January 28, 2017 Rabi II 29, 1438 AH Volume 7, Issue 4

Astronomy & Physics Weekly News

Dept. of Applied Physics & Astronomy - University of Sharjah
Compiled by Dr. Ilias Fernini

Top News

Metallic hydrogen, once theory, becomes reality

How fast is the universe expanding? Quasars provide an answer

2

Bursts of methane may have warmed early Mars

Gaia turns its eyes to asteroid hunting

5

Rare meteorites challenge our understanding of the solar system

Micro spacecraft investigates cometary water mystery

3

NuSTAR finds new clues to 'chameleon supernova'

New space weather model helps simulate magnetic structure of solar storms

6

Physicist uncovers clues to mechanism behind magnetic reconnection

Possible way to test black hole information paradox in the lab

4

Physicists unveil new form of matter—time crystals

For this metal, electricity flows, but not the heat

7

Special Read:

Astronaut Abby Visit to SCASS (Jan. 21, 2017)

UoS Students CubeSat Workshop at SCASS (Jan. 22-23, 2017)

This Week's Sky at a Glance, Jan. 28 - Feb. 03

IT Support Issam Jami
Designed by Mohamed Bakir

Metallic hydrogen, once theory, becomes reality

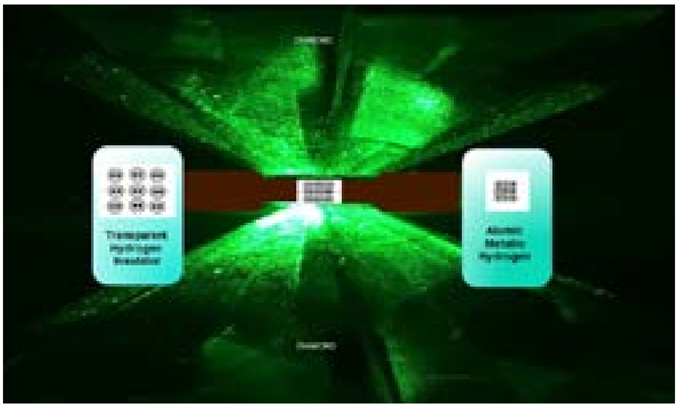


Image of diamond anvils compressing molecular hydrogen. At higher pressure the sample converts to atomic hydrogen, as shown on the right. Credit: R. Dias and I.F. Silvera

Nearly a century after it was theorized, Harvard scientists have succeeded in creating the rarest - and potentially one of the most valuable - materials on the planet.

The material - atomic metallic hydrogen - was created by Thomas D. Cabot Professor of the Natural Sciences Isaac Silvera and post-doctoral fellow Ranga Dias. In addition to helping scientists answer fundamental questions about the nature of matter, the material is theorized to have a wide range of applications, including as a room-temperature superconductor. The creation of the rare material is described in a January 26 paper published in Science.

“This is the holy grail of high-pressure physics,” Silvera said. “It's the first-ever sample of metallic hydrogen on Earth, so when you're looking at it, you're looking at something that's never existed before.”

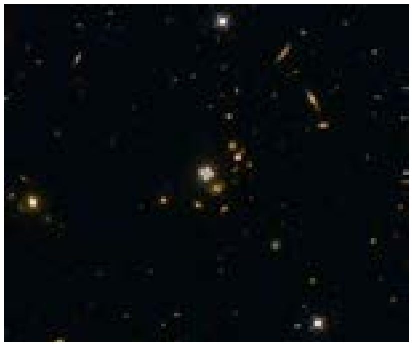
To create it, Silvera and Dias squeezed a tiny hydrogen sample at 495 gigapascal, or more than 71.7 million pounds-per-square inch - greater than the pressure at the center of the Earth. At those extreme pressures, Silvera explained, solid molecular hydrogen -which consists of molecules on the lattice sites of the solid - breaks down, and the tightly bound molecules dissociate to transforms into atomic hydrogen, which is a metal.

While the work offers an important new window into understanding the general properties of hydrogen, it also offers tantalizing hints at potentially revolutionary new materials.

