TECHNOLOGY MONITOR

A sneak peek at ultrafast switches, a project inspired by the origins of life, and more

WARF Accelerator speeds the development of technologies with exceptional potential for commercial success. With targeted funding and expert advice from seasoned business mentors known as Catalysts, the program helps inventors develop their technologies and advance to the marketplace. The latest developments:

HEALTH CARE

TARGET GUIDED:

A potential new drug discovery platform being developed by John Yin (chemical & biological engineering) could be used to create peptides that have the binding affinity and specificity of antibodies, but at much lower development cost. Yin’s ‘target-guided’ method to synthesize peptides is not only an exciting research tool, it could accelerate drug development by leapfrogging the screening activities currently necessary to identify good candidates.

In a few months, the team hopes to apply their method to a target with real human health relevance. Remarkably, the new approach is inspired by research into the primordial origins of DNA.

They report that all three steps of their reaction have now been successfully scaled up 10-50x with no loss in product yields. A company based on this technology, Pyran, gained valuable exposure by partaking in WARF Innovation Day and the Wisconsin Tech Council Early Stage Symposium.

SUPER SLIPPERY:

David Lynn (chemical & biological engineering) reports “substantial progress” in his effort to advance a new class of ‘slippery’ polymer coatings. One major application of this work is to keep patients safe. For example, applying the anti fouling coatings to medical catheters could prevent dangerous buildup of bacteria or fungi.

Going forward, the team plans to test how the coatings hold up under prolonged contact with blood.

CLEAN TECH

NEW PATHWAY:

As reported in a previous issue, a UW–Madison team is pioneering a ‘green’ chemical pathway for producing plastic precursors, called diols, from biomass. These high value chemicals are widely used in paints, coatings, adhesives and other goods – a $6 billion annual market in all. All diols are currently derived from petroleum.

The team is led by postdoctoral researchers Kevin Barnett and Kefeng Huang and Prof. George Huber (chemical & biological engineering).

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A new project by Kevin Ponto (design studies; Virtual Environments Group) looks to build a software solution inside a video game engine. Ponto’s approach is radically different from common visualization techniques currently in use. Stay tuned.

WEBSCIENCE AND ENGINEERING

WATCH THIS SPACE:

The emergence of virtual and augmented reality technologies should enable immersive experiences in real-life environments and transform how we learn, game and design. However, rendering complex ‘point cloud’ data is one of the challenges to making this vision a reality.

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ACCELERATOR CHRONICLE

Breath to Breath

Death and injury to patients under conscious sedation can be prevented. Two physicians strive to balance life and work – and sleepless nights – to bring peace of mind to families.

It is a few days before Christmas Eve. That Dr. Guelay Bilen-Rosas has found time to be interviewed is a small miracle in itself.

A pediatric anesthesiologist at UW Health, she is preparing for an upcoming 20-hour operation. Her patients, she admits, are never far from her mind.

Still, Dr. Bilen-Rosas is gracious and eager to talk about a remarkable technology that has been her waking dream for the last several years.

Guelay is joined by her co-inventor and husband, Dr. Humberto (Tito) Rosas, a radiologist. Together they describe a truly nightmarish scenario:

Imagine a loved one is undergoing surgery, or even a seemingly routine procedure such as a colonoscopy or dental extraction. He or she is administered a potent intravenous anesthetic. At some point, alarms begin to wail. The patient stopped breathing three minutes ago.

When this happens to celebrities – Joan Rivers and Michael Jackson died under sedation – it makes news. Yet respiratory compromise occurs more often than you might think, Tito says. An estimated several hundred deaths a year, in fact.

And the risk has only intensified as more and more procedures are moved to outpatient settings absent a trained anesthesiologist on-site.

The monitors used today don’t measure airflow directly but rather ‘surrogate’ factors like pulse oximetry, says Guelay, which have a lag time of several minutes and may impart a false sense of security. Even if intervention is timely and the patient survives, comorbidities such as brain damage and stroke can have profound consequences for quality of life.

