One of the great things about Johns Hopkins is its incredible network of top scientists and researchers. They are the best of the best and are developing cutting-edge technologies in hundreds of laboratories all across the university.

Johns Hopkins Technology Ventures connects scientists, researchers and entrepreneurs working on related or complementary projects. Sometimes, in joining forces with their peers, our faculty and staff members can increase their chances of developing their work into marketable treatments or products that can improve health and daily life all over the world.

For example, a chemistry researcher and two cardiologists had no idea that their research projects could, if combined, result in a promising treatment for heart failure until Johns Hopkins Technology Ventures helped put them in touch with each other. The resulting startup, Cardioxyl Pharmaceuticals, was recently acquired by Bristol-Myers Squibb.

Similarly, Gemstone Biotherapeutics started with an advanced wound treatment developed in a Johns Hopkins laboratory. After Johns Hopkins Technology Ventures introduced the young company to the inventors of a treatment for diabetic foot ulcers, the company then had two great products in its pipeline.

Read about these and other great things happening on campus and across Baltimore in this month’s issue of Johns Hopkins Technology Ventures’ newsletter.
Gemstone Builds Baltimore Business Developing New Wound Treatments from Johns Hopkins Labs

Gemstone Biotherapeutics was well into developing an advanced wound-healing gel that got its start at The Johns Hopkins University when Johns Hopkins Technology Ventures introduced the young company to the inventors of a second product, a treatment for diabetic foot ulcers.

The introduction was facilitated by one of Johns Hopkins Technology Ventures’ mentors-in-residence, who worked with Christy Wyskiel, senior advisor to the president of The Johns Hopkins University and head of Johns Hopkins Technology Ventures, to make it happen.

“Imagine what Gemstone would look like if we put these two technologies together,” Wyskiel told George Davis, Gemstone’s CEO.

Gemstone went for the win-win situation, adding the second product to its intellectual property profile. This boosted its potential product line while giving the foot ulcer treatment a faster path to commercialization than it would have had if its inventors had had to start a company from scratch.

“We’re becoming somewhat of a center for advanced wound care technology,” says Davis, who co-founded Gemstone in 2013 with business partner David Oros and Baltimore venture capital firm Gamma3 LLC. Gemstone was one of the first tenants of the laboratory space at Johns Hopkins innovation hub FastForward East, and it continues to rent lab space there while maintaining an office in Federal Hill.

“The FastForward lab space has been a great advantage for us in building out our company,” Davis says. “Trying to find affordable lab space to rent in Baltimore would have been very difficult without it.”

The startup’s initial technology — invented by chemical and biomolecular engineer Sharon Gerecht — is a novel biosynthetic scaffold that uses cell engineering methods and biomaterials to promote vascularization, a necessary component of tissue repair and regeneration. Gemstone licensed the technology from the university in 2013.

George Davis

The startup licensed the diabetic foot ulcer treatment from the university earlier this year. It’s a topical agent designed specifically for treating these ulcers, which are becoming a costly health care dilemma due to their increasing prevalence, Davis says.

The second technology was co-invented by Jeremy Walston, co-director of Johns Hopkins’ Biology of Healthy Aging Program, and geriatrician Peter Abadir.

“We’re combining the expertise of clinicians and scientists from a world-renowned scientific and research institution,” Davis explains. Johns Hopkins receives $2.5 billion in federal research funding a year — more than any other institution in the country — and “we’re hiring people who’ve gone there.”

Davis wants “to build a really good, solid business here in Baltimore,” building off of Gemstone’s Johns Hopkins connections. All of its products’ inventors are advisers for the company, which received a Maryland Incubator Company of the Year Award in the life sciences category last June.

“We’ve watched too many talented people graduate from Johns Hopkins and then leave,” says Davis, a managing partner of Gamma 3, which provided Gemstone with seed funding. Gamma 3 has funded several other local companies, including Johns Hopkins startups PGDx and PapGene. “We want to keep those people here in Baltimore.”

Gemstone currently employs four people: Davis; Laura Dickinson, director of research and development; Matt Davenport, research scientist; and Ian Tolfree, Gemstone’s director of operations and former venture manager of FastForward, Johns Hopkins’ innovation hub. Davenport, Dickinson and Tolfree all hold degrees from the university, and Davenport and Dickinson assisted Gerecht in developing Gemstone’s initial wound-healing biosynthetic treatment.

Davis expects Gemstone to file for FDA approval of the original product by the end of the year and hopes both products will enter the health care market by 2018.

“We think we have something very special with our technologies,” he says. “Their possible applications for the acute wound-healing market are very promising, and we’re excited that by staying local, we can help build up the innovation ecosystem in Baltimore.”

