

# 'Micro-windmills' could charge cellphones, inventors say

## University of Texas team builds 1.8-mm-wide power-generating device

By Matt Kwong, [CBC News](#) Posted: Jan 15, 2014 2:54 PM ET Last Updated: Jan 15, 2014 2:54 PM ET

Researchers in Texas have created a windmill so small it appears as a speck on the surface of a penny. But they say a multitude of the micro-machines, linked together, could someday generate enough energy to charge up a cellphone or a house.

"Imagine your phone is out of battery, so you take out a sleeve that has 1,000 windmills on it and wave it in the air for a few minutes," said Jung-chih Chiao, an electrical engineering professor at the University of Texas at Arlington. "That could give you enough power to get by and send a message."

The micro-windmill is only 1.8 millimetres at its widest point. As many as 10 of the tiny devices could fit on one grain of rice.

Chiao, who designed the micro-windmill prototype with research associate Smitha Rao, said it was fabricated using nickel alloy components that are flexible and durable.

The device was built using a subset of the micro-fabrication process for the tiny semiconductors used in everyday electronic circuits.

## Origami principles used

The windmills are then constructed from ultra-thin slices of semiconductor material known as a wafers.

I didn't want to put a big wind turbine in my backyard...I thought, 'Can I just set something up so I can power a sensor or light at night?'- *Jung-chih Chiao, University of Texas at Arlington professor*

"A windmill is a three-dimensional structure, but the semiconductor fabrication technique is two-dimensional," Chiao told CBC News from Arlington.

"So how do you do it? A simple way of thinking about this is like origami."

Assembling windmills using tweezers and constructing them like gingerbread houses would be too difficult due to the micro-scale of the assembly, he said.

"But with origami, sometimes you fold one side and the other side will stand up. We're using that kind of principle," Chiao said, adding that producing one micro-windmill would cost the same as making 1,000 because they would be on the same wafer.

While the University of Texas team has not been able to disclose how much electricity was generated with the micro-windmill, because of a patent application that's still being filed, Chiao said the use of thousands of the windmills together could eventually provide enough power to run a household's security, communication and lighting systems.

## Dust friction a challenge

"We got the idea because I didn't want to put a big wind turbine in my backyard, but I have a lot of wind there because I live near an airport," Chiao said. "I thought, 'Can I just set something up so I can power a sensor or light at night?'"



Smitha Rao, an associate researcher with the University of Texas at Arlington, designed the micro-windmill prototype. (University of Texas at Arlington)

A flat panel of 10,000 micro-windmills mounted on a six-foot by six-foot window might be able to do the trick, he says.

Similarly, a smartphone case studded with windmills could be useful in emergency situations after the sun has set and a person needs to contact the outside world but has run out of battery. Even holding the phone out for several minutes during a windy day could power up the battery, Chiao says.

"Sometimes there's not enough solar energy and sometimes you don't have the connector available that can plug into the power outlet," he said.

Chiao and Rao, who works with micro-robotic devices, are now in talks with the Taiwanese fabrication foundry WinMEMS Technologies Co., about commercializing their invention.

The researchers are still exploring potential physics challenges that might limit the design, such as friction problems that might occur if a piece of dust jams the mini-rotor blades.

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@Nathan A Thompson My parents often joke about that in the summer.

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Seems like a silly idea - there are more efficient ways to generate a little power from kinetic energy than waving around a bunch of tiny windmills. But without this kind of off-the-wall thinking and research, we don't make new useful discoveries, so I say.... good on you.

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Although the micro-windmill seems pushing the envelope, MEMs devices which were seen as novelties a few years ago are now commonplace.

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Mount them on drones, they'll never have to land.

Solar reactive paint, micro turbines, diesel engines will run on vegetable oil, hemp is harvest-able from 1sq meter in 4 - 9 weeks(also the strongest natural fiber on Earth - paper, cloth, rope, fenders, structural beams, household items are all made from it), vertical greenhouses can take the place of steep hill sides in urban areas, animal fat waste turned in to engine oil, plastic bags converted in to gasoline(roughly 10% of which also runs ...

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**DogieD**

@kyle123420 It doesn't work like that. A drone would need to use extra energy to fly with these little windmills on it. More energy than the windmills could actually produce (they aren't 100% efficient, probably very, very much less). So the drone would go less far carrying the windmills.

It takes energy to turn those little blades, believe it or not. And the greater the load on the electrical side, the harder it gets to turn the blades (i.e. more energy required).

