Einstein's math allows faster-than-light travel?

ALTHOUGH Einstein's theories suggest nothing can move faster than the speed of light, two scientists have extended his equations to show what would happen if faster-than-light travel were possible.

Despite an apparent prohibition on such travel by Einstein's theory of special relativity, the scientists said the theory actually lends itself easily to a description of velocities that exceed the speed of light.

"We started thinking about it, and we think this is a very natural extension of Einstein's equations," said applied mathematician James Hill, who co-authored the new paper with his University of Adelaide, Australia, colleague Barry Cox. The paper was published Oct. 3 in the journal Proceedings of the Royal Society A: Mathematical and Physical Sciences.

Special relativity, proposed by Albert Einstein in 1905, showed how concepts like speed are all relative: A moving observer will measure the speed of an object to be different than a stationary observer will. Furthermore, relativity revealed the concept of time dilation, which says that the faster you go, the more time seems to slow down. Thus, the crew of a speeding spaceship might perceive their trip to another planet to take two weeks, while people left behind on Earth would observe their passage taking 20 years.

Yet special relativity breaks down if two people's relative velocity, the difference between their respective speeds, approaches the speed of light. Now, Hill and Cox have extended the theory to accommodate an infinite relative velocity. [Top 10 Implications of Faster-Than-Light Neutrinos]

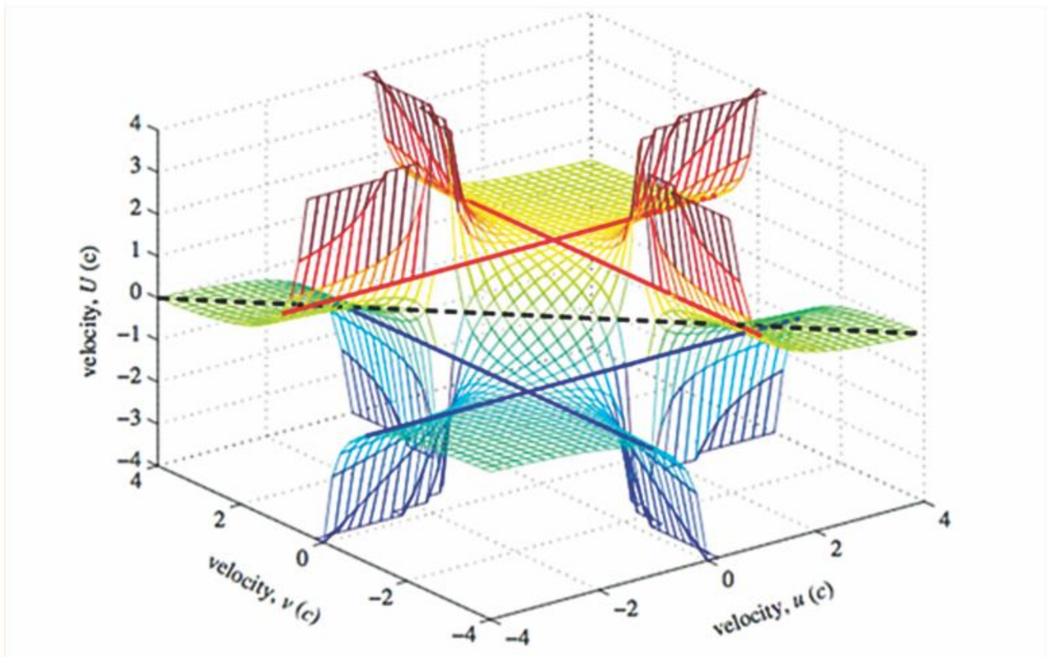


Figure 3. Three-dimensional view of U as function of u and v with all units multiples of c showing isolines of $U = \pm c$ and $U = 0$.

Here a three-dimensional (right) graph shows the relationship between three different velocities: v, u and U, where v is the velocity of a second observer measured by a first observer, u is the velocity of a moving particle measured by the second observer, and U is the relative velocity of the particle to the first observer.

Interestingly, neither the original Einstein equations, nor the new, extended theory can describe massive objects moving at the speed of light itself. Here, both sets of equations break down into mathematical singularities, where physical properties can't be defined.

