INTERNATIONAL YEAR OF LIGHT 2015

100 Million Stars in the Andromeda galaxy.

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Weekly news from around the world compiled by Dr. Ilias Fernini

Inside this issue:

Prof. Ihab Obaidat won the Khalifa Award for Research

It's great news to announce that Prof. Ihab Obaidat (Physics Dept., UAEU) has won the "Khalifa Award for Education" – Category of University Professor Distinguished in Scientific Research – for this Academic year 2014-2015 (8th Cycle). We take this opportunity to congratulate Dr. Ihab Obaidat for this wonderful achievement.

All of the 35 winners of the eighth annual Khalifa Award for Education will be honored in a ceremony at Emirates Palace Hotel in the capital on April 14.

Juma Al Majid, chairman of the Juma Al Majid Centre for Culture and Heritage, was named Educational Personality of the Year in recognition of his educational and cultural achievements, state news agency Wam reported.

An active member of many Arab and international cultural foundations, including the Arab Thought Foundation in Beirut and the advisory committee of the Centre for Middle Eastern Studies at Harvard University, Mr Al Majid has established schools, colleges and charities.

Amal Al Afifi, the award's secretary general, said the winners were chosen from 500 applicants – including 304 from the UAE and 196 from the Arab world – entered in one of 11 categories. Mrs Al Afifi said 26 of the winners were from the UAE.

The 2014-2015 edition of the award was launched under the theme "Distinguish Yourself, You Deserve Honour".

The award aims to promote the education sector in the UAE and the Arab world by encouraging and motivating creative and outstanding individuals working in the field through recognition.

The Khalifa Award's goals include highlighting and supporting the status of those working in all educational fields, contributing ...Read More...

Universe may be on the brink of collapse (on the cosmological timescale)

Physicists have proposed a mechanism for "cosmological collapse" that predicts that the universe will soon stop expanding and collapse in on itself, obliterating all matter as we know it. Their calculations suggest that the collapse is "imminent"—on the order of a few tens of billions of years or so—which may not keep most people up at night, but for the physicists it's still much too soon.

In a paper published in Physical Review Letters, physicists Nemanja Kaloper at the University of California, Davis; and Antonio Padilla at the University of Nottingham have proposed the cosmological collapse mechanism and analyzed its implications, which include an explanation of dark energy.

"The fact that we are seeing dark energy now could be taken as an indication of impending doom, and we are trying to look at the data to put some figures on the end date," Padilla told Phys.org. "Early indications suggest the collapse will kick in in a few tens of billions of years, but we have yet to properly verify this."...***Read More***...

This is the "South Pillar" region of the star-forming region called the Carina Nebula. Like cracking open a watermelon and finding its seeds, the infrared telescope "busted open" this murky cloud to reveal star embryos tucked inside finger-like pillars of thick dust. Credit: NASA

Researchers use Mira to peer inside high-temperature superconductors

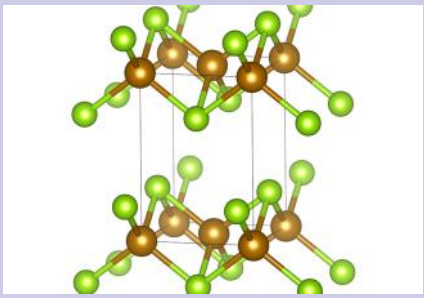
Researchers from the University of Illinois at Urbana-Champaign (UIUC) are using supercomputing resources at the Argonne Leadership Computing Facility (ALCF), a DOE Office of Science User Facility, to shed light on the mysterious nature of high-temperature superconductors.

With critical temperatures ranging from 30 Kelvin to 130 Kelvin (405 degrees below zero to 225 degrees below zero Fahrenheit), this relatively new class of superconductors is high -temperature in name only. Prior to their discovery in 1986, it was widely believed that superconductivity—a material's ability to transmit electric current with no resistance—could only occur below temperatures of 30 Kelvin.

The discovery of high-temperature superconductors led to countless follow-on research efforts and the identification of several other high-temperature superconductors, but the origin of the materials' unique properties remains elusive.

