INTERNATIONAL YEAR OF LIGHT 2015

100 Million Stars in the Andromeda galaxy.

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Astronomy & Physics News

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

Inside this issue:

Have Hope, will travel: UAE Mars team has 6 years to reach goal

TheNational - With only six years left to complete the Mars mission, the team of young Emiratis at the Mohammed bin Rashid Space Centre have to be as efficient as possible.

Seven teams will cover all aspects of the mission, including the probe's design and development, supervising the design according to international standards and choosing the place of launch.

Other aspects are managing the mission's operations, communications between Mars and Earth and supervising knowledge-sharing and transfer in the UAE….

"Getting to Mars is a big challenge which requires a lot of good planning and calculative risks," said Sarah Amiri, the mission's deputy project manager and science lead.

"But being part of that scientific community that starts posing those mission questions is a great place to be, because you're exposed to a lot of people that are pioneers in that area and provide a lot of insights into the benefits of setting sciences as pure sciences and not only as applied sciences, which engineering is."

Ms. Amiri, a 28-year-old computer science graduate, is now trying to find the right people for the science team.

"From time to time it will aid in the development of the mission and work towards generating research once the data becomes available," she said. "So we have a continuous mission that we're not only developing, we're also generating science and answering some of the science questions about utilizing the Emirates Mars mission."

A representative from each of six universities, including the Masdar Institute of Science and Technology, New York University Abu Dhabi and the American University of Sharjah, will be on the team.

Sharjah Centre for Astronomy and Space Sciences

GulfToday - His Highness Dr. Sheikh Sultan Bin Mohammed Al Qasimi, Supreme Council Member and Ruler of Sharjah and President of the University of Sharjah, has opened the Sharjah Center for Astronomy and Space Sciences (SCASS) in University City of Sharjah.

Following the opening ceremony, Sheikh Sultan toured the new center and was briefed by Professor Hamid Al Naimiy, chancellor of the University of Sharjah on the new facility which offers educational programs as well as research and studies taking place in its special labs.

The exhibitions in the center also showcase the contributions of Muslims to astronomy.

The center sheds light on the history of telescopes, satellites and space exploration. Inside the 209-seat dome-shaped projection hall is a star ball, a Japanese optical instrument that emits a brilliant star field of more than 10 million individual stars, combined with seven special projectors for Sun, Moon and five planets visible from Earth, to produce an interactive model of the observable universe, extending up to billions of light years away.

"That is the Correct Religion" (Deen Al Qayyimah) was the title of the documentary Sheikh Sultan and other officials watched after the opening ceremony. Authored by Sheikh Sultan himself under a title borrowed from a Holy Quran verse, the documentary tells the story of how the universe was created by Allah Almighty at the moment of the Big Bang.

Sheikh Sultan also launched the official website of the new center at

http://www.scass.com

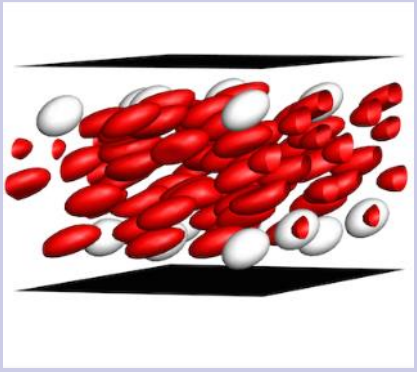
A turning point in the physics of blood

Mike Graham knows that fluid dynamics can reveal much about how the flow of blood helps and hinders individual blood cells as they go about their work.

Graham, the Vilas Distinguished Achievement Professor and Harvey D. Spangler Professor of Chemical and Biological Engineering at UW-Madison, established a theoretical basis for these ideas by creating complex computer stimulations that show how relatively stiff white blood cells and platelets interact with more flexible red blood cells. As the different cells collide during blood flow, white cells tend to be pushed toward the walls of a blood vessel. This segregation process, called margination, creates some advantages—for example, letting white blood cells quickly exit the blood vessel to head to the site of an injury or infection.

However, the mechanical details of blood could spell both good news and bad in areas ranging from drug delivery to blood disorders to the spread of disease. "I view my role as providing a fundamental basis of understanding for practitioners and for other engineers who are more directly connected with applications," Graham says.

Graham's work has reached a crucial turning point, yielding a theory that opens a door for other researchers to take advantage of what Graham's group has learned and observed throughout years of computationally simulating the physics of blood flow. ...***Read More***….



An image from a simulation that shows a case in which the stiffer cells (white) are driven to the walls of a blood vessel. Mike Graham's paper lays out a new theory that predicts the conditions under which this process occurs.

