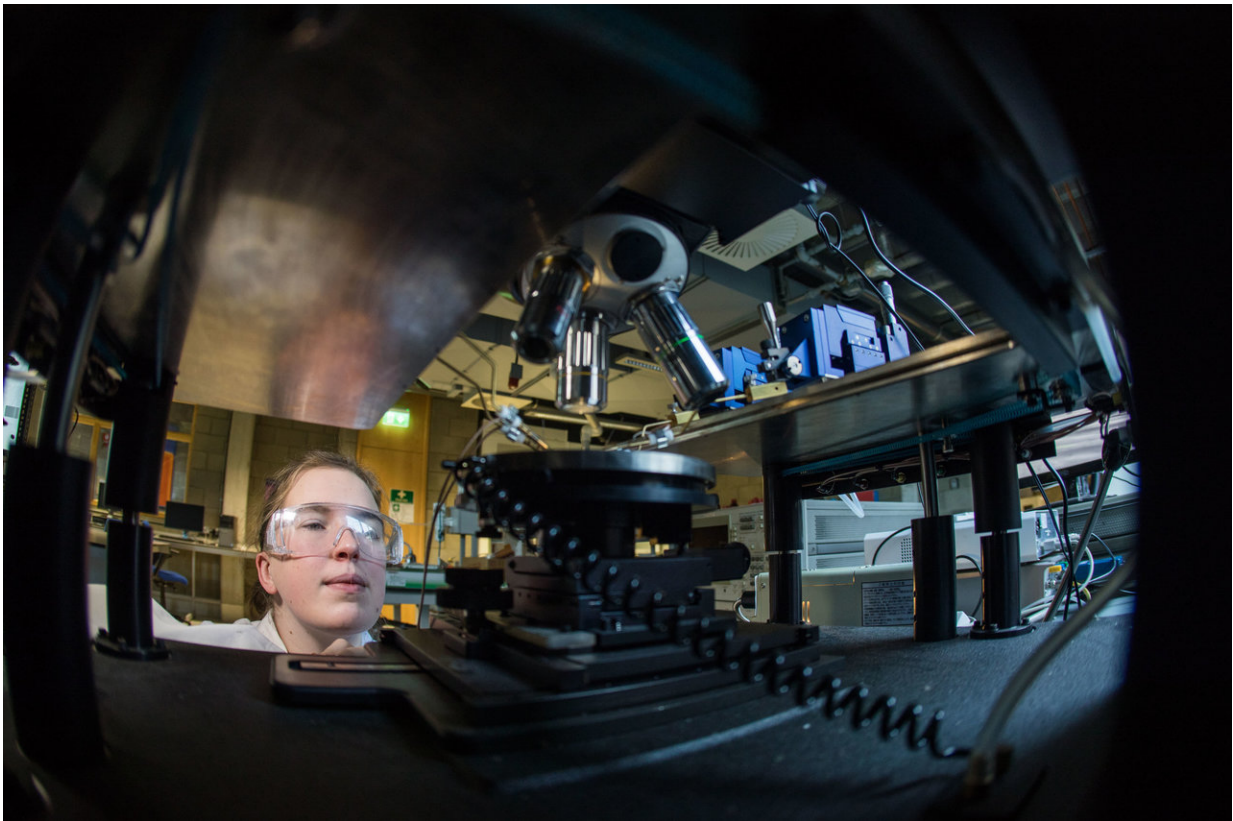


Researchers squeeze low-cost electricity from sustainable biomaterial

December 4 2017



Pictured is Sarah Guerin, Science Foundation Ireland funded post-graduate researcher at the Bernal Institute, UL. Credit: Sean Curtin True Media

Mobile phone speakers and motion detectors in cars and video games may soon be powered by electricity generated from low cost and

sustainable biomaterials, according to research carried out at University of Limerick (UL), Ireland.