“One prediction that's very important is metallic hydrogen is predicted to be meta-stable,” Silvera said. “That means if you take the pressure off, it will stay metallic, similar to the way diamonds form from graphite under intense heat and pressure, but remains a diamond when that pressure and heat is removed.”

Understanding whether the material is stable is important, Silvera said, because predictions suggest ...Read More...

How fast is the universe expanding? Quasars provide an answer



HE0435-1223, located in the centre of this wide-field image, is among the five best lensed quasars discovered to date. The foreground galaxy creates four almost evenly distributed images of the distant quasar around it. Image courtesy ESA/Hubble, NASA, Suyu et al.

The H0LiCOW collaboration, a cosmology project led by EPFL and Max Planck Institute and regrouping several research organizations in the world has made a new measurement of the Hubble constant, which indicates how fast the universe is expanding. The new measurement challenges some of the most recent ones, potentially pointing towards new physics beyond the standard cosmological model.

Measuring how far objects are across space has led to great discoveries, for example that our universe is expanding. The rate of this expansion is determined by the current Standard Cosmological Model, “Lambda CDM”, which puts the current expansion rate at about 72 km per second per megaparsec (a megaparsec is about 3.3 million light-years).

This rate is called the “Hubble constant”, H0, and has been constantly refined for almost a century: a high-precision measurement of H0 has profound implication both in cosmology and in physics. Now, the H0LiCOW collaboration has used new tools to independently calculate the all-important Hubble constant with 3.8% precision.

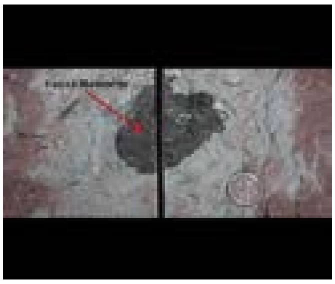
The new figure agrees with recent independent studies, which are however in tension with the predictions of the Standard Cosmological Model, potentially pointing towards new physics. The work is published in five papers in the Monthly Notices of the Royal Astronomical Society.

A history of expansion

The expansion of the Universe, based on the idea that the Universe originated with the Big Bang, was first proposed by the Belgian cosmologist Georges Lemaitre. At around the same time, in the late 1920's, the astronomer Edwin Hubble was studying galaxies moving away from the Milky Way, and noticed that those farthest from Earth seemed to be moving faster.

What he was actually observing was the Universe expanding, and he set out to calculate its rate. Hubble's observations uncovered a constant ...Read More...

Rare meteorites challenge our understanding of the solar system



The meteorite was given the name Osterplana 065 and was discovered in a quarry outside Lidkoping in Sweden. Watch a video on the research here.

Researchers have discovered minerals from 43 meteorites that landed on Earth 470 million years ago. More than half of the mineral grains are from meteorites completely unknown or very rare in today's meteorite flow. These findings mean that we will probably need to revise our current understanding of the history and development of the solar system.

The discovery confirms the hypothesis presented this summer when geology professor Birger Schmitz at Lund University in Sweden revealed that he had found what he referred to as an "extinct meteorite" - a meteorite dinosaur.

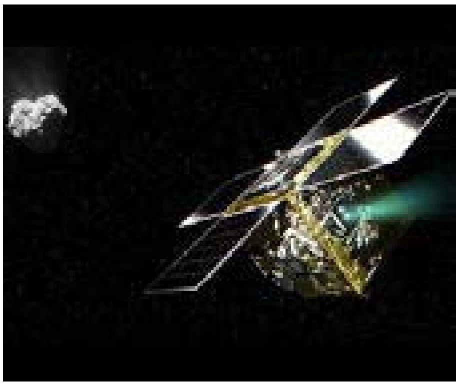
The meteorite was given the name Osterplana 065 and was discovered in a quarry outside Lidkoping in Sweden. The term 'extinct' was used because of its unusual composition, different from all known groups of meteorites, and because it originated from a celestial body that was destroyed in ancient times.

The discovery led to the hypothesis that the flow of meteorites may have been completely different 470 million years ago compared to today, as meteorites with such a composition no longer fall on Earth.