"We still don't have a universally agreed upon theory for this newer class of materials that are superconducting at higher temperatures," said Lucas Wagner, principal investigator and research assistant professor at UIUC. "The goal of our work at the ALCF is to get us a step closer to understanding these systems."

With an improved understanding of the mechanisms that give rise to high-temperature superconductivity, scientists will be better equipped to design new materials and develop ...***Read More***...



Researchers from the University of Illinois at Urbana-Champaign are using Mira to study the magnetic state of iron selenide, a known high-temperature superconductor, at varying levels of pressure. Credit: Lucas Wagner, University of Illinois at Urbana-Champaignpeer-high-temperature-superconductors.html#jCp

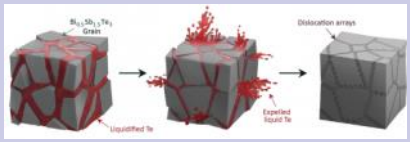
New breakthrough in thermoelectric materials

A joint South Korean and American research group has developed a scalable production method for a state of the art alloy for the use in solid state thermoelectric devices. This new alloy is nearly twice as efficient as existing materials and may lead to a new host of applications. Uses include refrigeration, consumer electronics, transportation as well as novel devices which have not been produced yet do to the inefficiencies of existing materials.

French physicist Jean Charles Athanase Peltier discovered a key concept necessary for thermoelectric (TE) temperature control in 1834. His findings were so significant, TE devices are now commonly referred to Peltier devices. Since his work, there have been steady advancements in materials and design. Despite the technological sophistication Peltier devices, they are still less energy efficient than traditional compressor/evaporation cooling.

In the 1960's, Peltier devices were primarily made from Bismuth-Telluride (Bi2Te3) or Antimony-Telluride (Sb2Te3) alloys and had a peak efficiency (zT) of 1.1, meaning the electricity going in was only slightly less than the heat coming out. Since the 1960's there have been incremental advancements in alloy technology used in Peltier devices.

In 2014, researchers in South Korea at IBS Center for Integrated Nanostructure Physics along with Samsung Advanced Institute of Technology, the Department of Nano Applied Engineering at Kangwon National University ...***Read More***...



Generation of dislocation arrays during the liquid-phase compaction process. The Te liquid (red) between theBi0.5Sb1.5Te3 grains flows out during the compacting process and facilitates theformation of dislocation arrays embedded in low-energy grain boundaries. Credit: Institute for Basic Science

CERN researchers confirm existence of the Force

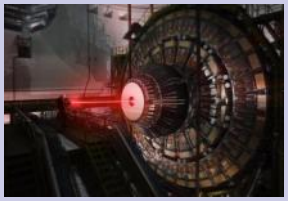
Researchers at the Large Hadron Collider just recently started testing the accelerator for running at the higher energy of 13 TeV, and already they have found new insights into the fundamental structure of the universe. Though four fundamental forces – the strong force, the weak force, the electromagnetic force and gravity – have been well documented and confirmed in experiments over the years, CERN announced today the first unequivocal evidence for the Force. "Very impressive, this result is," said a diminutive green spokesperson for the laboratory.

"The Force is what gives a particle physicist his powers," said CERN theorist Ben Kenobi of the University of Mos Eisley, Tatooine. "It's an energy field created by all living things. It surrounds us; and penetrates us; it binds the galaxy together."

Though researchers are as yet unsure what exactly causes the Force, students and professors at the laboratory have already started to harness its power. Practical applications so far include long-distance communication, influencing minds, and lifting heavy things out of swamps.

Kenobi says he first started teaching the ways of the Force to a young lady who was having trouble revising for her particle-physics exams. "She said that I was her only hope," says Kenobi. "So I just kinda took it from there. I designed an experiment to detect the Force, and passed on my knowledge."

Kenobi's seminal paper "May the Force be with EU" – a strong argument that his ...***Read More***...



