Versatile wearable sensor unlocks new applications

A sensor flexible enough to be used in soft robotics, wearable consumer electronics, smart medical prosthetic devices and real-time healthcare monitoring — this has now been made possible with an invention by NUS engineers.

Tactile sensors measure diverse properties arising from physical interaction, with the data transmitted to a connecting analytical system.

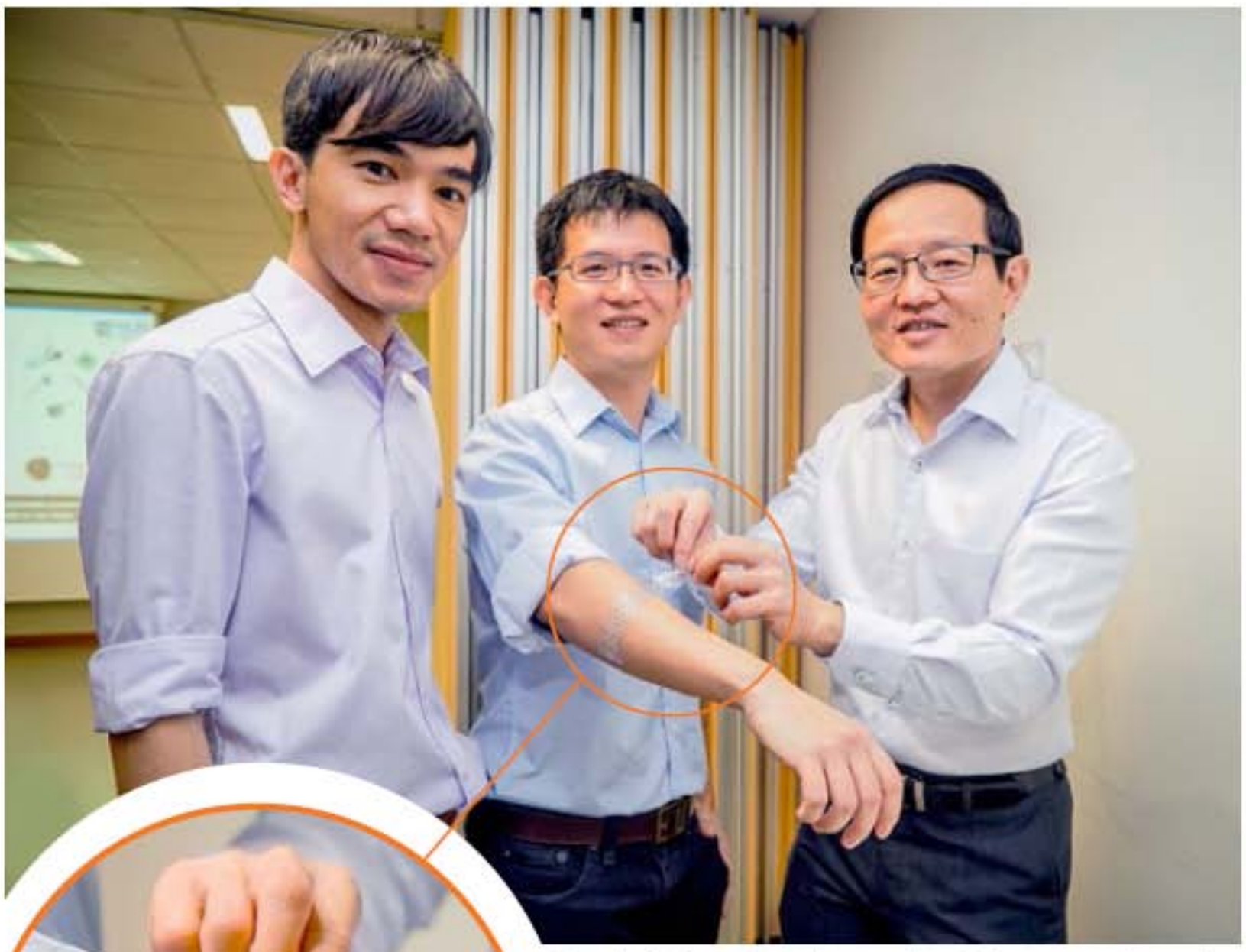
The NUS sensor, the first of its kind based on liquid, is small, thin, highly flexible and durable, unlike existing tactile sensors in solid-state form. The latter are generally rigid, inhibit natural body movement and prone to deformation and failure under pressure.

Being simple and cost-effective to produce, the new device developed by NUS Biomedical Engineering graduate students Kenry and Yeo Joo Chuan, under the supervision of Professor Lim Chwee Teck, is ideal for applications.

The product is fabricated on a flexible base, such as common silicone rubber, and uses an advanced two-dimensional nanomaterial in liquid form. The non-corrosive and non-toxic material makes the sensor safe and discreet, while allowing it to conform to any shape.

The researchers conducted a series of demanding tests on the device, including pressing, bending and stretching, even driving a car over it. The tough item performed admirably, giving consistent readings throughout the trials without compromising its functionality.

Prof Lim noted that the microfluidic device addresses an existing gap in the market.



From left: Kenry, Joo Chuan and Prof Lim have engineered a liquid-based tactile sensor that promises wide-ranging uses

"Being thin and flexible, the sensor gives a better fit when monitoring natural body movements. Its small size, durability and ease of production further differentiate this novel device from conventional tactile sensors. With the rapid advancement of healthcare and biomedical technologies as well as consumer electronics, we are optimistic about new possibilities to commercialise our invention," he said.

Prof Lim added that the product suits applications that may come into contact with human skin or where there is a lot of flexing, for instance, physiotherapy. Placed on a patient's finger, it can measure the amount of force exerted during flexion, determining whether the patient is flexing correctly or applying the appropriate amount of force.

Another possibility is drug delivery via a skin patch, where medication such as insulin can be administered into the body directly through microneedles.

The team has filed a patent for their invention and is exploring licensing partnerships for commercial development.

Different forms of the tactile sensor