NEW JHTV Inventor Portal

Got an invention?

Submitting your invention disclosure is now easier than ever. Johns Hopkins Technology Ventures’ new user-friendly, simplified electronic portal includes fewer questions and forms, making invention disclosures less complex and time-consuming. Anyone with a JHED identification account can access the portal.

For questions or support, contact Tina Preston at 410-516-4561.
Ten promising health care and sustainability startups pitched exciting new technologies to a live audience and panel of potential investors at Light City Baltimore’s startup pitch competition on March 31.

The competition was one of the highlights of the festival — the first large-scale, international light festival in the U.S. — which celebrated new ideas, ingenuity and creativity through art, music and innovation.

The competition featured five local health care startups and five local sustainability companies — all early-stage, pre-Series A companies chosen through an application process. Judges included venture capitalists from Baltimore (Greenspring Associates), New York and the West Coast. One company in each of the two categories was chosen by the judges to receive a $5,000 grant from the Warnock Foundation. Audience members chose a favorite as well.

From Johns Hopkins, Urban Pastoral presented in the sustainability category, and Quantified Care and FitMango presented in the health category, with FitMango taking the title of audience favorite in its category.

FitMango, formerly known as ShapeU, is developing an online platform to organize affordable, trainer-led workout sessions for small groups of exercisers.

Quantified Care provides a multimedia approach to health care coordination to help clinicians monitor, manage and engage with their patients using the communication tools that work best for them.

Urban Pastoral plans to rejuvenate the city’s neighborhoods through healthy food, city farming, job creation, community connections and the establishment of a robust local economy. It’s already marketing the produce it harvests sustainably in the heart of East Baltimore.

The pitch competition, like the festival as a whole, showcased some of the exciting possibilities that can happen in a city that offers entrepreneurs a dynamic and affordable home base from which to grow a company. Festival attendees experienced, firsthand, Baltimore’s innovative zeitgeist that fuels and is driven by its startups, whose forward-thinking ideas have the potential to make life better for people all over the world.

FitMango won the audience favorite award in the health category of Light City Baltimore’s startup pitch competition on March 31, 2016.
Faculty Spotlight: Debasish Sinha on Working with Bayer to Develop a Treatment for Age-Related Macular Degeneration

Researchers at the Wilmer Eye Institute and Bayer HealthCare are working together, as part of a five-year collaboration that began last June, to develop new ophthalmic therapies targeting retinal diseases.

Below are excerpts from our interview with Debasish Sinha, a Wilmer Eye Institute faculty member, who’s part of one of the many interesting collaborations currently ongoing with Bayer. He’s working to develop a new treatment for age-related macular degeneration (AMD).

Sinha earned a Ph.D. in immunology and completed a postdoctoral fellowship in molecular biology and genetics at the National Eye Institute. He joined the faculty of the Wilmer Eye Institute 14 years ago after working for three years in the pharmaceutical industry.

JHTV: Have you collaborated with industry in the past?
Sinha: Working with Bayer is my first experience collaborating with industry in an academic setting. Funding to support my lab’s research has come from traditional sources, such as the National Institutes of Health (NIH) and private foundations.

JHTV: How would you describe the project on which you’re working with Bayer?
Sinha: Our project with Bayer aims to identify potential drugs for dry AMD. This is an interesting disease because people do not know they have it until they experience initial visual impairment at around 65 old. As the aging population increases, dry AMD is becoming a common global problem, and there are no existing therapeutics to treat dry AMD.

Sinha’s lab studies the role of retinal pigment epithelial (RPE) cells in maintaining healthy vision. These cells both nourish the overlying photoreceptor cells and remove waste products from the surrounding environment. As these cells age, their lysosomes gradually lose the ability to efficiently digest and clear ingested debris. This accumulation of waste products results in self-degradation of RPE, a process known as autophagy, ultimately leading to vision loss through loss of photoreceptors — this is an underlying mechanism of dry AMD. In collaboration with Bayer, our goal is to identify therapeutic compounds that can rejuvenate functionality of the aging RPE, thus slowing the progression of the disease.

JHTV: Tell me more about the collaboration.
Sinha: Since starting our collaborative project in the summer of 2015, scientific interaction with Bayer has been very good. We have a formal meeting every month, but we correspond more frequently through email.

Working with Bayer presents many opportunities that are not possible to achieve at Johns Hopkins. For example, Bayer has provided access to libraries of pharmaceutical compounds and high-throughput screening capabilities, which are critical to moving the research forward toward finding an impactful treatment for dry AMD. This collaboration has been instrumental in moving the research to a stage that we previously had considered beyond the horizon.

