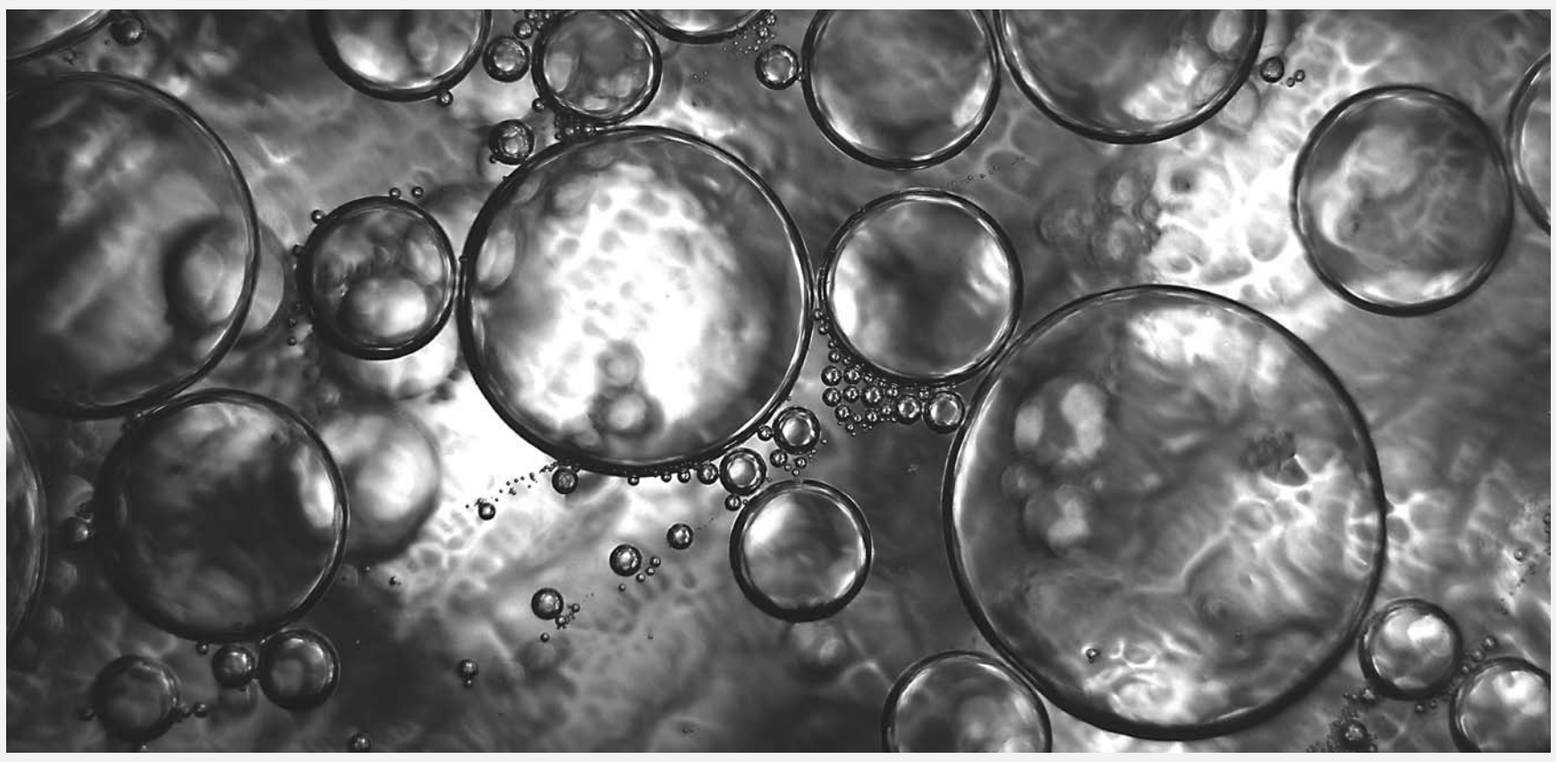


BUBBLE THEORY: Some researchers posit that our universe, like a bubble in a sea of bubbles, could at times be connected to other universes, with each individual also connected to a parallel counterpart. PHOTOS.COM

Multiple dimensions: Between superstrings and parallel worlds

By LEONARDO VINTIÑI
Epoch Times Staff

Every minute, billions of particles traveling from the sun pass through our bodies, and their trajectory continues—passing right through the planet as if solid matter didn't exist.