New laser-light source could lead to significant advances in research on fundamental physics

With the aid of extremely short and highly intense pulses of laser light, scientists have made great strides in their efforts to observe and control particle motions outside the confines of atomic nuclei. Indeed, the future of electronics lies in optical control of electron flows. That would enable data processing operations to be performed at frequencies equivalent to the rate of oscillation of visible light – some 100,000 times faster than is feasible with current techniques. To reach this goal, advances in laser technology are essential. Physicists at the Laboratory for Attosecond Physics (LAP), which is run jointly by LMU Munich and the Max Planck Institute of Quantum Optics (MPQ), has developed a novel light source that brings the age of optoelectronics closer. The team describes the new instrument in the journal Nature Communications.

Most of the lasers utilized in research laboratories are based on titanium:sapphire (Ti:Sa) crystals, and this type of instrument has been the dominant tool in the production of ultrashort light pulses for over 20 years. But this situation is likely to change very soon. All the indications are that thin-disc laser systems will soon displace their older rivals, which employ rod- or slab-like crystals. The team at the LAP has now introduced the Ytterbium:Yttrium-Aluminium-Garnet ...***Read More***...

The LAP team has developed a novel ytterbium:yttrium-aluminium-garnet thin-disk laser that emits light pulses lasting 7.7 femtoseconds and consisting of 2.2 optical oscillations. The pulses have an average power of 6 W and carry 0.15 microjoules of energy, over 1.5 orders of magnitude higher than those generated by commercially available Ti:Sa lasers. Credit: Thorsten Naeser

Penn physicists honored for work that could take heat out of computing

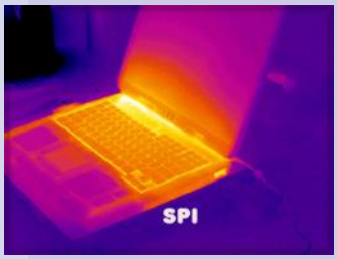
The concentrated heat radiating from your laptop. The sudden roar of the cooling fan from inside your desktop computer.

Familiar signs of wasted energy, caused largely by the increasing numbers of transistors crammed into the innards of our electronic gadgets. As you reach once again for that charging cable, be aware that an amiable pair of University of Pennsylvania physicists may have hit on the beginnings of a solution: a new kind of material called topological insulators.

It could take years, even decades, before these compounds are used in devices, and they represent just one of multiple ideas for how to take computers to the next level. But Charles L. Kane and Eugene J. Mele already are racking up awards for their work, receiving the latest last week at the Franklin Institute, a science museum in Philadelphia that houses the Benjamin Franklin National Memorial.

Though no computer designer is quite sure yet how to use topological insulators, they have sparked intense interest for their unusual properties. The materials act as insulators on their interiors, but they conduct electricity on their exteriors in a way that dissipates very little heat.

The underlying physics is a bit advanced for everyday conversation. But the key is that these materials force electrons to move in an orderly fashion, with none of the usual chaos and backscattering, said Kane, who arrived at Penn in 1991….***Read More***...



Thermal image of laptop computer heat profile.

Fresh evidence for how water reached Earth found in asteroid debris

Water delivery via asteroids or comets is likely taking place in many other planetary systems, just as it happened on Earth, new research strongly suggests.

Published by the Royal Astronomical Society and led by the University of Warwick, the research finds evidence for numerous planetary bodies, including asteroids and comets, containing large amounts of water.

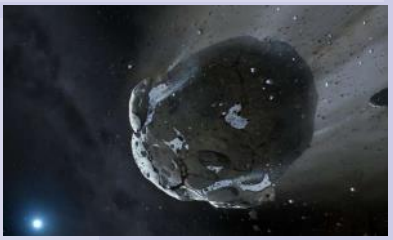
The research findings add further support to the possibility water can be delivered to Earth-like planets via such bodies to create a suitable environment for the formation of life.

Commenting on the findings lead researcher Dr Roberto Raddi, of the University of Warwick's Astronomy and Astrophysics Group, said:"Our research has found that, rather than being unique, water-rich asteroids similar to those found in our Solar System appear to be frequent. Accordingly, many of planets may have contained a volume of water, comparable to that contained in the Earth.

"It is believed that the Earth was initially dry, but our research strongly supports the view that the oceans we have today were created as a result of impacts by water-rich comets or asteroids".

