact 2016 Capital Conference on Nov. 29 and 30. The three companies, all tenants in FastForward, will have a chance to pitch in the Impact Lion’s Den, where they could receive funding in real time from a panel of accomplished investors.

Three Johns Hopkins students who have built a foot-operated video game controller for those who don’t have use of their hands claimed the $7,500 grand prize at the Intel-Cornell Cup. Game Enhancing Augmented Reality, also known as GEAR, is operated by Johns Hopkins biomedical engineering graduate students Gyorgy Levay, Nate Tran and Adam Li.

Good news for Ready Robotics! The Baltimore startup based on Johns Hopkins technology has raised $3.5M in its quest to help small-scale manufacturers with an easy-to-use, collaborative industrial robotic. According to the Baltimore Business Journal, Ready Robotics currently has nine full-time employees and plans to double that number in 2017.
New Social Innovation Lab Teams Benefiting Baltimore and Beyond

A nonprofit dedicated to revitalizing vacant Baltimore lots. A venture providing health and wellness services to teachers at the schools where they teach. An app that uses artificial intelligence to make mental health care more accessible.

These are just a few of the social innovations being developed by this year’s cohort of The Johns Hopkins University’s Social Innovation Lab (SIL), an early-stage incubator for innovative nonprofits and mission-driven companies whose technologies address pressing social issues in Baltimore and beyond.

This year, the program’s fifth, 10 ventures were selected from a pool of 53 applicants. The selected ventures comprise both Johns Hopkins and Baltimore community members. Nine of them are led by either women or minorities, and nine of them will have a direct impact on Baltimore.

“In addition to being promising solutions to pressing social issues in the areas of health, education and community development, these ventures and their leaders represent the strength and diversity of Baltimore’s social innovation and entrepreneurship community,” says SIL Director Darius Graham.

From October through April, SIL will work closely with the ventures to help them meet strategic milestones and make a measurable impact. SIL will provide the ventures with mentoring and help cohort members network with other social entrepreneurs in the city.

“For a developing company with a social impact, the more allies you have in your field, the more you can grow and learn,” says Jenna Shaw, leader of The Whole Teacher, one of this year’s ventures. “SIL is surrounded by innovative thinkers and people who are investing in social impact, and the companies in the cohort all want to make social change happen,” she adds. “The more you can surround yourself with like-minded people and tap into the resources of the community that you want to serve, the more impact you can have.”

Shaw, who is also director of technology and creativity at Baltimore’s Liberty Elementary School, started The Whole Teacher to bring health and wellness programs to teachers. A teacher herself, Shaw knows firsthand how difficult it is for teachers to fit doctor’s appointments, nutrition counseling, yoga and other wellness activities into their schedules. Her venture is piloting programs at three schools this year and tailoring them to what the teachers at each school want to get out of the program.

Shah, Johns Hopkins University senior Elyse Oliver’s venture, Project Charmify, takes a look at urban spaces to see how they can be used to benefit the communities surrounding them. The venture will focus on reinvigorating vacant lots in Baltimore this year, perhaps holding community events, starting farmers markets, bringing in food trucks and dinner festivals — whatever the community thinks would help to invigorate the neighborhood. For its first vacant lot, Project Charmify is partnering with students at Dunbar High School to turn the space into something that benefits the school community.

Oliver is looking forward to SIL’s mentoring and networking assistance. “There are a lot of different people working in lot revitalization in Baltimore, and we’re excited to meet and learn from them,” she says. She’s also looking forward to bringing the field of social entrepreneurship to high school students, who may go on to develop social ventures of their own.

Johns Hopkins University alumnus Shrenik Jain is developing his venture, Beacon, from an idea he had a few years ago as a firefighter and emergency medical technician in Baltimore. In this position, he saw what unchecked depression, PTSD, alcoholism and addiction can do to a person without access to mental health. This inspired him to develop, with classmate Radi Shah, an app to make mental health services more accessible to the population and more efficient for providers. To combat the social stigma surrounding mental health, users can remain anonymous.

Jain and Shah are working on the venture full-time. They’ve hired one person, are interviewing others and have completed one pilot test already. By participating in SIL, they hope to maximize their venture’s social impact.

The 2016-2017 Social Impact Lab cohort:

B-360 seeks to use Baltimore City Community College’s STEM Scholars Program to expose more residents of the city to STEM fields and increase diversity and representation in this area. The venture will meet students at the level at which they’re working and provide them with job readiness training and a pipeline to job success, starting at either the GED or community college level. Project leader: Brittany Young

Beacon is developing a mobile application for anonymous, text-based group therapy that utilizes advanced natural language processing techniques to increase treatment accessibility for patients and the efficiency of mental health care providers. Project leader: Shrenik Jain, Johns Hopkins University Whiting School of Engineering undergraduate student; Ravi Shah, Johns Hopkins University Whiting School of Engineering alumnus; Satya Bommaraju, Johns Hopkins University Whiting School of Engineering alumnus.
Michael Betenbaugh

When a scientist discovers a new drug to cure a disease, it’s cheers all around. But what happens next? How is the drug produced for commercialization so that it can actually be administered to a patient?

That’s where Michael Betenbaugh, a Whiting School of Engineering professor of chemical and biomolecular engineering, comes in. He and his laboratory team are working with researchers at MedImmune to develop a more efficient media in which to grow the microbes used to produce genetically engineered human antibodies for testing, development and commercialization.

