The future of health care is wearable.

TouchPoint Solution CEO and co-founder Vicki Mayo wears the company’s device that helps users cope with stress; it was named best in health and wellness at the 2019 Consumer Electronics Show.

Alumni, students and researchers are creating devices that revolutionize the medical field.

Story by DANIEL OBERHAUS
Photos by JEFF NEWTON
Until a few years ago, wearable tech was rarely seen outside a lab or a clinic, where doctors used the devices to gather critical patient data or help with recovery. Some of these devices tracked the mundane ebb and flow of brain waves or glucose levels. Others, like the sophisticated robotic exoskeletons developed by Tom Sugar, a professor of engineering, had more esoteric medical applications like helping the recovery of stroke victims. These technologies improved countless lives, but it took the arrival of wearables like the Apple Watch and Fitbit to truly catapult wearable tech into the mainstream.

Not only could these consumer devices monitor various vital statistics like sleep patterns and heart rhythms, they were fashionable and affordable to boot. People became obsessed with tracking their health, and the so-called “quantified self” movement was born. Consumer wearables quickly grew beyond mere tracking technology, and it’s a feeling familiar to us all. We sense it when we’re waiting for the results of a medical exam, preparing to ask our boss for a raise, or rehearsing to ask our crush on a date. It’s called stress, and it’s the body’s natural reaction to a tense, uncertain situation.

Nick Hool, a current graduate student in engineering who in 2016 completed his BSE in bioengineering, knows all about it. Hool has been an avid golfer for most of his life, but he still feels the rush of nerves when he steps onto the green to tee off. But after years of research, he believes he may finally have a solution — no pills or weeklong meditation retreats required.

Hool’s solution, developed with two other ASU engineering students, is a small pair of earbuds he calls the P57 ONE. Instead of piping in music, the earbuds deliver a weak electric current to the inner ear to stimulate the nerve that regulates our fight-or-flight response. As Hool discovered, the earbuds produce a rapid decline in the wearer’s stress levels, which he hopes may one day include professional athletes, soldiers and anyone who wants to bring a little more calm to their life.

Hool is currently conducting clinical trials under the auspices of his company, Hoolest Technologies, which got a big boost when it won $100,000 in the ASU Innovation Open in 2018. Hoolest is one of the first to take up residence at the new WearTech Applied Research Center, which is plotting the future of wearable technology at Park Central in midtown Phoenix.

A collaboration between the Partnership for Economic Innovation and the Ira A. Fulton Schools of Engineering, WearTech opened its doors last September to ASU students, faculty and local companies. ASU has long been in the forefront of medical technology, and the center aims to accelerate the transition of these technologies from the lab to the market by forging links between industry and academia.

“We’ve come to a point in time where you can take the rich functionality of microelectronics and put it in new forms, fits and functions,” says Gregory Raupp, a professor of chemical engineering and research director of the WearTech Applied Research Center. “It’s as simple as putting on your clothes to adapt to this new technology.”

Grad student Chris Luu Sang wearing a device by FlexBioTech, co-founded by Jennifer Blain Christen, Karen Anderson and Joseph Thitm, that makes electronics to help diagnose disease.
Wearable health care devices by the numbers

1.3M lives saved by wearables by 2020

$200B saved

Projected reduction in hospital visits

50% of chronic diseases

$56.8B market value

market projection for wearable tech by 2025

— Deloitte

— MarketsandMarkets

— Swiss Firm

— EY

— EY

— MarketsandMarkets

— ASU

— MarketsandMarkets

— ASU

devices for a host of therapeutic and performance-enhancing uses began to hit the market. Today, wearable tech is estimated by industry analyst CCS Insight to be a $25 billion global industry expected to double in size within five years.

Taking wearables from the lab to the market

With the WearTech Applied Research Center joint venture, ASU is helping to ensure that Phoenix is at the forefront of the wearables revolution. The center provides a space for Sun Devils and local industry partners working on wearables to host meetings and do testing as they prepare their products for the market. Raupp and his colleagues at WearTech also help the center’s partners navigate the legal hurdles associated with launching new medical devices, and the team helps industry partners find novel commercial applications for their technologies.

