Wind to meet world's power need

THERE is enough energy available in winds to meet all of the world's demand. Atmospheric turbines that convert steadier and faster high-altitude winds into energy could generate even more power than ground- and ocean-based units. New research from Carnegie's Ken Caldeira examines the limits of the amount of power that could be harvested from winds, as well as the effects high-altitude wind power could have on the climate as a whole.

Their work is published September 9 by Nature Climate Change.

Led by Kate Marvel of Lawrence Livermore National Laboratory, who began this research at Carnegie, the team used models to quantify the amount of power that could be generated from both surface and atmospheric winds. Surface winds were defined as those that can be accessed by turbines supported by towers on land or rising out of the sea. High-altitude winds were defined as those that can be accessed by technology merging turbines and kites. The study looked only at the geophysical limitations of these techniques, not technical or economic factors.

Turbines create drag, or resistance, which removes momentum from the winds and tends to slow them. As the number of wind turbines increase, the amount of energy that is extracted increases. But at some point, the winds would be slowed so much that adding more turbines will not generate more electricity. This study focused on finding the point at which energy extraction is highest.

Using models, the team was able to determine that more than 400 terrawatts of power could be extracted from surface winds and more than 1,800 terrawatts could be generated by winds extracted throughout the atmosphere.

Today, civilization uses about 18 TW of power. Near-surface winds could provide more than 20 times today's global power demand and wind turbines on kites could potentially capture 100 times the current global power demand.

At maximum levels of power extraction, there would be substantial climate effects to wind harvesting. But the study found that the climate effects of extracting wind energy at the level of current global demand would be small, as long as the turbines were spread out and not clustered in just a few regions. At the level of global energy demand, wind turbines might affect surface temperatures by about 0.1 degree Celsius and affect precipitation by about 1%. Overall, the environmental impacts would not be substantial.

Atmospheric turbines that convert steadier and faster high-altitude winds into energy could generate even more power than ground- and ocean-based units.

"Looking at the big picture, it is more likely that economic, technological or political factors will determine the growth of wind power around the world, rather than geophysical limitations," Caldeira said.

Source: **Science Daily**

ILL-STARRED

Exploding stars culprit?

Supernova

AN astrophysicist working on one of the greatest mysteries of cosmos has a new theory on global warming that might sound implausible on its face, but actually makes some sense: that we can measure future global warming based on the number of exploding stars we see in the sky.

Dr. Charles Wang of the University of Aberdeen has put forth a new theory concerning supernova that involves a Higgs Boson-like mystery particle that is scheduled to be tested at CERN. That's interesting, but perhaps more intriguing is the idea that his theory could aid in our understanding of where global warming originates and where it is going.

It turns out exploding stars elsewhere in the universe have an effect on the temperature of Earth's atmosphere. When stars explode elsewhere, the massive amount of cosmic rays created affect space weather in that corner of the cosmos, making it cloudier. That cloudiness shades Earth from other cosmic waves that are likely impacting the atmosphere here. The cloudier it is out there, the cooler Earth's atmosphere is. So, the theory goes, fewer star explosions equals a warmer atmosphere. And a warmer climate.

That doesn't help us much from a policy perspective. We don't yet fully understand the mechanisms by which individual stars go supernova, and we certainly don't have the means to control star explosions. But since we do record these explosions - roughly one per year - we could use that data to help predict future changes in climate.

Source: **Australian Popular Science**

LIGHTS

He shapped Quantum Physics

Niels Henrik David Bohr

NIELS Henrik David Bohr was a Danish physicist, who made foundational contributions to understanding atomic structure and quantum mechanics, for which he received the Nobel Prize in Physics in 1922. He was born in born in October 07, 1885.

In 1903, Bohr enrolled as an undergraduate at Copenhagen University, initially studying philosophy and mathematics. In 1905, prompted by a gold medal competition sponsored by the Royal Danish Academy of Sciences and Letters, he conducted a series of experiments to examine the properties of surface tension, using his father's laboratory in the university, familiar to him from assisting there since childhood. His essay won the prize, and it was this success that influenced Bohr to abandon philosophy and adopt physics. He continued as a graduate student at the University of Copenhagen, under the physicist Christian Christiansen, receiving his doctorate in 1911.