"The actual business of going through the speed of light is not defined," Hill told LiveScience. "The theory we've come up with is simply for velocities greater than the speed of light."

In effect, the singularity divides the universe into two: a world where everything moves slower than the speed of light, and a world where everything moves faster. The laws of physics in these two realms could turn out to be quite different.

In some ways, the hidden world beyond the speed of light looks to be a strange one indeed. Hill and Cox's equations suggest, for example, that as a spaceship traveling at super-light speeds accelerated faster and faster, it would lose more and more mass, until at infinite velocity, its mass became zero.

"It's very suggestive that the whole game is different once you go faster than light," Hill said.

Despite the singularity, Hill is not ready to accept that the speed of light is an insurmountable wall. He compared it to crossing the sound barrier. Before Chuck Yeager became the first person to travel faster than the speed of sound in 1947, many experts questioned whether it could be done. Scientists worried that the plane would disintegrate, or the human body wouldn't survive. Neither turned out to be true.

Fears of crossing the light barrier may be similarly unfounded, Hill said.

"I think it's only a matter of time," he said. "Human ingenuity being what it is, it's going to happen, but maybe it will involve a transportation mechanism entirely different from anything presently envisaged."

Source: **Live Science**

ROCKY VISITOR

Fresh Martian meteorite

Tissint Martian meteorite shows distinct charring from Earth's atmosphere.

A meteorite that streaked to Earth in a blazing fireball over the Moroccan desert is one of the freshest samples of the Red Planet's surface and atmosphere that scientists have ever seen.

Desert nomads recovered fragments of the Tissint meteorite, one of just five from Mars that have been seen during their descent, after it landed early in the morning of July 18, 2011. The space rock resembles a meteorite found in Antarctica in 1980 that was the first to show strong evidence of its Martian origin. But unlike other Martian meteorites that have sat on Earth's surface for tens or hundreds of years before being discovered, Tissint hasn't had much time to be altered by terrestrial influences.

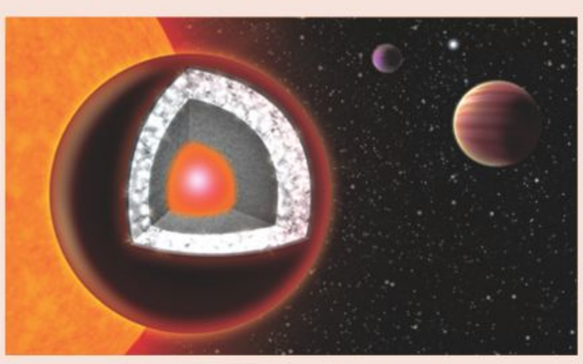
"It's really a great sample if you're interested in studying something that has more or less been delivered straight from Mars, uncontaminated, to the Earth," says planetary scientist Carl Agee of the University of New Mexico.

Other scientists agree but don't rule out contamination entirely. "It sat around the desert for months," says planetary scientist Harry McSween Jr. of the University of Tennessee, and the meteorite probably wasn't collected under sterile conditions. "Nevertheless, it's an interesting sample, in that it is probably less altered than others we have that weren't collected immediately."

Source: **Science News**

DIAMOND IN THESKY

Planet of diamond



It's a toasty world 41 light-years from Earth.

MOVE over, Hope Diamond. The most famous gems on Earth have new competition in the form of a planet made largely of diamond, astronomers say.

The alien planet, a so-called "super-Earth," is called 55 Cancri e and was discovered in 2004 around a nearby star in our Milky Way galaxy. After estimating the planet's mass and radius, and studying its host star's composition, scientists now say the rocky world is composed mainly of carbon (in the form of diamond and graphite), as well as iron, silicon carbide, and potentially silicates.

At least a third of the planet's mass is likely pure diamond.

"This is our first glimpse of a rocky world with a fundamentally different chemistry from Earth," lead researcher Nikku Madhusudhan of Yale University said in a statement. "The surface of this planet is likely covered in graphite and diamond rather than water and granite."

55 Cancri e is the first likely "diamond planet" to be identified around a sun-like star, though such worlds have been theorized before. Planets like this are vastly different from our Earth, which has relatively little carbon.

