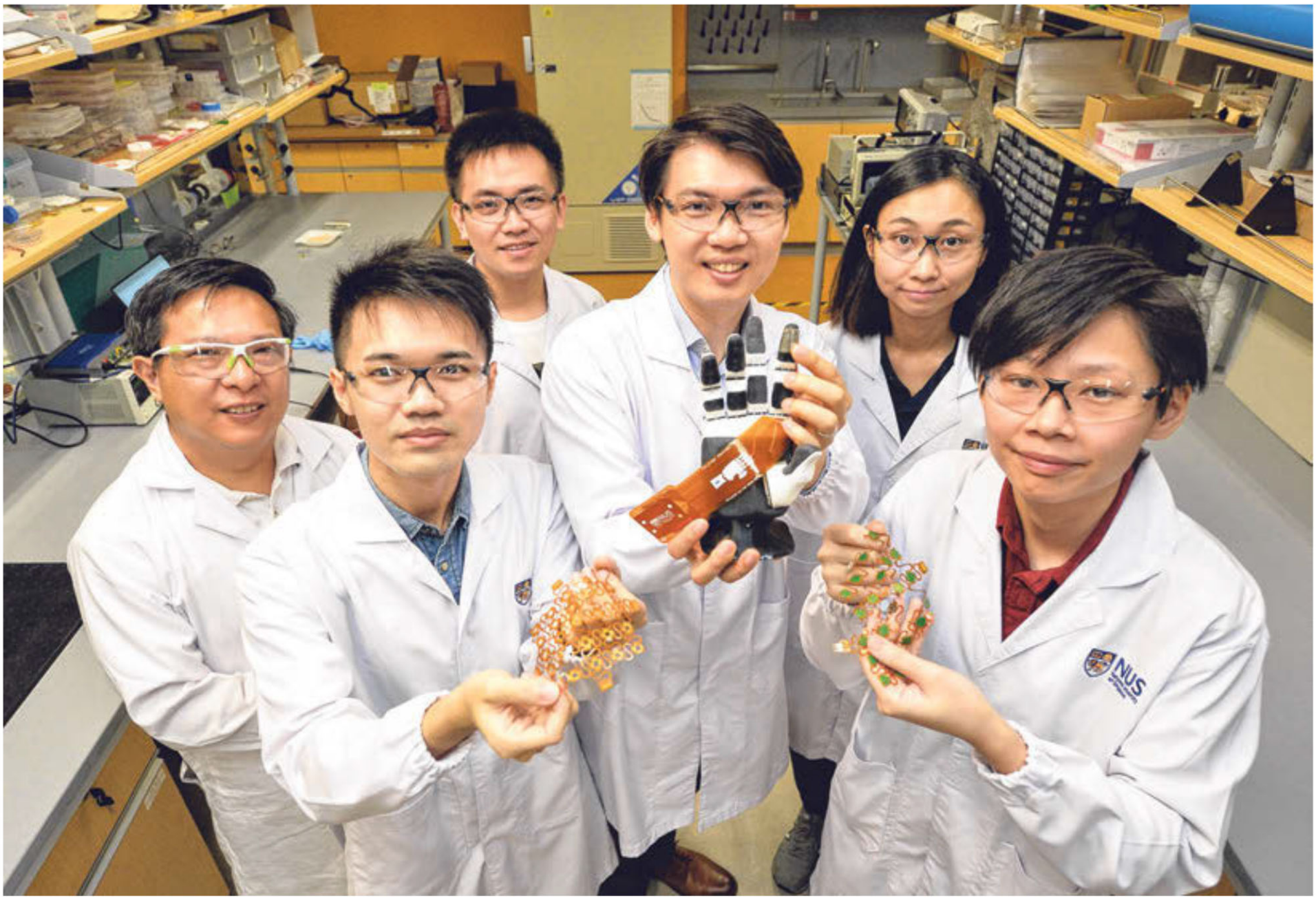
Source: *The Straits Times,* pB8
Date: 18 July 2019



Assistant Professor Benjamin Tee with a robotic hand that has electronic skin attached to the index finger. With him are (from left) research fellow Ng Kian Ann; PhD students Li Si and Yao Haicheng; and research fellows Tan Yu Jun and See Hian Hian. The two team members are holding e-skin prototypes. ST PHOTO: SHINTARO TAY

Prosthetics can sense touch with 'electronic skin' invention

Shabana Begum

Users of prosthetic limbs could soon be able to feel sensation on them, thanks to an "electronic skin" (e-skin) invented by researchers from the National University of Singapore (NUS).

The artificial nervous system can detect touch more than 1,000 times faster than the human equivalent and is the first e-skin in the world to do so, according to Assistant Professor Benjamin Tee from the Department of Materials Science and Engineering at the NUS Faculty of Engineering, who led the research.

Previously, damaged e-skins would lose their function due to their interlinked wiring system.

But if a corner of the Asynchronous Coded Electronic Skin (Aces) nervous system tears, the rest of the skin continues to have sensation, just like human skin, the researchers said.

This is because the Aces detects signals like the human nervous system and it comprises a network of sensors – each working independently – connected via a single electrical conductor.

The research team, which took 1½ years to develop the sensor system, published its innovation in Science Robotics journal today.

"When you lose a limb and get fitted with a prosthetic that doesn't feel, it's almost like you're always feeling numb and cannot control things very well," said Prof Tee. "If we have a skin that can make prosthetics smarter, we can restore motor functions, productivity and general quality of life for these people."

In human skin, receptors send information about touch to the brain, which enables humans to intuitively sense touch.

When the Aces is attached to a prosthetic hand, a neural implant must be inserted into the patient's arm so that the brain can detect the sense of touch from the e-skin.

The team will work with prosthetics researchers abroad to conduct a clinical trial of the e-skin with a patient using an artificial hand.

The Aces has also been designed for robots. "Robots need to have a sense of touch to interact better with humans, but robots today still cannot feel objects very well," said Prof Tee.

For instance, a search-and-rescue robot digging through rubble will need sensation to know that it has to push away rocks and concrete to rescue a trapped person.

E-skin such as the Aces can be commercialised for robots within a year or two, Prof Tee said, but it will take five to 10 years for prosthetics that sense touch to reach patients, to allow for clinical trials.

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