He mentored and collaborated with many of the top physicists of the century at his institute in Copenhagen. He was also a passionate footballer, and he played a number of matches for the Copenhagen-based Akademisk Boldklub. He was part of the British team of physicists working on the Manhattan Project. Bohr married Margrethe Norlund in 1912, and one of their sons, Aage Bohr, grew up to be an important physicist who in 1975 also received the Nobel Prize. David Bohr has been described as one of the most influential scientists of the 20th century.

David Bohr died in November 18, 1962.

Source: **Wikipedia**

LEADING TEMP FACTOR

Temperature rise slows economy

SMALL increases in temperature may have reduced the industrial and agricultural production of poor countries, according to a study by US economists.

Higher temperatures may also have contributed to political instability in these countries defined as those with below-median per capita income, adjusted for the purchasing power of the country's currency according to the study published in theAmerican Economic Journal: Macroeconomics last month. In contrast, rich countries have so far shown no measurable economic or political consequences resulting from temperature change.

Industry output in poor countries may go down when temperatures go up.

"Temperature fluctuations can have large negative impacts on poor countries," said Benjamin Olken, an economics professor at the Massachusetts Institute of Technology, and one of the authors of the study.

"If fluctuations affect the growth rate each year, over time that adds to a really big impact."

The authors compared annual temperature and precipitation changes from 1950 to 2003 with aggregate economic output data. Based on the data, the researchers estimated that a one degree Celsius rise in temperature in a given year had reduced economic growth by about 1.3 percentage points on average.

By correlating the temperature and precipitation data with regular changes of government, such as elections, and irregular changes, such as coups, the researchers found that higher temperatures are also associated with political instability in poor countries.

The impact of temperature on political instability may be "one mechanism through which temperature might affect productivity growth", according to the paper. But further work is needed to determine why both a country's economy and its political stability are affected by temperature, the authors said.

The findings could be used to tweak the traditional climate change models, allowing them to better distinguish the effects of climate from other factors influencing economies, the paper said.

"There is a huge amount of literature looking at the [impact of temperature] fluctuations," said Melissa Dell, one of the authors of the paper. "We're more able [than before] to convincingly isolate the temperature and not just something that's correlated with it."

Previous findings published in American Economic Review: Papers & Proceedings in 2010 also found that a one degree Celsius warming in a poor country had reduced the growth of all exports by between two and 5.7 percentage points.

Rich countries had not experienced such slowdowns that could be correlated with temperature increases, although the decline in imports from poor countries might have led to consumers in rich countries paying higher prices for commodities, the researchers speculated.

"It has generally been a reasonable assumption that poor countries are disproportionately affected by climate change, which is what the study showed," said Saleemul Huq, a senior fellow in the climate change group at the International Institute for Environment and Development, in United Kingdom. Huq said there was now a need to analyse the impact that severe temperature fluctuations in major food-producing countries may have on developing countries. For example, high temperatures in the United States have resulted in sharp price increases in corn around the world this year.

"I would like to see more about how changes in temperature in one part of the world have repercussions in another part of the world," said Huq. "Climate change in one part of the world can have a tremendous impact in another, that we are not yet aware of."

Source: **SciDev.Net**

NANO PIPED

Nanotube hologram

A holographic image of the word "CAMBRIDGE" generated using carbon nanotubes.

CARBON nanotubes a manmade material many times thinner than a wavelength of visible light can be used to create highly detailed holograms, researchers say.

These carbon tubes are hollow pipes only nanometers, or billionths of a meter, wide. They possess a range of extraordinary physical and electrical properties, such as being about 100 times stronger than steel at one-sixth the weight.

Industrial giants, government agencies and academic institutes worldwide are investigating carbon nanotubes as key ingredients for tomorrow's devices. This work includes researching a variety of applications regarding light holograms, for instance.

Holograms are a special kind of 2D photograph that, when lit up, seem like windows onto 3D scenes. The pixels making up each hologram scatter light falling onto them in very specific ways, causing these light waves to interact with each other to generate images with depth. The smaller the pixels making up the holograms are, the higher the resolution of the holograms and the more angles one can view them from.