These are, of course, neutrinos, the particles "without mass." While recent studies have revealed that these neutrally charged particles actually do possess mass, neutrinos remain the most difficult subatomic particles for modern physicists to study, mainly because they make so little of an impact on atomic structures as they wander about. Due to their tiny size they pass through everything, as though they were ghosts.

What's more, thanks to a few neutrinos that have actually been able to be observed through special detectors set up in a lab at the South Pole, scientists may have confirmed the existence of other dimensions.

So why build a lab at the South Pole? In their hunt for other dimensions, scientists specifically require a galactic traveling particle known as a high-energy neutrino. While we still don't have the technological means to produce such particles in an accelerator, nature can generate the desired effect. The South Pole simply offers a setting on Earth with the least amount of interference from other factors.

But even with a polar facility, these special neutrinos can be hard to find. The AMANDA (Antarctic Muon And Neutrino Detector Array) laboratory has detected only a handful of high-energy neutrinos thus far, but a new detection device still under construction—called IceCube—may increase chances of observing these elusive particles.

With these special sensors buried several hundred feet below the polar ice cap, scientists can detect flashes of blue light when these high-energy neutrinos (particles that bombard us by the trillions every second) collide with an atomic nucleus in the layer of ice that make up the walls of the installation.

Visualizing different dimensions

Analyzing these findings, AMANDA scientists have concluded that it is very probable that Superstring Theory (ST) may in fact be an accurate portrayal of reality—as far as it suggests that apart from the three spatial dimensions in which we can perceive, the universe has an even greater dimensional complexity. When these high-energy neutrinos (particles able to traverse the deepest regions of space) collide with protons here on Earth, scientists believe that they may have a window into these other dimensions.

So if there really are more than three physical dimensions, why can't we see them? The answer is simple to say, yet difficult to truly comprehend: The extra dimensions ST refers to are quite tiny—smaller than the diameter of an atom.

According to ST, the universe consists of 9, 10, 11, or even more dimensions. While we may not be able to easily visualize higher dimensions (possessing as we do a mind that has become well adapted to life in a three-dimensional world), the mathematical concepts of theoretical physics open the universe up to an even greater scope of perception. AMANDA and IceCube may, however, provide real evidence of the multiplicity of dimensions described by ST.

As researchers try to prove ST, other scientists are imagining other theories to explain the universe. One such view is being investigated by NASA. Using computerized models, they have taken to the task of creating thousands of possible parallel universes, as though they were bubbles.

According to researchers, these spheres (called universes) could either possess a set of physical laws similar to those of our universe or could well have adapted themselves to a completely different set.

Such a theory provokes the spooky sci-fi possibility that each person has many "versions" of themselves in each of these respective universes. It is further thought that these universes, while unconnected at certain periods, might also connect at other times—facilitating possible travel between them.

Whatever the case, without proof or even a means of experimentation, scientists still can't be sure which of these theories represent reality and which one accurately describes our world. Meanwhile, the conceptual ideas aiming to describe the universe with the data available begin to approach the mystical.

According to cosmologist Max Tegmark, there are currently four theories of possible multi-universes (or multiverses) proposed:

• Level I or open multiverse:
This theory postulates that the number of possible universes is as many as bubbles of a certain diameter that can exist. Since the volume of each bubble is finite, it leads to the conclusion that each certain universe is repeated in all its possible variants.