"The new results confirm the hypothesis. Based on 43 micrometeorites, which are as old as Osterplana 065, our new study shows that back then the flow was actually dramatically different. So far we have always assumed that the solar system is stable, and have therefore expected that the same type of meteorites have fallen on Earth throughout the history of the solar system, but we have now realised that this is not the case", says Birger Schmitz.

Birger Schmitz conducted the study together with his colleagues at Lund University, the University of Chicago, and the University of Wisconsin-Madison. The result was unexpected. Birger Schmitz is convinced that something so far unknown but of fundamental importance in the history of the solar system occurred nearly 500 million years ago.
...Read More...

Micro spacecraft investigates cometary water mystery



The PROCYON spacecraft and comet 67P/Churumov-Gerasiment (Conceptual Image). Image courtesy NAOJ/ESA/Go Miyazaki.

In September 2015, a team of astronomers from the National Astronomical Observatory of Japan, University of Michigan, Kyoto Sangyo University, Rikkyo University and the University of Tokyo successfully observed the entire hydrogen coma of the comet 67P/Churyumov-Gerasimenko, using the LAICA telescope onboard the PROCYON spacecraft. They also succeeded in obtaining the absolute rate of water discharge from the comet.

This comet was the target of ESA's Rosetta mission in 2015. Because the Rosetta spacecraft was actually inside the cometary coma, it couldn't observe the overall coma structure. There were bad observing conditions during the time the comet could be observed from Earth, so through our observations, we were able to test the coma models for the comet for the first time.

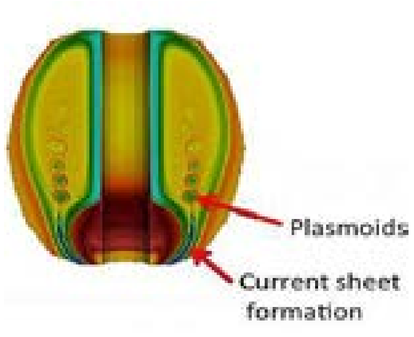
Comet observation by the PROCYON spacecraft had not been scheduled in the original mission plan. Thanks to the efforts of the spacecraft and telescope operation teams, observations were conducted shortly after we started discussing the possibility, producing results of great scientific importance.

This result is the first scientific achievement by a micro spacecraft for deep space exploration. Moreover, this provides an ideal example where observations by a low-cost mission (e.g., the PROCYON mission) support precise observations by a large mission (e.g., the Rosetta mission). We hope this will become a model case for micro spacecraft observations in support of large missions.

The Rosetta mission and its limits

The 2015 apparition (appearance) of the comet 67P/Churyumov-Gerasimenko was a target of ESA's Rosetta mission. In the Rosetta mission, precise observations of the comet were carried out from close to the surface of the nucleus for more than two years including when the comet passed perihelion (closest approach to the Sun) on August 13, 2015. However, observation of the entire coma was difficult because the Rosetta spacecraft was located in the cometary coma. ...Read More...

Physicist uncovers clues to mechanism behind magnetic reconnection



Current sheets and plasmoids are formed during the simulation of a process called coaxial helicity injection, which could produce effective startup current-drive in spherical tokamaks. Image courtesy Fatima Ebrahimi.

Physicist Fatima Ebrahimi at the U.S. Department of Energy's (DOE) Princeton Plasma Physics Laboratory (PPPL) has published a paper showing that magnetic reconnection - the process in which magnetic field lines snap together and release energy - can be triggered by motion in nearby magnetic fields. By running computer simulations, Ebrahimi gathered evidence indicating that the wiggling of atomic particles and magnetic fields within electrically charged gas known as plasma can spark the onset of reconnection, a process that, when it occurs on the sun, can spew plasma into space.

That plasma can eventually interact with magnetic fields surrounding the Earth, endangering communications networks and power systems. In fusion facilities, reconnection can help start and confine the plasma that fuels fusion reactions. This research was funded by the DOE's Office of Science (Fusion Energy Sciences) and was published in the December issue of Physics of Plasmas.