“We’re in the middle, between drug discovery and the clinicians who are applying these drugs to treat people,” Betenbaugh explains.

His work with MedImmune constitutes one of 10 partnerships currently active between The Johns Hopkins University and the pharmaceutical company. He and postdoctoral student Yue Zhang, who is supported by a MedImmune grant, are paired with MedImmune researchers to learn more about how microbes respond in different media environments. They use advanced analytical tools, including genomics, to understand the impact of the media on the microbes.

Betenbaugh and his teammates are using these studies to determine the optimal media components for maximizing production of antibodies by the microbes. They want to develop the most effective media possible for producing genetically engineered antibodies for diagnostics and pharmaceuticals.

To help others better understand what he does, Betenbaugh offers an analogy. Imagine driving a car without understanding how it works, he says. Once you learn how the engine operates and how all of the inner systems function, you’ll be a better driver. Learning more about the media in which MedImmune makes its antibodies will enable MedImmune to make better antibodies, more efficiently — and maybe even develop it into an even better media too.

“You need the best possible media in which to make the best possible antibodies to be considered for clinical trials and, ultimately, commercialization,” Betenbaugh explains.

Each drug manufacturer typically has its own media or hires out to a company that does. If a company’s media can yield a high number of antibodies in a relatively short amount of time, it enjoys a competitive advantage in developing and making drugs and getting them to market, he says.

“We’re looking at the basic media and seeing if we can discover properties that make it high-yielding and a more efficient factor for antibody production,” he says. “And we’re looking to engineer that media so that it has certain properties” to produce antibodies with specific characteristics.

Betenbaugh and his collaborators are finalizing their first scientific paper on their work and are finishing up a second one this fall. Further collaborations and intellectual property may come out of the partnership as well, he says, thereby helping to establish a long-term relationship between MedImmune and Johns Hopkins researchers.

**BentCarrot** is committed to strengthening urban communities by reducing food insecurity and promoting healthful diet decisions. Project leader: Mark Corser

**Intelehealth** is a technology nonprofit with a vision to improve access to comprehensive primary health care through telemedicine. Project leader: Neha Goel, Johns Hopkins University School of Medicine graduate student; Amal Afroz Alam, Johns Hopkins University Whiting School of Engineering graduate student; Emily Eggert, Johns Hopkins University Whiting School of Engineering alumnus

**Project Charmify** is looking to bring small-scale investment to Baltimore communities in the form of vacant lot revitalization and community-driven programming. Project leader: Elyse Oliver, Johns Hopkins University Krieger School of Arts and Sciences undergraduate student; Darius Irani, Johns Hopkins University Whiting School of Engineering undergraduate student; Yue Zhang, who is supported by a MedImmune grant, are paired with MedImmune researchers to learn more about how microbes respond in different media environments. They use advanced analytical tools, including genomics, to understand the impact of the media on the microbes.

**ReLac** is developing a vending machine to sell breast pumping supplies to working moms needing supplies while away from home. Project leader: Meg Stoltzfus, Johns Hopkins University staff member

**Touching Young Lives** aims to provide portable cribs and education about safe sleeping for babies to families in Baltimore City and County and eventually statewide. Project leader: Shantell Roberts

**Squadz** is developing a social activity platform to connect community members looking to play pick-up sports with each other and enable them to reserve sports venues via mobile bookings. Project leader: Nikhil Panu, Johns Hopkins University Whiting School of Engineering graduate student

**The Listening Lab** is a music listening education program that teaches fourth- and fifth-grade students awareness, concentration and intentional listening skills through a series of classroom sessions and live orchestra concerts. Project leader: Rebecca Smithorn

**The Whole Teacher** is working to provide health and wellness services to teachers to help reduce burn-out and increase retention. Project leader: Jenna Shaw, Johns Hopkins University School of Education alumnus.
chefs specializing in new dining concepts and locally sourced foods.

The FastForward space at R. House will include a combination of private and shared workspaces, offices and laboratories. They’ll be purpose-built to ensure they meet the needs of FastForward Homewood’s startups, says Brian Stansky, senior director of FastForward Innovations for Johns Hopkins Technology Ventures.

Remington is a hot spot for revitalization. Remington Row, a mixed-use development project anchored by Johns Hopkins Community Physicians, officially opened on the 2700 block of Remington Avenue in September. Stansky expects that FastForward Homewood will continue this renaissance. By bringing nascent companies into the area, the innovation hub is helping give Remington, a once-booming industrial quarter, an exciting new future.

"I think this will be a terrific spot," Stansky says, "for companies to plant roots and grow."

In addition to FastForward Homewood, Tech Ventures currently operates FastForward East at 855 N. Wolfe St., a few blocks off the Johns Hopkins medical campus. In early 2017, it will open FastForward 1812 across the street from FastForward East, increasing the amount of lab and office space Tech Ventures provides by 23,000 square feet.

Innovation is essential to our culture at Johns Hopkins. Across our campuses, faculty members and students are eager to develop their ideas and discoveries and put them to use in benefit to society – here in Baltimore and around the world.

We welcome gifts of any size. We would be happy to discuss our range of giving opportunities and other giving options.

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