“By the time the monitors go off, usually the patient’s oxygenation level is so low that we’ve already missed a several-minute window when we could have been treating,” says Tito.

An entirely new kind of monitor is needed. A monitor that can detect airway compromise early, quantitatively and in real time. To answer this challenge, the Rosas are developing a probe that employs ultrasound signaling to measure and predict airflow across the wind pipe.

“We envision this could be used in almost every clinic around the country,” Guelay says. “This will save lives.”

Anywhere a pulse oximeter is required, the new device could one day complement it.

Rosas have gathered critical data, expanded their team, and are now closing in on their next major milestone – a hands-free, miniaturized prototype that they can test in the operating room.

“This project started out as a little family business,” says Guelay. “But in life, great things don’t happen with just one person. It takes a village.”

The addition of medical physicist Quinton Guerrero and Irene Ong, a computer scientist, is pushing the project to the next level. By leveraging machine learning, the team believes that their fully automated device will provide a level of detection superior to even the best-trained human eyes.

For the Rosas, WARF has served as a valuable partner through their entrepreneurial journey.

“WARF has been a wonderful resource that many places don’t have,” says Tito. “We’re fortunate to have it here in Wisconsin. If you are a physician and don’t have an MBA and don’t know how to navigate those waters, there are people who can help you through that entire process.”

He adds, “This is the first project I have ever really started on which I knew was bigger than me. Maybe it wasn’t 100 percent achievable when we started. But we had this dream.

“If you ask me what I have learned, I learned to dream a little bigger.”

Of course, challenges both technical and personal loom large. The Rosas acknowledge that it is difficult at times to juggle their three hats: physician, entrepreneur, parent. Sometimes that means working until 2 a.m., only to rise again at 6.

Where do they draw inspiration? From each other, and from a sense of responsibility larger than life.

“When you see a child go from perfectly healthy to almost at the verge, and you know a mother or father is waiting on the other side, and you pledged to bring their baby back, there are a lot of emotions,” says Guelay.

“I want to give a mother another Mother’s Day, a father another Father’s Day.”
I’m excited because it allows me for the first time to work on translating research and innovation into commercial success on a full-time basis rather than as just one component of the various leadership roles that I have had. It’s an area that I care about deeply because we are helping faculty, staff, students and ultimately their achievements help the state and beyond. It really is the Wisconsin Idea, and one part in which UW–Madison can help the whole state prosper.

AR: We hope D2P’s activity helps create results we can see and measure, like increasing the number of startups, more licensing revenue from WARF patents, and greater returns from investments in UW–Madison spinoffs.

W: How do D2P and the WARF Accelerator Program work together?

AR: Where WARF Accelerator helps PI’s de-risk their technology, D2P’s Innovation to Market and Igniter programs can help them de-risk the market and business side of things. In turn, we’ve also referred PIs that have come through D2P’s programs over to WARF, so we are both building pipelines for one another.

W: What’s your vision for D2P going forward?

AR: Absolutely. Many times faculty serve in a PI role on research that has commercial potential, but their long-term goal is not to leave the university. Often, their graduate students can step in to carry their work forward out into the world.

A vibrant startup ecosystem will also provide opportunities for our graduates to have jobs here in the Madison region after graduation.

W: What does success look like in 3-5 years?

AR: Ultimately, success is a more vibrant startup ecosystem here on campus and in the region, where would-be entrepreneurs can find the resources and support they need to be successful and where campus innovation and research transfer to the marketplace occurs at a more rapid rate and in higher volumes to benefit society. Resources include: physical spaces, human talent, financial resources, entrepreneurship programming and mentorship, and networks (customers, suppliers, investors, etc.).

If we do those things, more startups, patents and licensing revenue, and jobs will occur. As it gains momentum and critical mass, human talent, industry partners and investment will be attracted to the Madison region. As an educational entity here to serve campus, another way we will define success is through raised awareness and participation in the wide array of UW–Madison programs and services for innovators.

WARF: You’re a veteran of state government and higher education. Economic development has always been a part of your career. Why are you excited to lead D2P right now?