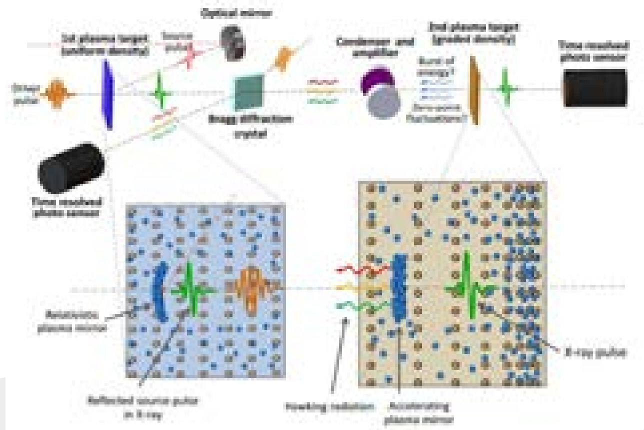
Using a computer code developed by researchers at universities and fusion labs, Ebrahimi simulated plasma circulating within a vessel shaped like a doughnut. The vessel mimicked the doughnut shape of fusion facilities called tokamaks. The simulated facility had an opening in its floor for physicists to inject magnetic field lines that would balloon in the tokamak's interior and initiate the fusion process.

Reconnection occurred in the following way. The field lines forming the balloon created an electric current that produced three-dimensional wiggles and wobbles that pushed the open end of the balloon until it closed. At that point, magnetic reconnection occurred and turned the magnetic balloon into a magnetic bubble called a plasmoid that carries electric current.

Ebrahimi is now expanding that research. She is currently looking into how to harness the current to create and confine a fusion plasma without using a large central magnet called a solenoid.

Different conditions can set off the reconnection process. "If the strength of the field lines associated with the original magnetic balloon is not enough on its own to instigate reconnection," Ebrahimi said, "the secondary magnetic wiggles can amplify the magnetic fields at the reconnection site, triggering the event." She is also...Read More...

Possible way to test black hole information paradox in the lab



A schematic diagram of the proposed analog black hole experiment. The first, gaseous and uniform plasma target is used to prepare a high intensity x-ray pulse. The x-ray pulse will induce an accelerating plasma mirror due to the increasing plasma density in the second target. As the mirror stops abruptly, it will release either a burst of energy or zero-point fluctuations. The correlation function between either of these signals and the Hawking photons is measured upstream. Credit: arXiv:1512.04064 [gr-qc]

A pair of researchers, one with National Taiwan University, the other with École Polytechnique in France has come up with a way to test the idea of Hawking radiation and the information paradox in a lab setting. In their paper published in the journal Physical Review Letters, Pisin Chen and Gerard Mourou describe their idea and the likely difficulties that researchers would face in trying to carry out actual experiments.

The information paradox surrounding black holes came about as researchers pondered the problem of physical information being destroyed when it is pulled into a black hole and disappearing later as the black hole dies—this would seem to violate the laws of physics. Back in the 1970s, Stephen Hawking famously postulated the idea that if a pair of entangled photons came to exist near the event horizon and one was pulled into the black hole but the other escaped, then the escaping photon would hold the information, preventing its loss, thus avoiding a paradox. Since that time, physicists have conceived thought experiments to test this idea, but of course, due to the inability to travel to and test a black hole, all remain theoretical. In this new effort, the research pair believe they may have come up with a way to test one of those thought experiments in a lab here on Earth.

The thought experiment consisted of developing a way to mimic the behavior of the photons near the black hole event horizon—perhaps by generating entangled pairs of photons and then using an accelerating mirror to mimic the impact of black hole gravity. In this scenario, one photon would be reflected (representing Hawking radiation) while the other would not—it would keep moving until the mirror finally stopped. ...Read More...

Bursts of methane may have warmed early Mars

SEAS researchers suggest that early Mars may have been warmed intermittently by a powerful greenhouse effect, possibly explaining water on the planet's surface billions of years ago. Image courtesy NASA.

The presence of water on ancient Mars is a paradox. There's plenty of geographical evidence that rivers periodically flowed across the planet's surface. Yet in the time period when these waters are supposed to have run - three to four billion years ago - Mars should have been too cold to support liquid water.