JHTV: How long did it take to go from submitting a nonconfidential proposal to Bayer to actually being able to start work on the project?
Sinha: From submitting a letter of intent to the joint review committee to receiving project approval by the joint steering committee, the process took about three months. We worked around the clock to develop the full proposal, which involved substantial back-and-forth dialogue with our Bayer collaborators.

JHTV: How does this corporate research sponsorship compare with other funding sources?
Sinha: My lab has traditionally been funded by NIH. That organization’s funding process takes at least a year and involves fixed deadlines. Once obtained, a grant from NIH provides four to five years of funding and can be used to pursue fundamental research questions.

In comparison to a traditional NIH grant, industry funding provides more capital investment over a shorter term. However, if the project is not working, there is the possibility that project might be wound down. In terms of scope, industry projects are typically patient-oriented and translational.

Ideally, I would like for my lab to be supported by both NIH and industry to fund both basic science and translational projects. I believe this funding mix is good for the lab.

Debasish Sinha, third from right, and members of his laboratory team
O'Connor Entrepreneurship Fund Announces Second Cohort of Student Startups

A mobile platform for anonymous group therapy. A wrist-mounted device to assist visually impaired individuals with navigation. An online platform to help college students manage their schedules.

These and three other technologies in the making at Johns Hopkins got a little closer to reality earlier this spring when the six student startups developing them received seed funding from the Ralph O’Connor Undergraduate Entrepreneurship Fund.

The startups make up the second cohort to receive grants from the fund, which is made possible by a gift from Ralph O’Connor, a Johns Hopkins University Krieger School of Arts and Sciences alumnus. Grants from the fund are between $2,000 and $10,000 and help student startups enter the entrepreneurial ecosystem.

The six startups are:

**Proscia** — led by David West, a senior biomedical engineering student — is developing a cloud-based pathology platform that will allow doctors to store, share and analyze digital pathology for better diagnoses. Other team members include Peeyush Shrivastava, a biomedical science student at Ohio State University, and Coleman Stavish, a senior computer science student at the University of Pittsburgh.

**Brevvite** — led by Elliot Kim, a senior economics student — is developing a versatile, fashionable backpack for carrying expensive equipment.

**MoTrack** — led by Ben Pikus, Parth Singh and Rahul Yerrabelli, freshman biomedical engineering students — uses motion sensors to integrate hand therapy exercises with fun computer games, providing real-time corrective feedback and the ability to track and report day-to-day rehabilitation progress.

**GRUP** — led by Shrenik Jain, a sophomore applied mathematics and statistics student, and Akash Ray and Ravi Shah, graduate engineering management students — is developing a mobile platform for affordable, anonymous group therapy.

**Touch Plus** — led by Brandon Duderstadt and Matias Eisler, freshman computer science students, and Bijan Varjavand, a freshman materials science and engineering science student — is developing a wrist-mounted device to assist visually impaired individuals with navigation through the use of computer vision and novel haptic feedback technology.

**Semester.ly** — led by Noah Presler, a junior computer science student — is creating an online platform to help college students build and manage their schedules. Other team members include Maxwell Yeo and Eric Calder, both junior computer science students, and Baltimore freelance illustrator Philip Cho.

**Ralph S. O’Connor and his wife, Becky, in front of the sculpture Red Sails, a gift from the O’Connors to The Johns Hopkins University. IMAGE: homewoodphoto.jhu.edu**

Help us bring life-changing innovation to the world

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.

For more info, please visit
http://ventures.jhu.edu/support-our-mission/
Christy Wyskiel, head of Johns Hopkins Technology Ventures; Robert Lord, co-founder of Protenus; and Nick Culbertson (not pictured), co-founder of Protenus, were honored by the Baltimore Business Journal, which named Wyskiel and Protenus to its Tech 10.

Protenus produces software that detects HIPAA violations, recognizes when an electronic medical record is accessed by someone who doesn’t have authority to see it and identifies the clinical context of a breach.

Protenus scored the ninth-biggest business deal — for $4 million — in Maryland during the first quarter of 2016, the Baltimore Business Journal reports. Culbertson and Lord, who co-founded the company while students at the school of medicine, raised the money in a Series A funding round led by Arthur Ventures.

Kala Pharmaceuticals Inc. closed an oversubscribed $68 million Series C preferred stock financing funding round, led by Longitude Capital, in early April. The startup is developing innovative ophthalmic products based on its proprietary mucus-penetrating particle technology, which was initially developed in Johns Hopkins laboratories.