The Force has proven a popular research tool for the CERN beams department Credit: Max Brice and Daniel Dominguez/CERN

Rocky planets may orbit many double stars

Luke Skywalker's home in "Star Wars" is the desert planet Tatooine, with twin sunsets because it orbits two stars. So far, only uninhabitable gas-giant planets have been identified circling such binary stars, and many researchers believe rocky planets cannot form there. Now, mathematical simulations show that Earthlike, solid planets such as Tatooine likely exist and may be widespread.

"Tatooine sunsets may be common after all," concludes the study by astrophysicists Ben Bromley of the University of Utah and Scott Kenyon of the Smithsonian Astrophysical Observatory.

"Our main result is that outside a small region near a binary star, [either rocky or gas-giant] planet formation can proceed in much the same was as around a single star," they write. "In our scenario, planets are as prevalent around binaries as around single stars."

The study has been submitted to Astrophysical Journal for review, but as is the custom in the field, the authors have posted the unreviewed paper on the scientific preprint website ArXiv.

With Star Wars: Episode VII – The Force Awakens due to hit movie screens Dec. 18, fans of the epic series may be cheered at the possible reality of planets like Tatooine, home planet of both Luke and Anakin Skywalker, meeting place of Obi Wan Kenobi and Han Solo and the domain ruled (until his death in battle) by crime lord Jabba the Hutt. Luke stares at Tatooine's double suns setting in a classic film moment.

The title of the new study is "Planet formation around binary stars: Tatooine made easy," but the paper looks anything but easy: it is filled with mathematical formulas describing how binary stars can be orbited by planetesimals – asteroid-sized rocks that clump together to form planets.

"We took our sweet ...***Read More***...

In this acrylic painting, University of Utah astrophysicist Ben Bromley envisions the view of a double sunset from an uninhabited Earthlike planet orbiting a pair of binary stars. In a new study, Bromley and Scott Kenyon of the Smithsonian Astrophysical Observatory performed mathematical analysis and simulations showing ….

As stars form, magnetic fields influence regions big and small

Stars form when gravity pulls together material within giant clouds of gas and dust. But gravity isn't the only force at work. Both turbulence and magnetic fields battle gravity, either by stirring things up or by channeling and restricting gas flows, respectively. New research focusing on magnetic fields shows that they influence star formation on a variety of scales, from hundreds of light-years down to a fraction of a light-year.

The new study, which the journal Nature is publishing online on March 30th, probed the Cat's Paw Nebula, also known as NGC 6334. This nebula contains about 200,000 suns' worth of material that is coalescing to form new stars, some with up to 30 to 40 times as much mass as our sun. It is located 5,500 light-years from Earth in the constellation Scorpius. The team painstakingly measured the orientation of magnetic fields within the Cat's Paw. "We found that the magnetic field direction is quite well preserved from large to small scales, implying that self-gravity and cloud turbulence are not able to significantly alter the field direction," said lead author Hua-bai Li (The Chinese University of Hong Kong), who conducted the high-resolution observations while a post-doctoral fellow at the Harvard-Smithsonian Center for Astrophysics (CfA). "Even though they're much weaker than ...***Read More***...

The Cat's Paw Nebula, also known as NGC 6334, comes alive in this infrared image from the Spitzer Space Telescope. A new study of this nebula finds that magnetic fields influence star formation on a variety of scales, from hundreds of light-years ...

Curiosity Sniffs Out History of Martian Atmosphere

NASA's Curiosity rover is using a new experiment to better understand the history of the Martian atmosphere by analyzing xenon. While NASA's Curiosity rover concluded its detailed examination of the rock layers of the "Pahrump Hills" in Gale Crater on Mars this winter, some members of the rover team were busy analyzing the Martian atmosphere for xenon, a heavy noble gas.

Curiosity's Sample Analysis at Mars (SAM) experiment analyzed xenon in the planet's atmosphere. Since noble gases are chemically inert and do not react with other substances in the air or on the ground, they are excellent tracers of the history of the atmosphere. Xenon is present in the Martian atmosphere at a challengingly low quantity and can be directly measured only with on-site experiments such as SAM.