Researchers from the Harvard John A. Paulson School of Engineering and Applied Science (SEAS) suggest that early Mars may have been warmed intermittently by a powerful greenhouse effect. In a paper published in Geophysical Research Letters, researchers found that interactions between methane, carbon dioxide and hydrogen in the early Martian atmosphere may have created warm periods when the planet could support liquid water on the surface.

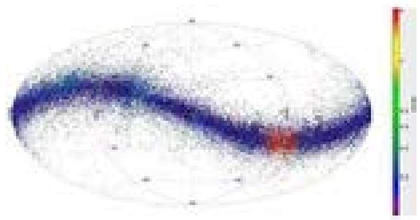
"Early Mars is unique in the sense that it's the one planetary environment, outside Earth, where we can say with confidence that there were at least episodic periods where life could have flourished," said Robin Wordsworth, assistant professor of environmental science and engineering at SEAS, and first author of the paper. "If we understand how early Mars operated, it could tell us something about the potential for finding life on other planets outside the solar system."

Four billion years ago, the Sun was about 30 percent fainter than today and significantly less solar radiation - a.k.a. heat - reached the Martian surface. The scant radiation that did reach the planet was trapped by the atmosphere, resulting in warm, wet periods. For decades, researchers have struggled to model exactly how the planet was insulated.

The obvious culprit is CO_2. Carbon dioxide makes up 95 percent of today's Martian atmosphere and is the most well-known and abundant greenhouse gas on Earth. But CO_2 alone does not account for Mars' early temperatures.

"You can do climate calculations where you add CO_2 and build up to hundreds of times the present ..Read More...

Gaia turns its eyes to asteroid hunting



Gaia's asteroid detections. ESA/Gaia/DPAC/CU4, L. Galluccio, F. Mignard, P. Tanga (Observatoire de la Cote d'Azur)

Whilst best known for its surveys of the stars and mapping the Milky Way in three dimensions, ESA's Gaia has many more strings to its bow. Among them, its contribution to our understanding of the asteroids that litter the Solar System. Now, for the first time, Gaia is not only providing information crucial to understanding known asteroids, it has also started to look for new ones, previously unknown to astronomers.

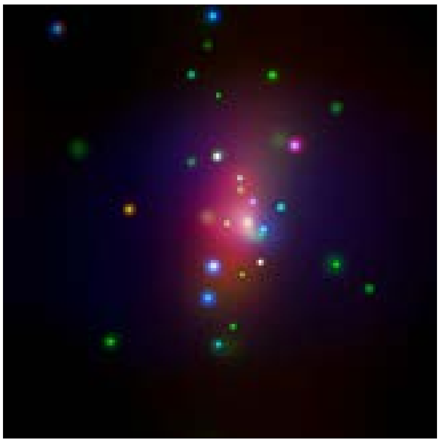
Since it began scientific operations in 2014, Gaia has played an important role in understanding Solar System objects. This was never the main goal of Gaia - which is mapping about a billion stars, roughly 1% of the stellar population of our Galaxy - but it is a valuable side effect of its work. Gaia's observations of known asteroids have already provided data used to characterise the orbits and physical properties of these rocky bodies more precisely than ever before.

"All of the asteroids we studied up until now were already known to the astronomy community," explains Paolo Tanga, Planetary Scientist at Observatoire de la Cote d'Azur, France, responsible for the processing of Solar System observations.

These asteroids were identified as spots in the Gaia data that were present in one image and gone in one taken a short time later, suggesting they were in fact objects moving against the more distant stars. Once identified, moving objects found in the Gaia data are matched against known asteroid orbits to tell us which asteroid we are looking at. "Now," continues Tanga, "for the first time, we are finding moving objects that can't be matched to any catalogued star or asteroid."

The process of identifying asteroids in the Gaia data begins with a piece of code known as the Initial Data Processing (IDT) software - which was largely developed at the University of Barcelona and runs at the Data Processing Centre at the European Space Astronomy Centre (ESAC), ESA's establishment in Spain. This software compares multiple measurements taken of the same area and singles out objects that are observed but cannot be ...Read More...