Some of the tenants, like Hoot, are relative newcomers to wearable tech. Others, like Jennifer Blain Christen, an assistant professor in the School of Electrical, Computer and Energy Engineering, have been researching digital health technology for decades. In 2016, Christen, along with Mayo Clinic medical oncologist and immunologist Karen Anderson, MD, PhD, associate professor at the Biodesign Institute, and Joseph Smith, ’14 PhD in electrical and electronics engineering, co-founded FlexBioTech, a company that makes flexible, bio-safe electronics for disease diagnostics. The company grew out of Christen’s National Science Foundation-funded research on smart patches that could sense the presence of biomarkers that might indicate health problems in users’ sweat and provide data analytics to smartphones.

Christen has spent most of her career delving into the tricky material problems associated with wearable devices — how to make the electronics smaller, faster and cheaper without sacrificing the quality of the data or the user experience. For decades, hardware limitations were the major bottleneck preventing the widespread adoption of wearable tech. No one wants to look like they’re wearing a computer.

In this sense, Christen says that the WearTech center came along at an ideal time.

“We’re finally able to make small wearable devices, and the cost has become so much more accessible,” Christen says. “It doesn’t take $10,000 to get started making something; for $30 you can go get a microprocessor that’s small enough to wear on the body.”

As a neuropsychologist and founder of Phoenix-based Serin Center, Amy Serin, ’96 BS in psychology, appreciates the challenges of bringing a new device to the market. As part of her clinical practice, Serin developed TouchPoint Solution, which makes a wearable technology that helps users cope with debilitating stress by using two devices that alternate vibrations.

The alternating vibrations essentially tell the brain to turn down its stress response. According to Serin, it’s the high-tech equivalent of listening to some calming music, but exerts a much more rapid and powerful effect on the brain.

When Serin was studying psychology at ASU as an undergrad in the mid-’90s, the first flip phone, the Motorola StarTAC, was the hottest mobile device on the market, so no one was talking about wearable digital devices that are also mini-computers. Today, mental health professionals are abuzz about her device, which has proven effective for reducing stress in autistic children, those suffering from post-traumatic stress disorder, and those dealing with the routine anxieties of daily life.

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Christen helped form a partnership between FlexBioTech and True Mobile Health, a Phoenix-based medical services provider. True Mobile Health was looking for a way to monitor alcohol and illicit substances in patients just released from addiction treatment centers, a possible use case that Christen hadn’t previously considered. In the future, she says the smart patch might also be used as a diagnostic tool for common diseases like the flu or mono, monitoring stress and keeping tabs on infection.

HemaPorter is a small cold storage container for securely transporting blood and organs in environments that lack access to electricity.
“Learning you can actually take an idea and start a company and hire people and bring in revenue and have an impact in your community, is such a significant empowerment.”

— JI MI CHOI, ASU ASSOCIATE VICE PRESIDENT OF ENTREPRENEURSHIP + INNOVATION

BIG MONEY

Power of the pitch

Every semester, in classes and extracurricular activities, students have the opportunity to learn entrepreneurial skills like evidence-based pitching. They pitch their ideas in competitions such as ASU Launch Days and biannual Demo Day challenges. Competitors won a total of $150,000 in seed money at the most recent Demo Day in December. Some of these winners go on to the ASU Innovation Open held every January, which draws entrepreneurs from around the globe. This year’s participants competed for more than $300,000 in cash prizes and other funding to support their ventures. Alumni and community members can apply to be part of ASU Venture Devils to receive entrepreneurship and pitch training, mentorship and access to funding opportunities. Every year, ASU awards, with Edison endowment dollars and other philanthropic gifts, more than $1 million for promising business ideas.

Learn more at entrepreneurship.asu.edu.