"Xenon is a fundamental measurement to make on a planet such as Mars or Venus, since it provides essential information to understand the early history of these planets and why they turned out so differently from Earth," said Melissa Trainer, one of the scientists analyzing the SAM data.

A planetary atmosphere is made up of different gases, which are in turn made up of variants of the same chemical element called isotopes. When a planet loses its atmosphere, that process can affect the ratios of remaining isotopes.

Measuring xenon tells us more about the history of the loss of the Martian atmosphere. The special characteristics of xenon - it exists naturally in nine different isotopes, ranging in atomic mass from 124 (with 70 neutrons per atom) to 136 (with 82 neutrons per atom) - allows us to ...**Read More**...

A Sample Analysis at Mars (SAM) team member at NASA Goddard prepares the SAM testbed for an experiment. This test copy of the SAM suite of instruments is inside a chamber that, when closed, can model the pressure and temperature environment that SAM sees inside Curiosity on Mars. Image courtesy NASA.

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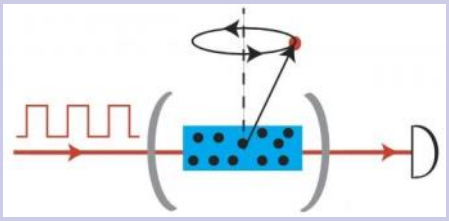
Super sensitive measurement of magnetic fields

There are electrical signals in the nervous system, the brain and throughout the human body and there are tiny magnetic fields associated with these signals that could be important for medical science. Researchers from the Niels Bohr Institute have just developed a method that could be used to obtain extremely precise measurements of ultra-small magnetic fields. The results are published in the scientific journal Nature Physics.

The tiny magnetic fields are all the way down on the atomic level. The atoms do not stand still, they revolve around themselves and the axis is like a tiny magnetic rod. But the axis has a slight tilt and as a result the magnetic rod swings in circles. To measure a swinging object you need to have both its position and the speed of the oscillation.

But in the world of atoms, the laws of classical physics ...***Read More***...



The newly developed sensor that can measure the ultra-small magnetic fields is comprised of a cloud of billions of cesium gas atoms in a tiny glass tube. Using laser light, the tilts of all of the atoms are turned in the same direction. Credit: Kasper Jensen, Niels Bohr Institute

Black holes don't erase information, scientists say

The "information loss paradox" in black holes—a problem that has plagued physics for nearly 40 years—may not exist.

Shred a document, and you can piece it back together. Burn a book, and you could theoretically do the same. But send information into a black hole, and it's lost forever.

That's what some physicists have argued for years: That black holes are the ultimate vaults, entities that suck in information and then evaporate without leaving behind any clues as to what they once contained.

But new research shows that this perspective may not be correct.

"According to our work, information isn't lost once it enters a black hole," says Dejan Stojkovic, PhD, associate professor of physics at the University at Buffalo. "It doesn't just disappear."

Stojkovic's new study, "Radiation from a Collapsing Object is Manifestly Unitary," appeared on March 17 in Physical Review Letters, with UB PhD student Anshul Saini as co-author….Read More…

An artist's impression shows the surroundings of a supermassive black hole at the heart of the active galaxy NGC 3783 in the southern constellation of Centaurus. A new University at Buffalo study finds that -- contrary to what some physicists have argued for the years -- information is not lost once it has entered a black hole. The research presents explicit calculations showing how information is, in fact, preserved. Credit: ESO/M. Kornmesserl

When quantum mechanics and international relations collide

Wars and atoms have, as it were, a conjugated history.

On the eve of the second world war, physicists Albert Einstein and Leó Szilárd wrote a letter to President Franklin D Roosevelt to inform him of the destructive potential of nuclear fission.

The letter would trigger a chain-reaction, as it were, beginning with the Manhattan Project and leading to the first use of nuclear weapons, continuing through to an arms race without end.

Einstein later offered a baleful post-mortem: The unleashed power of the atom has changed everything save our modes of thinking, and thus we drift toward unparalleled catastrophe….***Read More***...

There are more parallels between quantum mechanics and international relations than you might think. Credit: Liam Gillick/Wikimedia, CC BY-SA