NuSTAR finds new clues to 'chameleon supernova'



This image from NASA's Chandra X-ray Observatory shows spiral galaxy NGC 7331, center, in a three-color X-ray image. Red, green and blue colors are used for low, medium and high-energy X-rays, respectively. An unusual supernova called SN 2014C has been spotted in this galaxy, indicated by the box. Image courtesy NASA/CXC/CIERA/R.Margutti et al.

"We're made of star stuff," astronomer Carl Sagan famously said. Nuclear reactions that happened in ancient stars generated much of the material that makes up our bodies, our planet and our solar system. When stars explode in violent deaths called supernovae, those newly formed elements escape and spread out in the universe.

One supernova in particular is challenging astronomers' models of how exploding stars distribute their elements. The supernova SN 2014C dramatically changed in appearance over the course of a year, apparently because it had thrown off a lot of material late in its life. This doesn't fit into any recognized category of how a stellar explosion should happen. To explain it, scientists must reconsider established ideas about how massive stars live out their lives before exploding.

"This 'chameleon supernova' may represent a new mechanism of how massive stars deliver elements created in their cores to the rest of the universe," said Raffaella Margutti, assistant professor of physics and astronomy at Northwestern University in Evanston, Illinois. Margutti led a study about supernova SN 2014C published this week in The Astrophysical Journal.

A supernova mystery

Astronomers classify exploding stars based on whether or not hydrogen is present in the event. While stars begin their lives with hydrogen fusing into helium, large stars nearing a supernova death have run out of hydrogen as fuel. Supernovae in which very little hydrogen is present are called "Type I." Those that do have an abundance of hydrogen, which are rarer, are called "Type II."

But SN 2014C, discovered in 2014 in a spiral galaxy about 36 million to 46 million light-years away, is different. By looking at it in optical wavelengths with ...Read More...

New space weather model helps simulate magnetic structure of solar storms

These animated images show the propagation of a CME as it erupts from the sun and travels through space, comparing actual NASA and ESA's SOHO satellite observations on the right to the simulation from the new CME-modeling tool at the Community Coordinated Modeling Center on the left. SOHO observed this CME on March 7, 2011. Image courtesy NASA/CCMC/University of Michigan/Joy Ng.

The dynamic space environment that surrounds Earth - the space our astronauts and spacecraft travel through - can be rattled by huge solar eruptions from the sun, which spew giant clouds of magnetic energy and plasma, a hot gas of electrically charged particles, out into space. The magnetic field of these solar eruptions are difficult to predict and can interact with Earth's magnetic fields, causing space weather effects.

A new tool called EEGGL - short for the Eruptive Event Generator (Gibson and Low) and pronounced "eagle" - helps map out the paths of these magnetically structured clouds, called coronal mass ejections or CMEs, before they reach Earth. EEGGL is part of a much larger new model of the corona, the sun's outer atmosphere, and interplanetary space, developed by a team at the University of Michigan.

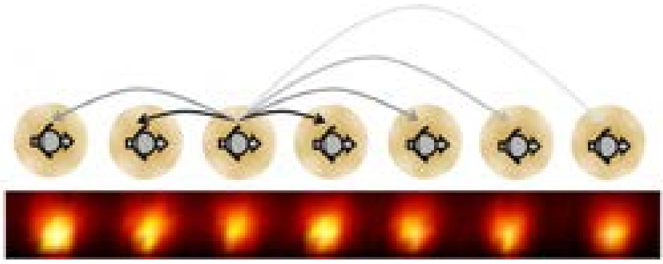
Built to simulate solar storms, EEGGL helps NASA study how a CME might travel through space to Earth and what magnetic configuration it will have when it arrives. The model is hosted by the Community Coordinated Modeling Center, or CCMC, at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

The new model is known as a "first principles" model because its calculations are based on the fundamental physics theory that describes the event - in this case, the plasma properties and magnetic free energy, or electromagnetics, guiding a CME's movement through space.

Such computer models can help researchers better understand how the sun will affect near-Earth space, and potentially improve our ability to predict space weather, as is done by the U.S. National Oceanic and Atmospheric Administration.

