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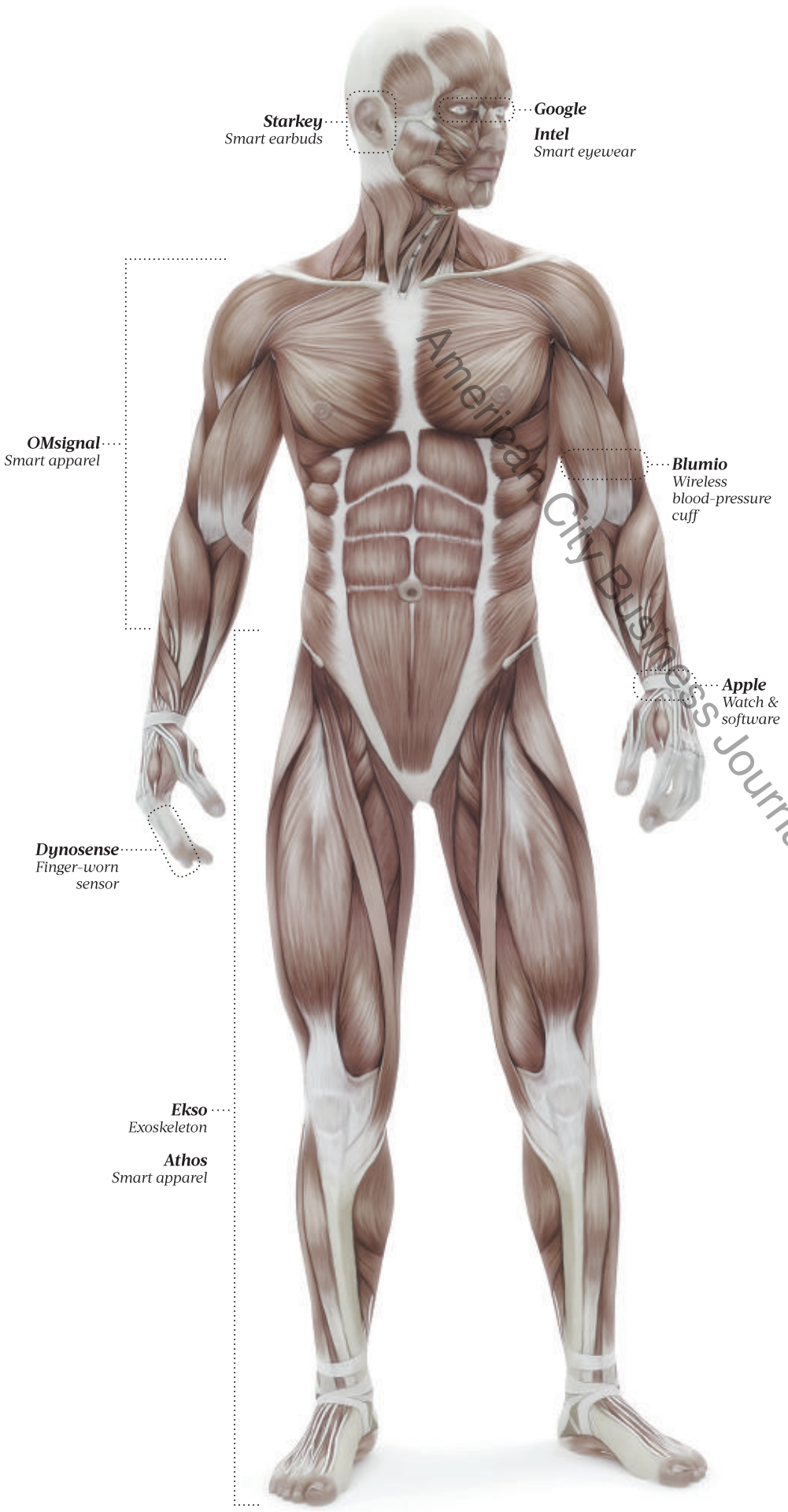

COVER STORY

BODY BY SILICON VALLEY

Tech firms large and small are adding sensors and connecting humans to the cloud to augment performance and improve health. Are smart shorts or shirts in your future?

BY LEIA PARKER & JENNIFER ELIAS · PAGES 10-12

INSIDE

2016's Excellence in Healthcare honorees

Meet six health professionals who are improving the way people are being helped in hospitals and clinics across Silicon Valley. PAGES 14-20

What do your insides look like in VR?

Mountain View startup EchoPixel is developing virtual reality imaging tech to help doctors get a better view inside patients. CROMWELL SCHUBARTH, 8

THE LIST CEOs WHO MAKE SERIOUS BUCKS 25-26

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COVER STORY

SMART APPAREL

Redwood City-based startup Athos and Montreal, Canada-based OMsignal – which is working with San Jose industrial designer Whipsaw – have developed clothing with sensors embedded in the fabric. The clothes have small processors attached that relay data to apps for analysis.

Athos' workout clothes use electromyography, which tracks how much effort muscles are exerting during workouts, said Jake Waxenberg, director of brand strategy. That enables people to make adjustments to their movements to ensure they get the maximum benefit from the activity, he said.

Athos has received more than $50 million in funding from backers including Joe Lacob, majority owner of the Golden State Warriors. It primarily sells its shirts, shorts and processors – that attach to the clothing – through its website, but it's doing some retail tests in Canada's Sport Chek stores, Waxenberg said.