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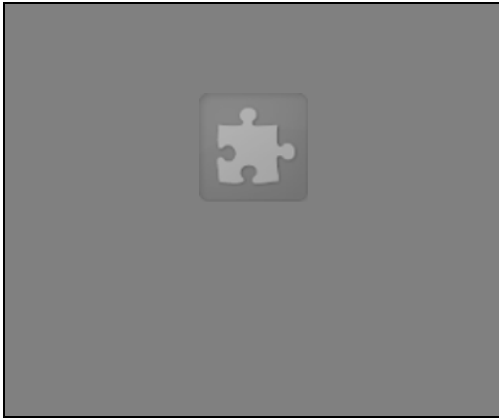
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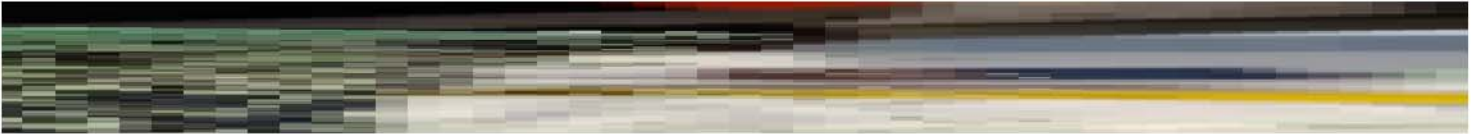
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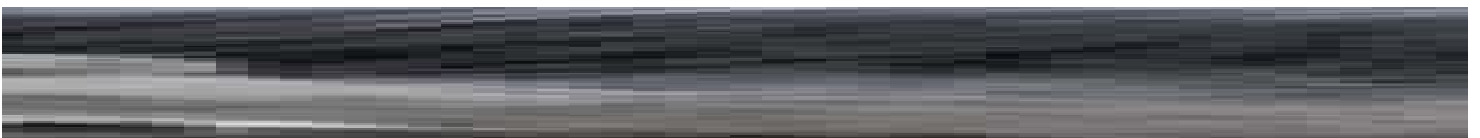
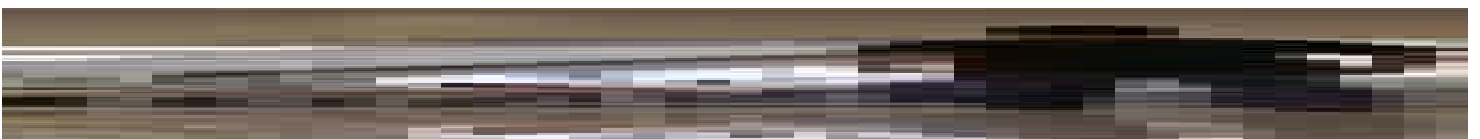
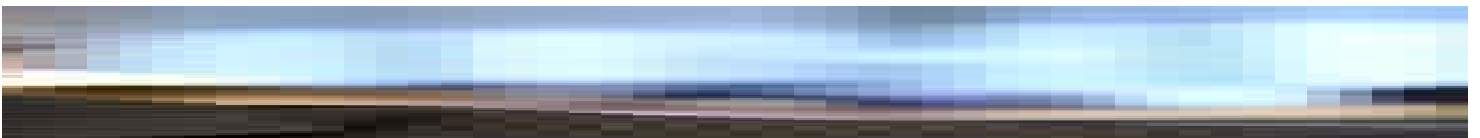
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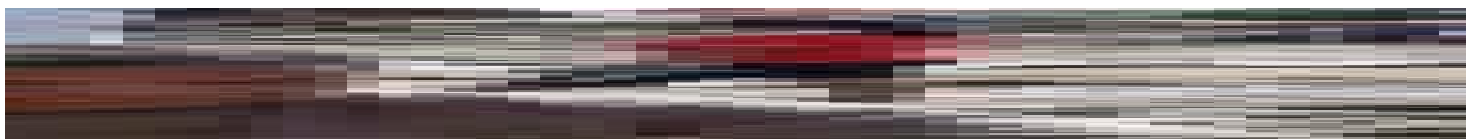