• Level II or bubbles:
These universes are separated by an empty space. This empty space would expand faster than it would be possible to travel through. They would also have, in addition, different basic conditions as well as different fundamental physical constants.

• Level III or the interpretation of many worlds:
In these universes, whenever a quantum function collapses, the universe unfolds itself into as many "versions" as necessary to realize all possible results.

• Level IV or the ultimate ensemble:
Universes with other mathematical structures leading to fundamental differences in physical laws.

For more information go to: http://www.icecube.wisc.edu/

Building a better battery

CHICAGO (Reuters)—U.S. engineers have found a way to make lithium batteries that are smaller, lighter, longer lasting, and capable of recharging in seconds.

The researchers believe the quick-charging batteries could open up new applications, including better batteries for electric cars.

And because they use older materials in a new way, the batteries could be available for sale in two to three years, a team from Massachusetts Institute of Technology reported in the journal Nature.

Current rechargeable lithium batteries can store large amounts of energy, making them long-running. But they are stingy about releasing their power, making them discharge energy slowly and require hours to recharge.

Scientists traditionally have blamed slow-moving lithium ions—which carry charge across the battery—for this sluggishness.

However, about five years ago, Gerbrand Ceder and a team at MIT discovered that lithium ions in traditional lithium iron phosphate battery material actually move quite quickly.

"It turned out there were other limitations," Ceder said in a telephone interview.

Ceder and colleagues discovered that lithium ions travel through tunnels accessed from the surface of the material. If a lithium ion at the surface is directly in front of a tunnel entrance, it can quickly deliver a charge. But if the ion is not at the entrance, it cannot easily move there, making it less efficient at delivering a charge.

Ceder and colleagues remedied this by revamping the battery recipe. "We changed the composition of the base material and we changed the way it is made—the heat treatment," Ceder said.

This created many smooth tunnels in the material that allow the ions to slip in and out easily. "The trick was knowing what to change," he said.

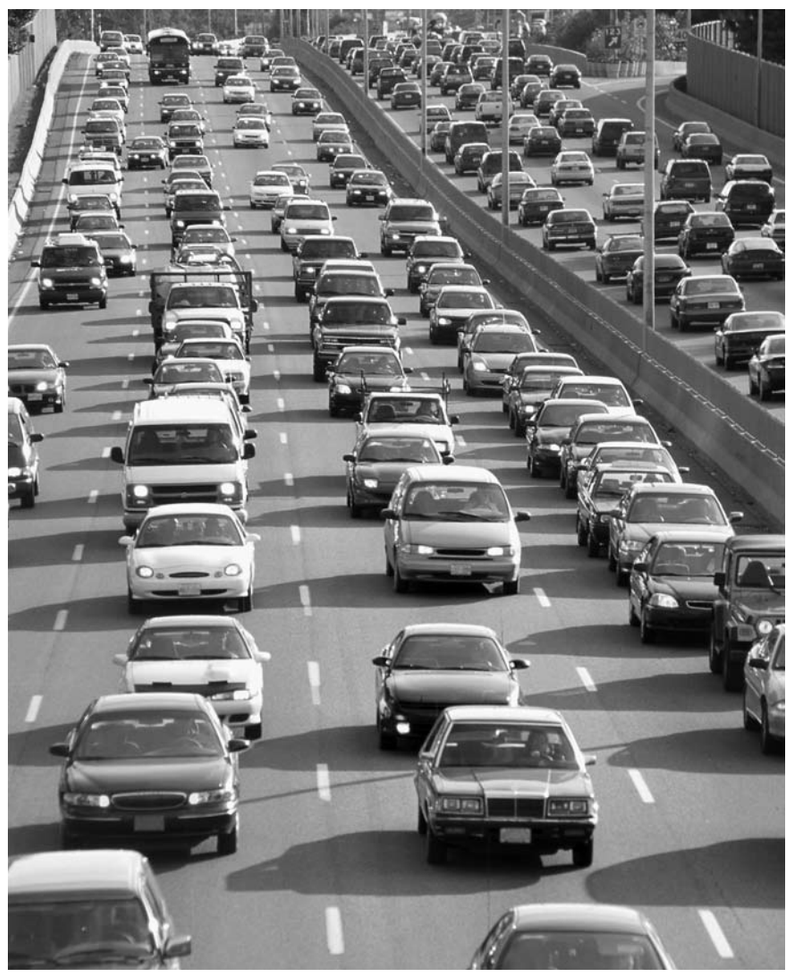
Using their new processing technique, the team made a small battery that could be fully charged in 10 to 20 seconds.