AR: I actually don’t think so. Some of the most interesting innovations occur where diverse teams doing basic and applied science are coming together to create novel solutions. In many respects, UW–Madison is well positioned due to its incredible basic research strengths to create these super teams to develop new IP and potential industries.

W: Do graduate students and postdocs have a role in the entrepreneurial ecosystem?

AR: D2P is the one entity that has been purposely created to serve the whole campus and to bring all the entities together so that the whole is greater than the sum of the parts. We have a great opportunity to be a convener of those entities and then to work as a group to strengthen current offerings and to identify gaps that we can work together to fill. Working together and leveraging resources across campus makes us more competitive for outside grants and funding that can help support these activities as well.

Commercialization and entrepreneurship will never be easy or without risks, but we can be a source of support and provide experienced mentorship along the journey.

AR: D2P has two key program offerings: Innovation to Market (I2M) and Igniter, which help teams learn key program offerings: Innovation to Market (I2M) and Igniter, which help teams learn to develop an implementation strategy.

W: Is there an inherent tension between commercialization and basic research? How do you overcome that?

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Name: Andrew Richards
Title: Director of Discovery to Product (D2P)
Experience: Richards was tapped last spring to lead the redesigned D2P program on campus. His mission is ambitious – build connections and raze the walls to commercialization for faculty, staff and student innovators. Success could boost local startup activity, and seed a culture of entrepreneurship. Richards previously served as the chief of staff for the Vice Chancellor for Research and Graduate Education at UW–Madison and as the chief of staff for the UW System President.

MORE ON D2P

Discovery to Product (D2P) helps innovators move ideas from the university to the world by facilitating connections to university and community resources and providing free mentoring and education to faculty, staff and students at UW–Madison. D2P has two key program offerings: Innovation to Market (I2M) and Igniter, which help teams learn how to assess their innovation’s value and develop an implementation strategy.

Programs are led by innovation and commercialization specialists, who are veteran business developers, entrepreneurs, product managers and startup executives with specific industry experiences in engineering, life sciences, information technology, food science and consumer goods.

www.waraccelerator.org
SWITCHING IDENTITIES:
Making headlines in the journal Science, an international team led by Chang-Beom Eom has developed a material that could lay the groundwork for ultrafast electronic devices, such as the cellphones and computers of the future. Incredibly, the new material can transition from an electricity-transmitting metal to a nonconducting insulating material without changing its atomic structure.
WARF Accelerator support is helping Prof. Eom (materials science & engineering) fabricate, optimize and ultimately test how fast the special material can switch properties.

FOOD AND AGRICULTURE
LIKE VALIUM FOR FISH:
Aquaculture (farmed seafood) currently accounts for more than 50 percent of all seafood consumed. To meet global demand, antibiotic-free feed ingredients are needed to boost growth rate and cut stress in the fish. A project led by Jake Olson (animal sciences) is exploring how a poultry byproduct, dubbed cosajaba oil, may hold the key.
The oil has now been shown to possess anti-inflammatory properties and improve stress tolerance in salmon and other species. Olson reports that best practices for oil extraction and quality control have been established. Next, he wants to demonstrate cosajaba’s benefits at commercial scale. Salmonid industry take note.

SOIL SYMBIOSIS:
Jean-Michel Ané (agronomy) seeks to understand how plants and microbes develop symbiotic relationships. The answer is highly relevant to modern agriculture, with implications from soil quality to the cost of food and biofuel. With WARF Accelerator support, Prof. Ané is developing an improved method to purify and potentially decorate chitin oligomers from soil bacteria and test whether they can be used to promote plant growth.

WARF Innovation Day:
November 5, 2019
Thank you to everyone who made our first-ever WARF Innovation Day a success! The event brought together industry innovators, researchers, investors, students and the public over homecoming.
With more than 300 attendees, the event showcased some of the most commercially promising technologies at UW–Madison, featured exciting quick pitch presentations from six WARF Accelerator participants and much more.