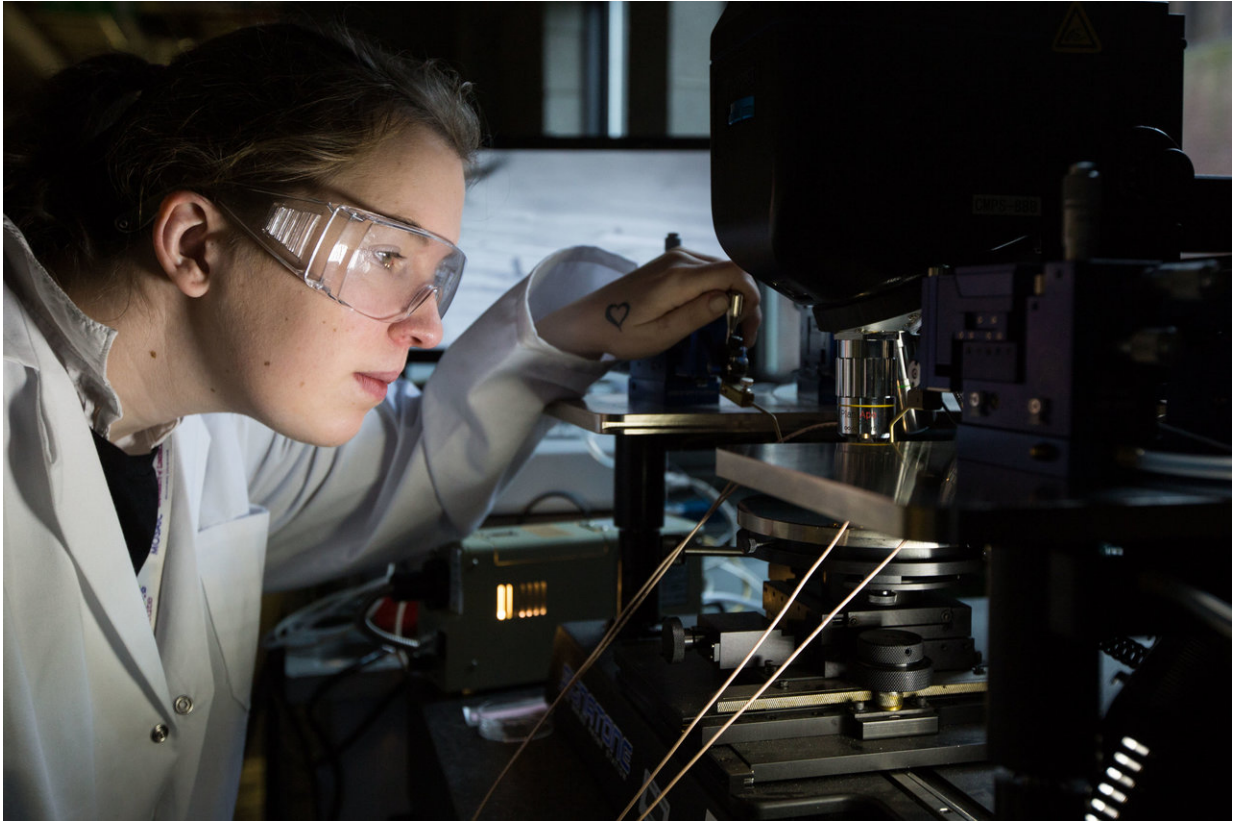
Scientists at UL's Bernal Institute have discovered that the biomolecule glycine, when tapped or squeezed, can generate enough [electricity](#) to power electrical devices in an economically viable and environmentally sustainable way. The research was published on December 4, 2017 in leading international journal *Nature Materials*.

Glycine is the simplest amino acid. It occurs in practically all agro and forestry residues. It can be produced at less than one per cent of the cost of currently used [piezoelectric materials](#).

Piezoelectric materials generate electricity in response to pressure, and vice versa. They are widely used in cars, phones, and remote controls for games consoles. Unlike glycine, these materials are normally synthetic and often contain toxic elements such as lead or lithium.

"It is really exciting that such a tiny molecule can generate so much electricity," said lead author Sarah Guerin, a post-graduate student at the Department of Physics and the Bernal Institute, UL.

"We used computer models to predict the electrical response of a wide range of crystals and the glycine number was off the charts. We then grew long, narrow crystals of glycine in alcohol," she added, "and we produced electricity just by tapping them."



Pictured is Sarah Guerin, Science Foundation Ireland funded post-graduate researcher at the Bernal Institute, UL. Credit: Sean Curtin TrueMedia

Sarah's PhD supervisor Dr Damien Thompson, adds, "The predictive models we are developing can save years of trial-and-error lab work. The modelling data tells us what kinds of crystals to grow and where best to cut and press those crystals to generate electricity."

Co-author and Science Foundation Ireland (SFI) Centre for Medical Devices (CURAM) investigator Professor Tofail Syed said: "We also have a pending patent that translates our findings to applications such as biodegradable power generation, devices detecting diseases inside of the body and physiologically controlled drug pumps".

Previously, Bernal scientists discovered piezoelectricity in the globular protein lysozyme, found in tears, egg-white and saliva, and hydroxyapatite, a component of bone.

"The current finding extends the technology towards pragmatic, low-cost, renewable sources for electricity generation," according to Professor Luuk van der Wielen, Director of the Bernal Institute and Bernal Professor of Biosystems Engineering and Design. "The finding translates the earlier Bernal scientists' world-leading contribution in bio-piezoelectricity towards a large-scale and affordable application potential."

Professor Edmond Magner, Dean of Science and Engineering at UL, said: "UL's Department of Physics and Bernal Institute researchers continue to pioneer the use of biological crystals for electrical applications. This work places them at the forefront in the development of bio-piezoelectric devices".

The full paper, Control of Piezoelectricity in Amino Acids by Supramolecular Packing, by Sarah Guerin, Aimee Stapleton, Drahomir Chovan, Rabah Mouras, Matthew Gleeson, Cian McKeown, Mohamed R Noor, Christophe Silien, Fernando M F Rhen, Andrei L Kholkin, Ning Liu, Tewfik Soulimane, Syed A M Tofail, and Damien Thompson, is published in *Nature Materials*, December 4, 2017.

More information: Sarah Guerin et al, Control of piezoelectricity in amino acids by supramolecular packing, *Nature Materials* (2017). [DOI: 10.1038/nmat5045](https://doi.org/10.1038/nmat5045)

Provided by University of Limerick

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