Ceder thinks the material could lead to smaller, lighter batteries because less material is needed for the same result.

And because they simply tinkered with a material already commonly used for batteries, it could be easily adapted for commercial use.

"If manufacturers decide they want to go down this road, they could do this in a few years," Ceder said.

One glitch, Ceder said, would be handling the extra surge of power. "All of the wiring has to get beefed up," he said.



POWER SUPPLY: An Israeli company has plans for producing energy by using busy traffic. PHOTOS.COM

Israeli company turns traffic into energy source

HAIFA, Israel (Reuters)—An Israeli energy startup wants to turn irritating rush hour traffic into a source of electricity.

Innowattech, an energy company affiliated with Israel Technion Institute of Technology, said special generators placed under roads, railways, and runways can harvest enough energy from passing vehicles to mass-produce electricity.

The generators contain material that produces electricity when mechanical force is applied, like the pressure from a passing car and tires.

The process, known as piezoelectricity, has been used for years on a smaller scale, including in barbecue lighters and a dance club where the pounding feet of dancers light the floor.

Uri Amit, chairman of Innowattech, said the company technology will be the largest application of piezoelectrics to date, with a half-mile lane of highway providing up to 100 kW of electricity, enough to power about 40 houses.

The technology has its limitations since it can collect a steady flow of electricity only from busy roads and rails. But Amit said that in any case, peak-hour morning and evening demand for power coincided with heavy traffic at the start and end of the business day.

We can produce electricity anywhere there is a busy road using energy that normally goes to waste, Amit said.

He said the first pilot program would begin in the coming months on a 90-foot strip of highway outside Tel Aviv and that similar projects could start internationally in 2010.

Efstathios Meletis, chairman of the Materials Science and Engineering Department at the University of Texas at Arlington, said the Innowattech technology was a sound idea that theoretically could be done. But problems, he said, could arise in the implementation and the coordination needed to bury the generators over vast amounts of highways and train tracks.

Roadworks

One of the hurdles was finding a way to package the generators so they are effective when buried in the road. The company's chief scientist, Eugeny Harash, developed a casing that acts like asphalt. The generators are then put in the road during scheduled maintenance in 11-inch squares.

The asphalt is elastic and the pressure of each tire that passes is picked up by the generator, which is buried about 1 inch below the road surface, Harash said. The drivers won't even feel a difference. The piezoelectric material lasts for at least 30 years, which is longer than most roads, Harash said.

"The generators can also be placed in the sleepers, or cross-ties, of rail tracks to harvest the energy of trains," he said.

The energy is transferred to storage systems that are set up along the road at about every 0.3 miles. The power can then be fed into a main grid, or even used to charge batteries as part of a future electric car infrastructure.

Innowattech chairman Amit said the current cost for fitting a half-mile of one lane of highway is about $650,000, with a cost of $6,500 per kilowatt. He said that when mass production begins, the price could drop by two thirds, making the system even cheaper than solar energy systems.

The company said the target cost of generation is from 3 cents to 10 cents per kilowatt/hour, depending on the amount of traffic. Wind generated energy has comparable costs, while fossil fuels require about 5 cents per kilowatt/hour.

NASA launches telescope to scout for earths

CAPE CANAVERAL, Fla. (Reuters) — NASA recently launched a pioneering telescope to survey a corner of the galaxy in hopes of learning if other planets like Earth exist.

