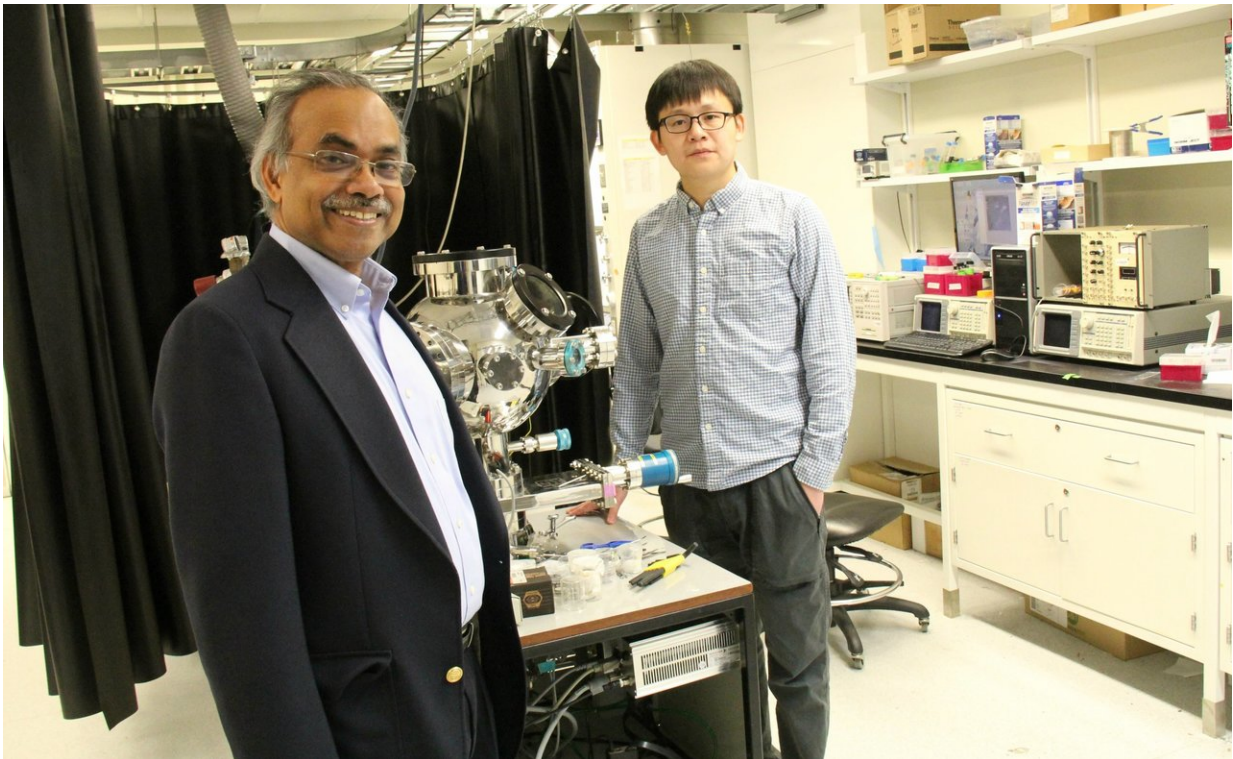


Researchers discover new way to power electrical devices

December 11 2017, by Richard Cairney



University of Alberta researcher Thomas Thundat and PhD student Jun Liu have made a major advance in the development of triboelectric nan generators. These devices can turn small amounts of mechanical energy, like vibrations, into a steady DC power current. The nanogenerators can power small handheld devices or sensors that monitor anything from pipelines to medical implants. Credit: UAlberta Engineering

A team of University of Alberta engineers developed a new way to produce electrical power that can charge handheld devices or sensors that monitor anything from pipelines to medical implants. The discovery sets a new world standard in devices called triboelectric nanogenerators by producing a high-density DC current—a vast improvement over low-quality AC currents produced by other research teams.

Jun Liu, a PhD student working under the supervision of chemical engineering professor Thomas Thundat, was conducting research unrelated to these tiny generators, using a [device](#) called an [atomic force microscope](#). It provides images at the atomic level using a tiny cantilever to "feel" an object, the same way you might learn about an object by running a finger over it. Liu forgot to press a button that would apply electricity to the sample—but he still saw a current coming from the material.

"I didn't know why I was seeing a current," he recalled.

One theory was that it was an anomaly or a technical problem, or interference. But Liu wanted to get to the bottom of it. He eventually pinned the cause on the friction of the microscope's probe on the material. It's like shuffling across a carpet then touching someone and giving them a shock.

It turns out that the mechanical energy of the microscope's cantilever moving across a surface can generate a flow of electricity. But instead of releasing all the energy in one burst, the U of A team generated a steady current.

"Many other researchers are trying to generate power at the prototype stages but their performances are limited by the current density they're getting—that is the problem we solved," said Liu.

"This is big," said Thundat. "So far, what other teams have been able to do is to generate very high voltages, but not the current. What Jun has discovered is a new way to get continuous flow of high current."

The discovery means that nanoscale generators have the potential to harvest power for electrical devices based on nanoscale movement and vibration: an engine, traffic on a roadway—even a heartbeat. It could lead to technology with applications in everything from sensors used to monitor the physical strength of structures such as bridges or pipelines, the performance of engines or wearable electronic devices.

Liu said the applications are limited only by imagination.

The U of A findings appear in the latest edition of the journal *Nature Nanotechnology*.

More information: Jun Liu et al, Direct-current triboelectricity generation by a sliding Schottky nanocontact on MoS₂ multilayers, *Nature Nanotechnology* (2017). [DOI: 10.1038/s41565-017-0019-5](https://doi.org/10.1038/s41565-017-0019-5)

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