Taking into account the magnetic structure of a CME from its initiation at the sun could mark a big ..Read More...

Physicists unveil new form of matter—time crystals



Following a blueprint created by UC Berkeley physicist Norman Yao, physicists at the University of Maryland made the first time crystal using a one-dimensional chain of ytterbium ions. Each ion behaves like an electron spin and exhibits long-range interactions indicated by the arrows. Credit: Chris Monroe, University of Maryland

Normal crystals, likes diamond, are an atomic lattice that repeats in space, but physicists recently suggested making materials that repeat in time. Last year, UC Berkeley's Norman Yao sketched out the phases surrounding a time crystal and what to measure in order to confirm that this new material is actually a stable phase of matter. This stimulated two teams to build a time crystal, the first examples of a non-equilibrium form of matter.

To most people, crystals mean diamond bling, semiprecious gems or perhaps the jagged amethyst or quartz crystals beloved by collectors.

To Norman Yao, these inert crystals are the tip of the iceberg.

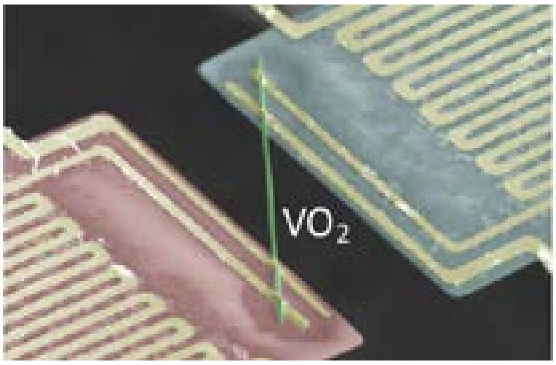
If crystals have an atomic structure that repeats in space, like the carbon lattice of a diamond, why can't crystals also have a structure that repeats in time? That is, a time crystal?

In a paper published online last week in the journal Physical Review Letters, the University of California, Berkeley assistant professor of physics describes exactly how to make and measure the properties of such a crystal, and even predicts what the various phases surrounding the time crystal should be—akin to the liquid and gas phases of ice.

This is not mere speculation. Two groups followed Yao's blueprint and have already created the first-ever time crystals. The groups at the University of Maryland and Harvard University reported their successes, using two totally different setups, in papers posted online last year, and have submitted the results for publication. Yao is a co-author on both papers.

Time crystals repeat in time because they are kicked periodically, sort of like tapping Jell-O repeatedly to get it to jiggle, Yao said. The big breakthrough, he ...Read More...

For this metal, electricity flows, but not the heat



Vanadium dioxide (VO2) nanobeams synthesized by Berkeley researchers show exotic electrical and thermal properties. In this false-color scanning electron microscopy image, thermal conductivity was measured by transporting heat from the suspended heat source pad (red) to the sensing pad (blue). The pads are bridged by a VO2 nanobeam. Credit: Junqiao Wu/ Berkeley Lab

There's a known rule-breaker among materials, and a new discovery by an international team of scientists adds more evidence to back up the metal's nonconformist reputation. According to a new study led by scientists at the Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab) and at the University of California, Berkeley, electrons in vanadium dioxide can conduct electricity without conducting heat.

he findings, to be published in the Jan. 27 issue of the journal Science, could lead to a wide range of applications, such as thermoelectric systems that convert waste heat from engines and appliances into electricity.

For most metals, the relationship between electrical and thermal conductivity is governed by the Wiedemann-Franz Law. Simply put, the law states that good conductors of electricity are also good conductors of heat. That is not the case for metallic vanadium dioxide, a material already noted for its unusual ability to switch from an insulator to a metal when it reaches a balmy 67 degrees Celsius, or 152 degrees Fahrenheit.

"This was a totally unexpected finding," said study principal investigator Junqiao Wu, a physicist at Berkeley Lab's Materials Sciences Division and a UC Berkeley professor of materials science and engineering. "It shows a drastic breakdown of a textbook law that has been known to be robust for conventional conductors. This discovery is of fundamental importance for understanding the basic electronic behavior of novel conductors."