The telescope, named Kepler, rode into a starry night sky aboard an unmanned Delta rocket.

"So far, although we've discovered more than 300 planets (beyond the solar system), we haven't discovered any Earths," said NASA's associate administrator for space science Weiler.

Kepler, named for the 17th century astronomer Johannes Kepler, is designed to do just that.

Once in position trailing Earth around the sun, Kepler will turn its gaze onto a patch of sky between the constellations Cygnus and Lyra that is filled with more than 4 million stars. Scientists plan to scrutinize Kepler's observations of more than 100,000 targets in hopes of catching tiny blinks of light caused by passing planets.

"Trying to detect Jupiter-size planets crossing in front of their stars is like trying to measure the effect of a mosquito flying by a car's headlight," said Jim Fanson, Kepler project manager. "Finding Earth-sized planets is like trying to detect a very tiny flea."

The measurements will not only be difficult to make, they will be time-consuming.

A planet the size of Earth that is about as far from its parent star as Earth is, will pass by Kepler's view just once a year. Scientists say they'll need to catch three transits to verify existence of an Earth-size world.

NASA hopes to follow up the $591-million Kepler mission with a new generation of powerful telescopes capable of directly imaging Earth-size planets and analyzing their atmospheres for gases indicative of life.

"I think we would be absolutely astonished if Kepler didn't find any Earth-like planets," said astronomer Alan Boss with the Carnegie Institution of Washington. "I think we're going to find that the number of Earths is quite large."

Engineered cell engine is step to artificial life

WASHINGTON (Reuters)—U.S. scientists said they have taken an important step toward making an artificial life form by making a ribosome—the cell's factory.

The ribosome makes the proteins that carry out key business for all forms of life. Messenger RNA carries DNA's genetic instructions to a cell's ribosome, which then cooks up the desired protein. Every living organism from bacteria to humans uses a ribosome, and they are all strikingly similar.

It is not quite artificial life, but an important step in that direction, said George Church, a professor of genetics at Harvard Medical School, who directed the research with a single graduate student.

"If you are going to make synthetic life that is anything like current life ... you have got to have this ... biological machine," Church told reporters in a telephone briefing.

And it can have important industrial uses, especially for manufacturing drugs and proteins not found in nature.

> 'One hundred fifty-one genes would include enough genes to replicate DNA, produce RNA, produce ribosomes, and have a very primitive membrane.'
>
> —George Church, Harvard Medical School genetics professor

Church stressed his research has not been published in a scientific journal, the usual route for reporting such work. He presented it over the weekend to a seminar of Harvard alumni.

Church's group is not seeking to make life in a test tube, but instead to make designer proteins in lab dishes.

"We can ... go straight into protein synthesis," he said. Church and postdoctoral fellow Mike Jewett have already synthesized firefly luciferase—the glowing stuff.

"We'd also like to make a whole new kind of cell ... which is a mirror image of a replicating system." Most life forms are "right-handed" or "left-handed," a quality called chirality.

Changing chirality is known to change the effects of drugs in the body. For instance, thalidomide, once used to prevent morning sickness, causes severe birth defects. It has left- and right-handed versions and only the "left" version caused the defects—but the marketed drug contained both types.

It may be possible to make other proteins in a lab dish without using living cells, Church said. These may include drugs that have been too hard to make now using a process called rational drug design, when drugs are built molecule by molecule to have a specific mechanism of action.

Viruses do not count as living organisms by most definitions, Church said, and to build the simplest form of artificial, but true life it would take 151 genes, he and other experts calculate.

"One hundred fifty-one genes would include enough genes to replicate DNA, produce RNA, produce ribosomes, and have a very primitive membrane," Church said.

Genome pioneer Craig Venter is trying to make artificial life, using a company called Synthetic Genomics Inc. They are working on projects including synthetic vegetable oil that could be used as clean-burning biofuel.