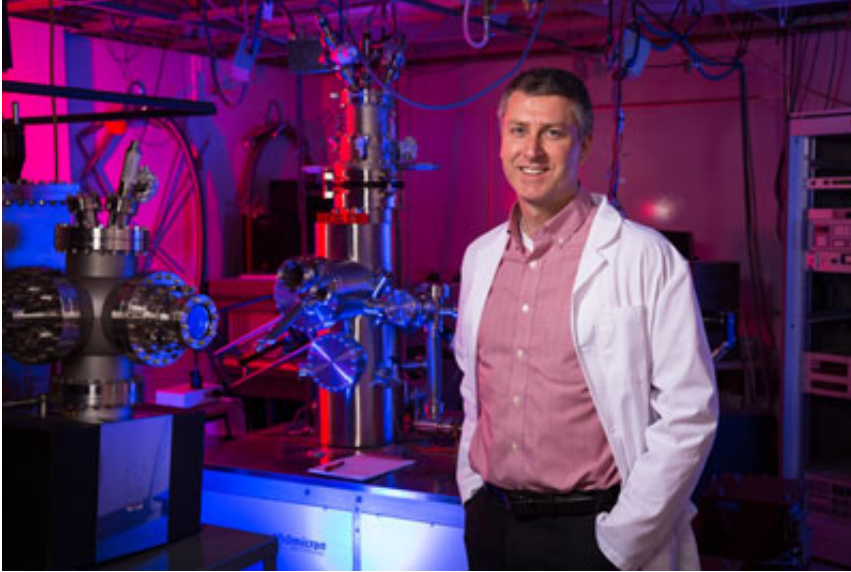


Buckling graphene takes a 'Lévy flight' - physicsworld.com



The spontaneous buckling of freestanding sheets of graphene has been observed by a team of physicists based in the US, Iran and Belgium. The researchers believe the random process could be used to harvest thermal energy from the environment and could someday be used to power small electronic devices such as remote sensors.

Graphene is a sheet of carbon just one atom thick. Since it was [first isolated in 2004](#), the material has been found to have a number of exceptional electronic and mechanical properties that could be used in a range of applications from electronics to water purification.

Atomic scale

In this latest research, [Paul Thibado](#) and colleagues at the University of Arkansas, Shahid Rajaei Teacher Training University and the University of Antwerp used scanning tunnelling microscopy to study the surface of freestanding graphene at the atomic scale.

The team focused on an atom-sized portion of the graphene surface, measuring its height over a period of more than two hours at room temperature. They found that the height of the region varied by as much as 10 nm over that time – a distance that is about 40 times the separation between neighbouring carbon atoms in graphene.

"Freestanding graphene is constantly in motion. It moves up and down like a buoy bobbing in the ocean"

Paul Thibado, University of Arkansas

Most of the time the motion was akin to a gentle bobbing that is described by Brownian motion – random movement that is expected in such a system. "Freestanding graphene is constantly in motion," Thibado explains. "It moves up and down like a buoy bobbing in the ocean."

However, Thibado and colleagues also caught sight of a much more violent motion. Occasionally the region they were observing would swing rapidly from being part of a concave surface to being part of a convex surface and vice versa.

“The bobbing motion is intermittently interrupted when the material flips from looking like the inner part of a bowl to the outer part of the bowl,” explains Thibado, adding “that high velocity, snap-through movement is known as mechanical buckling”.

Random walk

By analysing the frequency of these buckling events, the team worked out that they can be described as a “Lévy flight”. This is a random-walk process in which large excursions from the average position are common. Lévy flights are often seen in biological systems, such as the foraging patterns of animals.

The team believes that this buckling motion could be used to generate electricity from ambient thermal energy. Such an energy source could be used to run low-power devices such as remote wireless sensors.

The research is described in [*Physical Review Letters*](#).