Additional new investors include OrbiMed, Vivo Capital and CAM Capital, which join RA Capital Management, Wellington Management Company LLP, Polaris Partners, Lux Capital, CVF LLC and other existing investors.

Tissue Analytics has raised $1.9 million in debt from unnamed investors to scale up its wound analysis business. The startup, co-founded by Josh Budman and Kevin Keenahan, alumni of the Johns Hopkins Whiting School of Engineering’s Center for Bioengineering Innovation and Design, is developing an app to track wound size and healing.

Through Tissue Analytics’ technology, front-line health care providers — including home health workers and home care aides — patients’ families and patients themselves take photos of wounds via the app, which uses an algorithm to determine a wound’s area, depth and amount of healing since the last photo. Clinicians use the photos to monitor patient healing from afar.
The Abell Foundation recently invested $200,000 in Sisu Global Health, the Baltimore startup and DreamIt Health Baltimore alum creating low-cost medical devices for developing countries. Sisu won AOL co-founder Steve Case’s Rise of the Rest pitch competition, with a prize of $100,000, in Baltimore last September.

Sisu’s first product is the Hemafuse, an easy-to-use device that collects and saves blood pooling inside a patient for later transfusion back into the patient. With the tool, pooled blood isn’t wasted—a critical benefit in parts of the world where blood shortages are common.

Johns Hopkins startup Sonavex took home the $10,000 grand prize at the April 19 Crab Trap Competition—modeled after Shark Tank—held during the second annual Regional BioTech Forum hosted by MedImmune and BioHealth Innovation, Maryland’s commercialization collaborative, at MedImmune’s corporate headquarters in Gaithersburg, Maryland.

Sonavex is developing an ultrasound-based system to pinpoint potential postsurgical blood clots. The company has won numerous awards and grants, including TEDCO Maryland Innovation Initiative Phase 1 and 3 awards, a Coulter Translational Research Award, an Association of University Technology Managers New Venture Forum award, a BioMaryland LIFE award and a BMEidea award for biomedical innovation from VentureWell. Sonavex was also named Baltimore’s 2015 Startup of the Year, Live Pitch Winner, by Tech.co.

Bristol-Myers Squibb Buys...

Continued from page 1

up to $1.775 billion upon achievement of certain development, regulatory and sales milestones.

Cardioxyl’s co-founders will be working with Bristol-Myers Squibb to develop its nitroxyl prodrug into a fully approved, marketable treatment for heart failure, says scientific co-founder David Kass, a cardiologist at The Johns Hopkins Hospital.

Prodrugs are inactive compounds that, once administered and metabolized, convert into active drugs. Cardioxyl’s nitroxyl prodrug breaks down into molecules of nitroxyl, which strengthens heart contractions, Kass says. It also relaxes veins and arteries, helping move fluid out of the lungs and making it easier to breathe—a particularly valuable effect in patients with congestive heart failure, he adds.

But nitroxyl, also known as HNO, which the scientific co-founders suspect may be produced in nature, is too unstable to exist by itself for very long—nitroxyl gas sealed in a container will quickly turn itself into nitrous oxide (N2O) and water (H2O). Using a prodrug compound keeps the nitroxyl intact until it’s time for it to act. A good prodrug allows the nitroxyl to be released slowly, Kass says.

“We wanted to design and develop nitroxyl prodrugs that we could tweak to change the nitroxyl release rate,” Toscano explains.

For more than a century, the compound Angeli’s salt (Na2N2O3) has been used as the nitroxyl prodrug, but it destabilizes quickly and its effects do not last very long. IV bags of Angeli’s salt would need to be changed every 10 minutes to maintain a supply of nitroxyl, Kass explains.

Cardioxyl’s nitroxyl prodrug is longer lasting than Angeli’s salt, and it could have the potential, if taken regularly in pill form, to keep patients with heart failure out of the hospital. The nonactive components of the prodrug are not toxic and are eliminated by the body’s excretory system, Kass adds.

Initially, Kass and Toscano were working independently of one another. Kass and Johns Hopkins cardiologist Nazareno Paolocci, also a scientific co-founder of Cardioxyl, were studying the nitroxyl molecule—performing all of their studies using Angeli’s salt—while Toscano was developing new nitroxyl prodrugs other than Angeli’s salt.

“When we started our research on nitroxyl prodrugs, it was to answer questions about the molecule out of scientific curiosity,” Toscano says. “But once we started talking with Naz and Dave, we realized that it could potentially be a very useful therapeutic.

“That something we started in our lab as a scientific curiosity might end up as an actual drug that could help people is really incredible,” he adds.

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