"By contrast, Earth's interior is rich in oxygen, but extremely poor in carbon less than a part in thousand by mass," said study co-author and Yale geophysicist Kanani Lee.

Source: **Live Science**

NANO WORKSHOP

International Workshop On Nanotechnology

Meeting economic, environmental challenges

SHAMIMA K. CHOUDHURY

AN International Workshop on nanotechnology "Nanotechnology and its prospects in Bangladesh" was held in Dhaka, Bangladesh on 21-23 September 2012. The Workshop was jointly organized by the University of Dhaka and Bangladesh University of Engineering and Technology. Prime Minister, Sheikh Hasina inaugurated the Workshop on 21 September at Hotel Sonargaon. All the scientific sessions were held at the Conference room of the Senate Bhaban, University of Dhaka. She emphasized the importance of nanotechnology and declared the opening of a nanotech Centre on public-private partnership.

Over 200 delegates from home and abroad actively participated in the Workshop. Over 100 papers and posters on different aspects of research and applications of nanotechnology globally and in Bangladesh were presented at the workshop. Scientists from Canada, USA, Sri Lanka, India, Thailand, Malaysia and Philippines and also scientists from different disciplines of nanoscience from Bangladesh spoke at the workshop. They emphasized application of nanotechnology in different sectors like: food and agriculture; health and medicine; energy and environment; ICT and microelectronics; industry and consumer goods.

On the last day of the conference, a position paper on nanotechnology was presented by Professor Shamima Choudhury, Convener, Scientific Committee of the Workshop. The paper contained suggestions for research and development of nanotechnology and its application in different sectors and overall upgrading of nanotechnological research activities in the country.

Many comments from the participants were received and these were incorporated in the draft recommendations document presented by Professor Choudhury. Detailed discussion was held on the draft and a number of suggestions were presented from the audience. Based on written and verbal comments and suggestions from the session the recommendations of the Workshop were finalized as follows:

Nanotechnology Roadmap - A roadmap for proper nanotechnology development with clear vision, mission, goals and objectives in line with the Vision 2021 of the government should be developed by the proposed **Bangladesh Society for Nanotechnology.** The roadmap will include short, medium and long term plans for nanotechnology research, development and application of this emerging technology for the socioeconomic development of the country.

Strengthening of nanotechnology research in Bangladesh

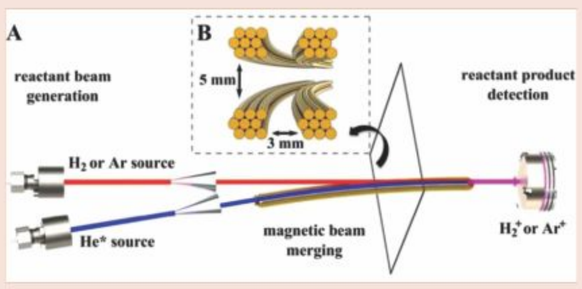
From the good number of presentations made from different academic and research bodies of the country, the workshop observed:

- Nanotechnology research has been initiated in different organizations.
- Proper funding should be ensured for continuation of such research endeavours in different organizations.
- For strengthening of advanced nanotech research a Centre of Excellence for nanotech research as declared by the prime minister in the inaugural ceremony should be established soon with facilities for cutting-edge nanotechnology research in different sectors of economy.
- Curricula development on nanotechnology
- Public Understanding of Nanotechnology- Success of any new technology depends on its acceptance by the public. As such, engagement of the public at all levels of nanotechnology technology development will ensure its proper application.

The writer is convener Scientific Committee and Professor Physics, Dhaka University.

COOL ALCHEMY

Cold Chemistry



The blue beam passes through a curved magnetic quadrupole guide, and the merged beam (purple) enters a quadrupole mass spectrometer.

AT very low temperatures, close to absolute zero, chemical reactions may proceed at a much higher rate than classical chemistry says they should -- because in this extreme chill, quantum effects enter the picture. A Weizmann Institute of Science team has now confirmed this experimentally; their results will not only provide insight into processes in the intriguing quantum world in which particles act as waves, but they might explain how chemical reactions occur in the vast frigid regions of interstellar space.