In observations obtained at the William Herschel Telescope in the Canary Islands, the University of Warwick astronomers detected a large quantity of hydrogen and oxygen in the atmosphere of a white dwarf (known as SDSS J1242+5226). The quantities found provide the evidence that a water-rich exo-asteroid was disrupted and eventually delivered the water it contained onto the star.

The asteroid, the researchers discovered, was comparable in size to Ceres - at 900km across, the largest asteroid in ...***Read More***….



Artist's impression of a rocky and water-rich asteroid being torn apart by the strong gravity of the white dwarf star. Similar objects in the Solar System likely delivered the bulk of water on Earth and represent the building blocks of the terrestrial planets. Credit: copyright Mark A. Garlick, space-art.co.uk, University of Warwick

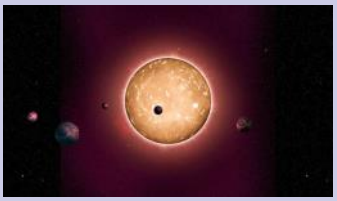
Ancient star raises prospects of intelligent life

Can life survive for billions of years longer than the expected timeline on Earth? As scientists discover older and older solar systems, it's likely that before long we'll find an ancient planet in a habitable zone. Knowing if life is possible on this exoplanet would have immense implications for habitability and the development of ancient life, one researcher says.

In January, a group led by Tiago Campante—an astroseismology or "starquake" researcher at the University of Birmingham in the United Kingdom—announced a discovery of five tiny, likely rocky worlds close to an ancient star. The star is named Kepler-444 after NASA's planet-hunting Kepler mission, which first made a tentative discovery.

Campante's contribution was narrowing down the age of Kepler-444 and its planets to an astounding 11.2 billion years old. That's nearly 2.5 times as old as our solar system. None of Kepler-444's planets are thought to be habitable, as they circle the star at a scorchingly-close distance. However, Campante said that finding those planets is a great stride forward in the search for older, habitable worlds and the best may be yet to come.

"This system gives us hope that there ...***Read More***….



Artist's conception of Kepler-444 and its five orbiting planets. Credit: Peter Devine and Tiago Campante/University of Birmingham

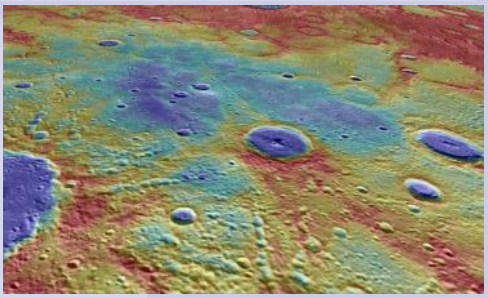
MESSENGER reveals Mercury's magnetic field secrets

New data from MESSENGER, the spacecraft that orbited Mercury for four years before crashing into the planet a week ago, reveals Mercury's magnetic field is almost four billion years old. The discovery helps scientists piece together the history of Mercury, the closest planet to the sun and one about which we knew very little before MESSENGER.

NASA's MESSENGER probe left Earth in 2004, reached Mercury in 2008 and has orbited the planet since 2011, sending valuable data back to scientists. A study detailing the planet's ancient magnetic field was published today in Science Express. Researchers used data obtained by MESSENGER in the fall of 2014 and 2015 when the probe flew incredibly close to the planet's surface - at altitudes as low as 15 kilometers. In the years prior, MESSENGER's lowest altitudes were between 200 and 400 kilometers.

"The mission was originally planned to last one year; no one expected it to go for four," said Catherine Johnson, a University of British Columbia planetary scientist and lead author of the study. "The science from these recent observations is really interesting and what we've learned about the magnetic field is just the first part of it."

Scientists have known for some time that Mercury has a magnetic field similar to Earth's, but much weaker. The motion of liquid iron deep inside the planet's core generates the field….***Read More***...



In this perspective view, we look west across Suisei Planitia (blue colors), the site of some of the crustal magnetic signals. The plains are comprised of volcanic lava flows that erupted and solidified several billion years ago, filling the low areas between the higher topography (red colors).