"The size of pixels is one of the key limiting features in the state-of-the-art of holographic displays systems," said researcher Haider Butt, an optical scientist at the University of Cambridge in England.

Now scientists have created holograms using the smallest pixels yet carbon nanotubes.

"Due to the nanoscale dimensions of the carbon nanotube array, the image presented a wide field of view and high resolution," Butt told InnovationNewsDaily.

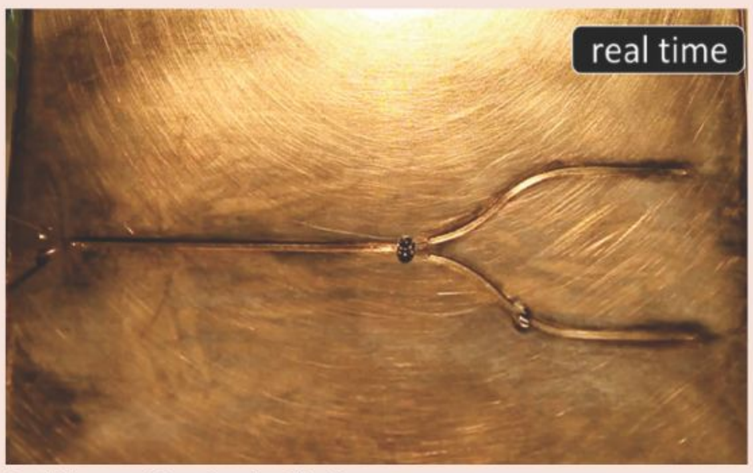
The researchers used multi-walled carbon nanotubes tubes within tubes that were on average 140 nanometers across, or about 700 times thinner than a human hair. These were grown on silicon surfaces like pillars rising from the ground, each reaching about 1,500 nanometers high. Their calculations let them know where these nanotubes should be placed and how wide they should be in order to generate a holographic image of the word "CAMBRIDGE."

These holographic displays and their pixels are very sensitive to changes in material properties and incoming light. As such, "a new class of highly sensitive holographic sensors can be developed that could sense distance, motion, tilt, density of biological materials," and features of light falling onto them, Butt said.

While promising, carbon nanotubes are still expensive to fabricate, so the team is investigating other materials that could generate holograms in similar ways. "Alternative materials should be explored and researched," Butt said. "As a next step, we are going to try zinc oxide nanowires to achieve the same effects."

Source: **Yahoo News**

POWERLESS DRIVE



A still from a video showing flip-flop memory computing based on water droplets.

SOURCE: **LIVE SCIENCE**

Water-drop-run computer

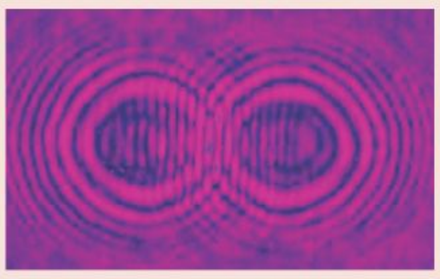
Today's computers can short out if liquid enters their innards, but water droplets could form the basis for tomorrow's electricity-free computing devices.

The idea of turning water droplets into digital bits the basic unit of data transfer came from experiments at Aalto University in Finland. When researchers observed water droplets bouncing off one another like billiard balls on a water-repellent surface, they realized they could guide the water droplets along water-repellent tracks.

DID YOU KNOW?

What is superfluid?

A superfluid is a phase of matter capable of flowing endlessly without energy loss. This property of certain isotopes was discovered by Pyotr Leonidovich Kapitsa, John F. Allen, and Don Misener in 1937. It has been achieved at very low temperatures with at least two isotopes of helium, one isotope of rubidium, and one isotope of lithium.



Laser sheds light on superfluids.

The superfluid phase transition occurs when all the constituent atoms of a sample begin to occupy the same quantum state. This transition happens when the atoms are placed very closely together and cooled down so much that their quantum wave functions begin to overlap and the atoms lose their individual identities, behaving more like a single super-atom than an agglomeration of atoms.