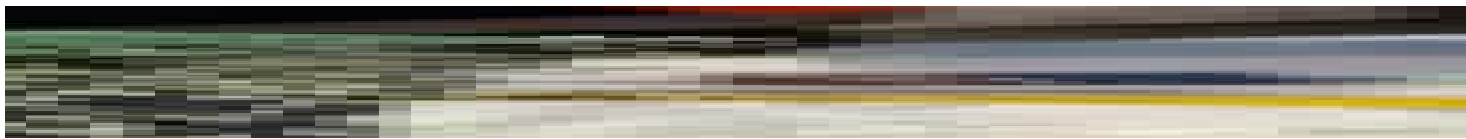
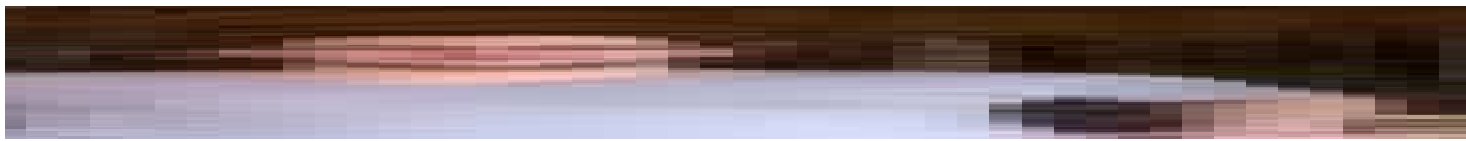
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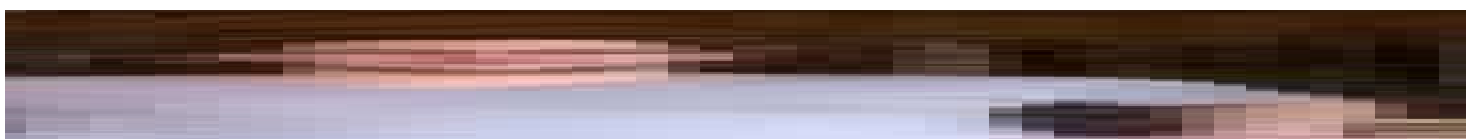
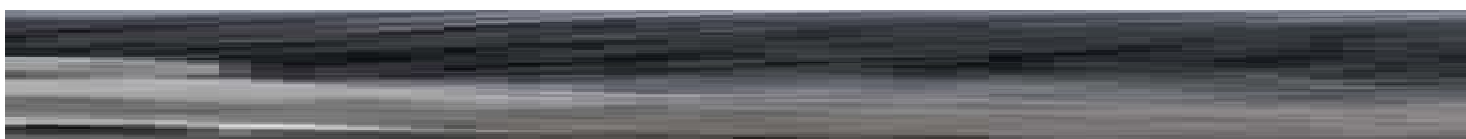
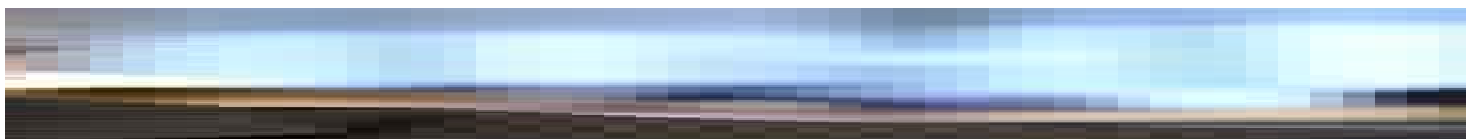
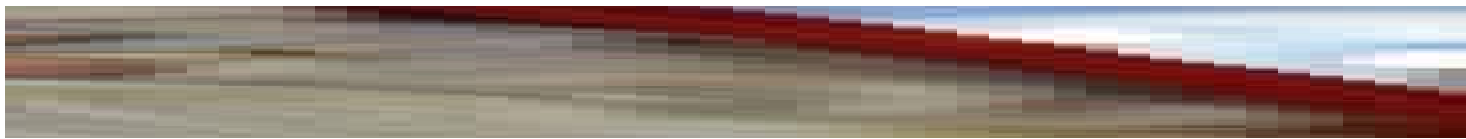
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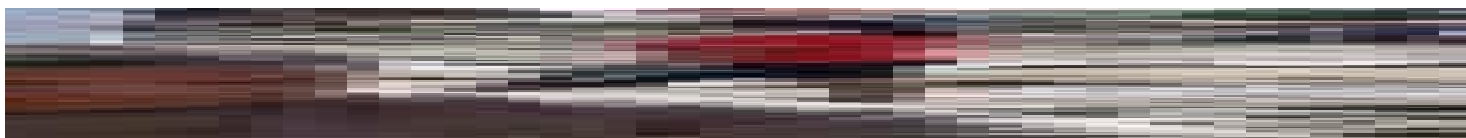
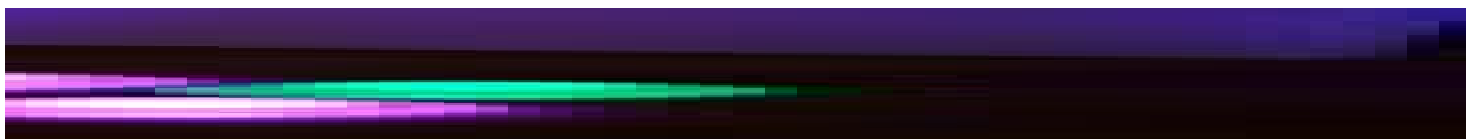
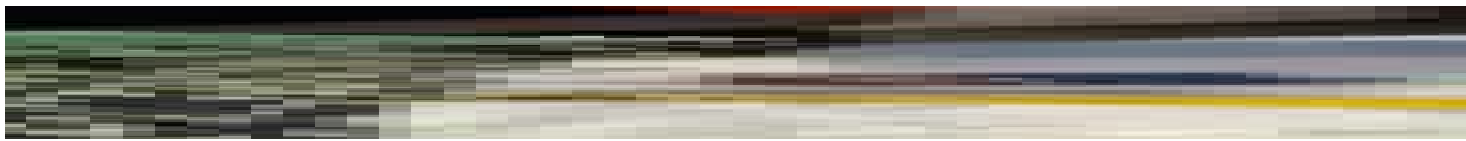