In the course of studying vanadium dioxide's properties, Wu and his research team partnered with Olivier Delaire at DOE's Oak Ridge National Laboratory and an associate professor at Duke University. Using results from simulations and X-ray scattering experiments, the researchers were able to tease out the proportion of thermal conductivity attributable to the vibration of ...Read More...

This Week's Sky at a Glance, Jan. 28 - Feb. 03

Jan. 28	New Moon (04:07)
Jan. 29	Jumada I 1438 AH
Jan. 30	Moon at descending node (02:21)
Jan. 31	Venus 4.1° N of Moon (18:34)
Feb. 01	Mars 2.3° N of Moon (05:09)

Astronaut Abby Visit to SCASS (Jan. 21, 2017)

The Sharjah Center for Astronomy and Space Sciences has recently received the famous astronaut Abby for a short courtesy visit. Mr. Marwan Shwaiki, the planetarium manager, toured her the center and explained the different scientific experiments as well as the planetarium. Astronaut Abby was amazed by the multitude of the physical science experimentations and the large planetarium. Mr. Ibrahim Al-Jarwan, the administrative and public relations manager was also present during the visit. Ms. Abby asked Dr. Ilias Fernini, the observatory and the research laboratories manager, about the different research themes of the center as well as about the astronomy observatory. Astronaut Abby was pleased to know that the center is launching five space sciences research laboratories, i.e, the "Radio Astronomy Laboratory", the "GIS and Remote Sensing Center", the "Ionospheric Laboratory", the "CubeSat Laboratory", and the "Meteorite Center". These space sciences laboratories are used by the students of the University of Sharjah in terms of their graduation research projects. Ms. Abby was eager to know if the University of Sharjah accepts students from the US. Dr. Ilias informed her that the university is an international institution with students from all over the world. Any student with the right credentials is welcome to join the very diverse nature of the University of Sharjah. Collaboration and future visits from US students was welcomed by the three managers and plans will be set to enhance this collaboration.

Astronaut Abby is a girl with a dream. She aspires to be a scientist and dreams of becoming a NASA astronaut. But it doesn't stop there–she also dreams of becoming the first astronaut to Mars. With a dreams this big, it takes setting goals and working hard each day to make them a reality. Abby is committed to inspiring her generation, the Mars Generation, to dream big, act big and inspire others. Since the age of five, Abby has been dreaming of space and flying. A hands-on experience in the fifth grade cemented her commitment to her dream: Abby was chosen to participate in the Minneapolis Public School GEMS program (Girls in Engineering, Mathematics and Science) at her school. Four years later, she had built robots, conducted science experiments and participated in NASA's weather balloon program through the University of Minnesota.

Two-Day Hands-On Experience on ArduSat DemoSat Cubesat
SCASS (Jan. 22-23, 2017)

A two-day CubeSat workshop (Jan. 22-23, 2017) was held at the Sharjah Center for Astronomy and Space Sciences as part of the CubeSat Laboratory program. Fifteen CubeSat students from the University of Sharjah participated in the workshop. The students had the chance to have a first hands-on experiment with all the different components of a DemoSat. The CubeSat typically carries sensors and other small payloads into space giving us the opportunity to put observatories in space. With a CubeSat you can predict a thunderstorm, track ships, map soil moisture, and more. The Ardusat DemoSat is a small cube that is the shape of a CubeSat and contains similar sensors as an actual satellite. One of its many functions is to demonstrate how CubeSats work. Also, the Ardusat DemoSat has sensors and other tools that make it a useful scientific data collection tool, ideal for doing classroom based experiments. The students were able to handle the DemoSat and check its functionality in terms of running experiments with all the eight sensors and the different other components of the DemoSat. The students we able to identify the Arduino board, the Space board, the expansion breadboard, the power system, the SD logger, the XBee radio, and the real time clock (RTC). The eight sensors (Luminosity Sensor, Temperature Sensor, Accelerometer, Gyroscope, Magnetometer, Barometer, Ultra Violet Light Sensor, Infrared Thermopile) were all checked out and students were able to get a first hands-on experience on how a CubeSat works.