OMsignal is developing washable shirts and smart bras that continuously track the heart's electrical signature with electrocardiogram readings, CEO Stephane Marceau said. The apparel also measures respiration flow by looking at the chest's expansion and contraction, and measures movement with accelerometers.

"One of the virtues of smart apparel is that if it's done right, you can acquire a much deeper and clearer biological signal," Marceau said.

The company will launch the OMsignal Bra as its lead product in August, Marceau said. It previously teamed up with designer Ralph Lauren to produce a limited edition smart shirt (branded as Polo Tech, powered by OMsignal), launched at the 2014 U.S. Open tennis tournament.

OMsignal worked with partner design firm Whipsaw on the connector front, Marceau said.

Athos smart apparel uses electromyography, which tracks how much effort muscles are exerting during workouts.

COURTESY OF ATHOS

"We see from our work with them that one day the hardware portion of the system will completely disappear, such that you just initially have apparel. When this happens, you'll go to the store, buy a bra or shirt, and you'll just expect it to be a connected object."

MEDICAL WEARABLES

Companies eyeing the market for FDA-approved wearables include San Francisco's Blumio and San Jose's DynoSense.

Blumio recently demonstrated its blood pressure cuff at the Highway1 hardware startup accelerator. The device can measure blood pressure without inflating, using radar to precisely measure the speed of the pulse wave, said co-founder Catherine Liao.

"When you turn on the faucet or tap, the pipe will vibrate before water arrives," Liao said. "It's a very similar dynamic to what happens in the body. The speed of that pulse wave is directly a function of how stiff your artery is. The stiffer your artery is, your heart has to work harder."

Blumio will start clinical trials this summer, working with the University of California, San Francisco, on validation testing, Liao said. The company is working with Whipsaw to ensure the design is as comfortable as possible, she said.

Companies developing such wearables typically want the devices to appear professional enough to inspire confidence in their performance, but without having the look and feel of a clinical medical device, said Greg Aper, Whipsaw's business development director.

Whipsaw has worked on up to 10 types of wearable devices in the past couple of years, Aper said, including working with Nike to design the Fuel Band fitness tracker for the consumer market.

COURTESY OF BLUMIO

Blumio has created a blood pressure monitor for the upper arm that doesn't need to inflate and deflate.

Good Samaritan Hospital CEO Paul Beaupré suggested a truly revolutionary device for hospital stays would be a small box worn on the wrist with a finger connection that would measure oximetry of the bloodstream, heart rate and have three wireless Bluetooth-enabled sensors on the chest to detect any heart abnormalities. Beaupré said he has seen prototypes of such a device. If the FDA approved such a device within certain acceptable guidelines for patients, then nurses wouldn't have to disturb patients at night, he said.

"What is the one thing that gets in the way most often with the healing process?" Beaupré said. "No one actually gets any sleep in a hospital, because every four hours we are mandated to go in and take the patients' blood pressure and wake them up and ask them how they're doing."

DynoSense's Dyno device is similar to what Beaupré described, though without the sensors for the chest. It's not designed for continuous wear, but used only long enough to get a reading by blowing into it and putting a finger in a clip.

CEO Saeed Azimi said the device tracks more than 30 health and fitness metrics, and an app generates a health score in a range of up to 100 and a letter grade. DynoSense is hoping for FDA clearance in a couple of months, he said.

DynoSense is also developing a wearable sleep tracker to be worn around the neck, though Azimi declined to provide details.

STARKEY TECHNOLOGIES

The Dash wireless earbud tracks multiple health measurements.

'HEARABLES' AND EYEWEAR

Hearing aid company Starkey Technologies created its first mainstream consumer product with German company Bragi in a new pair of wireless earbuds with 27 sensors for health measurements. The waterproof earbuds, called the Dash, not only deliver sound, but also track activity levels, heart rate, steps, distance and calories.

Starkey's research and development facilities are in Berkeley, and the company hopes to open a lab in Silicon Valley this year.

Multiple reports, including from the Massachusetts Institute of Technology, show measurements from the ear are more accurate than other devices such as wrist-worn trackers, allowing quicker data on blood flow and vital signs. But it's a lot harder to fit health sensors and sound quality into a small, ear-worn device.

The partnership between the consumer tech company and the hearing aid company stemmed from Satjiv Chahil, a longtime marketer in Silicon Valley who has worked with HP, Apple, Sony and Beats by Dre. Chahil said he believes the next trend of wearables will be ear-worn, predicating an imminent rise of "hearables."

As for eyewear, Google's augmented reality headset Google Glass is being used by Stanford researchers to help children with autism — and eventually other mental health disorders — read emotions. The initiative is called the Autism Glass Project, and the researchers designed the software to use facial recognition to tell the children which emotions are being expressed by the person they're looking at. The research team says it is looking for more volunteers for the study, headquartered in a lab at Stanford's pediatrics department.

In a project that began more than two years ago, the Autism Glass Project provides Android-run software so it can accommodate any type of wearables that sprout up in the future. Stanford researchers said it could potentially be reimbursable through health insurance, and they're striving for clinical validity. They hope it will enable future FDA approval for a broader population.

Debuting by the end of the year is a smart eyewear product called Radar Pace, which comes from a partnership between Intel and sunglass brand Oakley. The Oakley smart sunglasses will include an Intel-built AI assistant called Radar that coaches runners and interacts via voice commands.