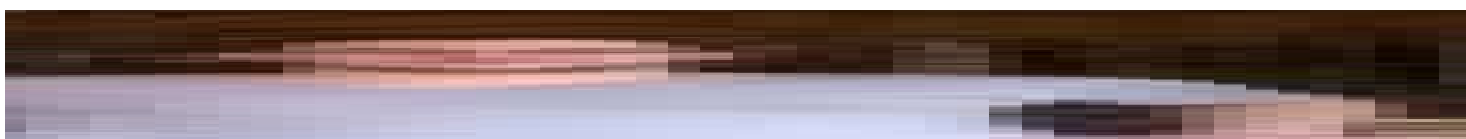
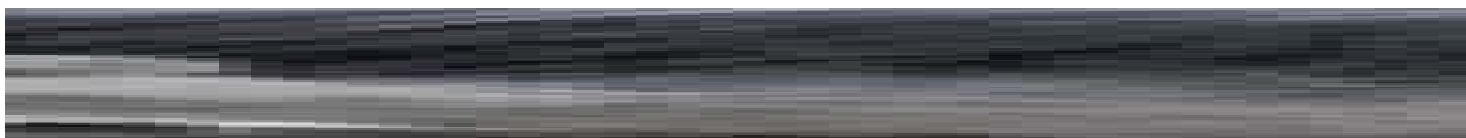
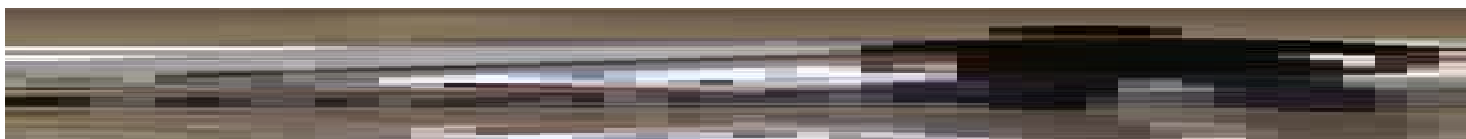
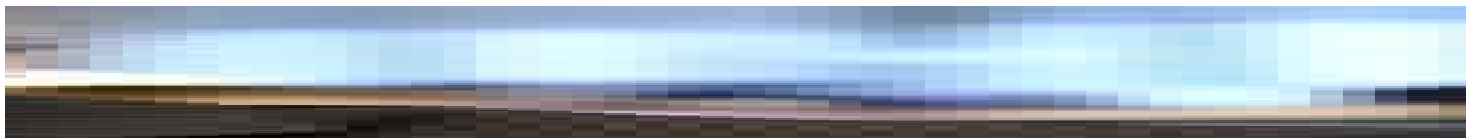
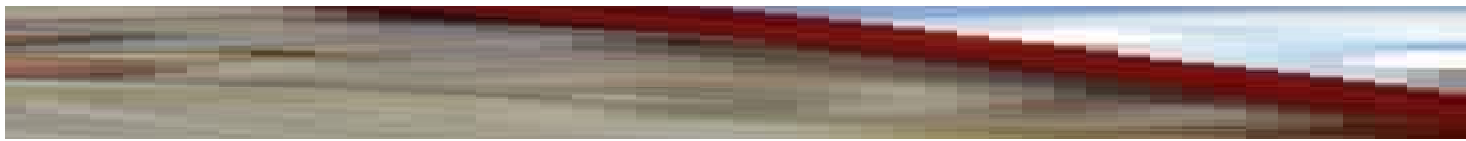












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