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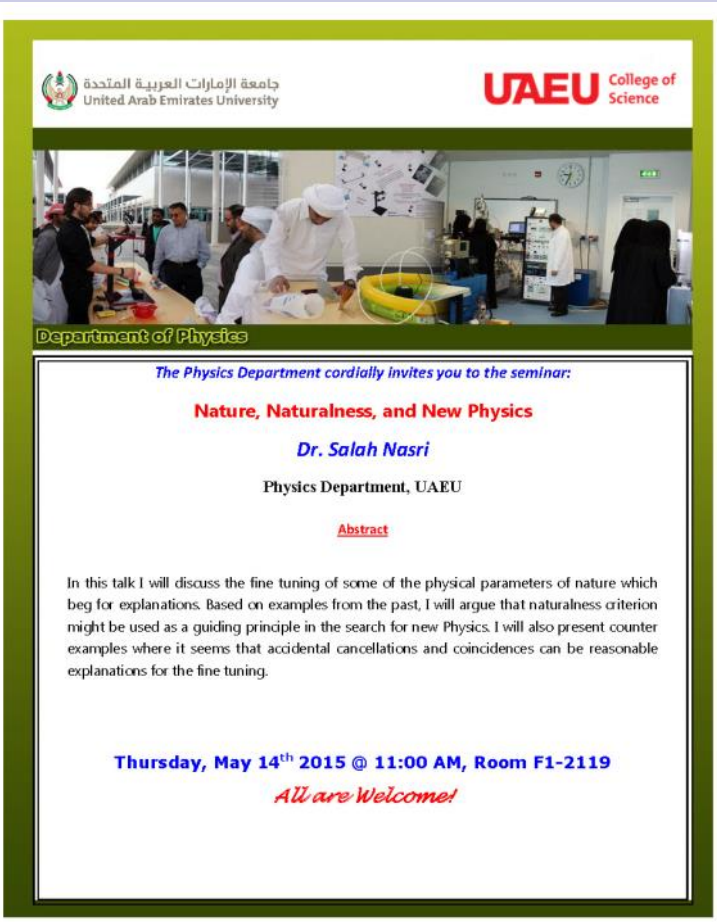
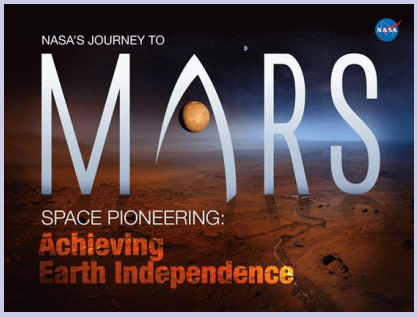


NASA Challenge: Space Pioneering – Achieving Earth Independence

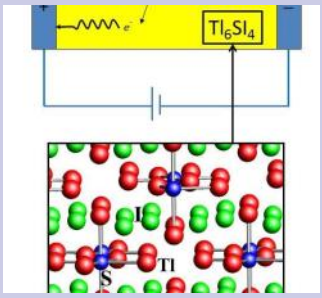
NASA's challenge is finding elements that support the logistics and capabilities required for a sustainable permanent human presence beyond Earth's vicinity.

For this specific Challenge, the Solver is asked to focus on those particular elements of "pioneering space" needed to establish a continuous human presence on Mars. The Solver is asked to describe one or more Mars surface systems/capabilities and operations needed to achieve this goal that are, to the greatest extent possible, technically achievable, economically sustainable, and minimize (ideally, eliminate) reliance on support from Earth.

This is a Theoretical Challenge that requires only a written submission. The Challenge award will be contingent upon theoretical evaluation of the submission by the Seeker. Awards will be paid out to the top submissions that meet or exceed the criteria below. Awards will be paid out in increments of $5,000 (minimum) up to a potential total award pool of $15,000. The awards are not guaranteed, however; the Seeker expects to pay out 1-3 awards in total ...***Read More***…



NASA's Journey to Mars. Credit: NASA.



Schematic for a Tl6SI4 detector and the crystal structure of Tl6SI4. Credit: Mao-Hua Du/Oak Ridge National Laboratory, Oak Ridge, Tenn

Bringing high-energy particle detection in from the cold

Radiation detectors, which monitor high-energy particles such as those produced by nuclear decay and cosmic radiation, are being used increasingly in medical imaging, petroleum well logging, astronomy and national security. Conventional semiconductor detectors made from germanium and silicon are standard equipment in nuclear physics, but are less useful in many emerging applications because they require low temperatures to operate. In recent years, scientists have been seeking new semiconductor materials to develop high-performance radiation detectors that can operate at room temperature.

Now researchers from Oak Ridge National Laboratory in Tennessee think they have a good candidate material. The scientists studied for the first time native defects and dielectric properties of an emerging semiconductor compound called thallium sulfide iodide (Tl6SI4). Using a computational modeling method called density functional calculations, the researchers demonstrated the material's potential for creating high-performance, low-cost, room-temperature semiconductor radiation detectors. In a paper published this week in the Journal of Applied Physics the researchers report their calculations and findings….***Read More***...