Long-standing predictions are that quantum effects should allow the formation of a transient bond -- one that will force colliding atoms and molecules to orbit each other, instead of separating after the collision. Such a state would be very important, as orbiting atoms and molecules could have multiple chances to interact chemically. In this theory, a reaction that would seem to have a very low probability of occurring would proceed very rapidly at certain energies.

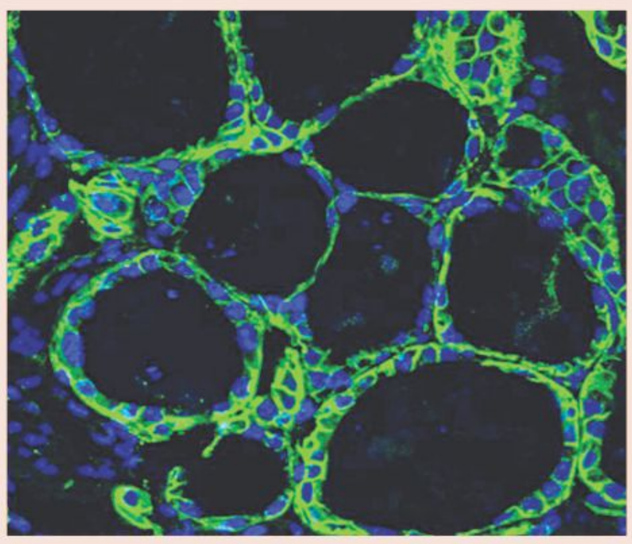
Dr. Ed Narevicius and his team in the Institute's Department of Chemical Physics managed, for the first time, to experimentally confirm this elusive process in a reaction they performed at chilling temperatures of just a fraction of a degree above absolute zero -- 0.01°K. Their results appeared this week in Science.

"The problem," says Dr. Narevicius, "is that in classical chemistry, we think of reactions in terms of colliding billiard balls held together by springs on the molecular level. In the classical picture, reaction barriers block those billiard balls from approaching one another, whereas in the quantum physics world, reaction barriers can be penetrated by particles, as these acquire wave-like qualities at ultra-low temperatures."

The quest to observe quantum effects in chemical reactions started over half a century ago with pioneering experiments by Dudley Herschbach and Yuan T. Lee, who later received a Nobel Prize for their work. They succeeded in observing chemical reactions at unprecedented resolution by colliding two low-temperature, supersonic beams. However, the collisions took place at relative speeds that were much too high to resolve many quantum effects: when two fast beams collide, the relative velocity sets the collision temperature at above 100°K, much too warm for quantum effects to play a significant role. Over the years, researchers have used various ingenious techniques, including changing the angle of the beams and slowing them down to a near-halt, that managed to bring the temperatures down to around 5°K -- close, but still a miss for those seeking to observe chemical reactions in quantum conditions.

Source: **Science Daily**

ON A PLATTER



Embryonic stem cells formed hollow, hormone-producing spheres (green) in a lab dish that, when transplanted into mice, worked like a functioning thyroid gland.

Thyroid in a dish

Cells following this thyroid development program form hollow, hormone-producing spheres like those found in a normal thyroid gland.

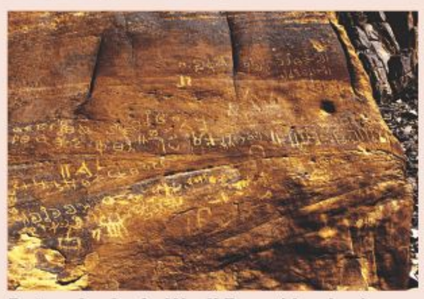
Researchers tested the dish-grown glands by transplanting them into mice whose thyroids had been destroyed with radiation. The new organs made hormones and reversed the mice's thyroid problems.

Source: **Science News**

DID YOU KNOW?

What is epigraphy?

Epigraphy, literally "on-writing", "inscription") is the study of inscriptions or epigraphs as writing; it is the science of identifying graphemes (the smallest unit that has meaning in a writing system), clarifying their meanings, classifying their uses according to dates and cultural contexts, and drawing conclusions about the writing and the writers. Specifically excluded from epigraphy are the historical significance of an epigraph as a document and the artistic value of a literary composition.



Petroglyphs in Wadi Rum (Jordan)