DOWNLOAD PDF 8 SPACE AND ENERGY

Chapter 1 : 8 Mind-Blowing Facts About Space

During the cold months of the year a huge part of the utility bill takes the up the heating of the house. Central air heating can be impractical and very costly. Electric space heaters also used to be an expensive way to heat up the house. However, nowadays there're new models that incorporate new.

By Dennis Green That we may be not be alone? The vastness of it all? Neutron stars can spin at a rate of rotations per second. Neutron stars are one of the possible evolutionary end-points of high mass stars. Neutron stars can rotate up to 60 times per second after born. Under special circumstances, this rate can increase to more than times per second. All of space is completely silent. Sound waves need a medium to travel through. Since there is no atmosphere in space, space will always be eerily silent. You may be asking how astronauts can talk to each other in space. Lucky for them, radio waves can travel through space. No problem there, Houston. There is an uncountable number of stars in the known universe. We basically have no idea how many stars there are in the universe. Right now we use our estimate of how many stars there are in our own galaxy, the Milky Way. We then multiply that number by the best guesstimate of the number of galaxies in the universe. After all that math, NASA can only confidently say that say there all zillions of uncountable stars. A zillion is any uncountable amount. An Australian National University study put their estimate at 70 sextillion. This figure is basically a guess, though. That means their footprints, roverprints, spaceship prints, and discarded materials will stay preserved on the moon for a very long time. The moon still a dynamic environment. Technically, our Sun is a "G-type main-sequence star" which means that every second, it fuses approximately million tons of hydrogen to helium. This means that it also converts about 4 million tons of matter to energy as a byproduct. Being the type of star that the Sun is, it also means that when it dies, it will become a red giant and envelop the earth and everything on it. More energy from the sun hits Earth every hour than the planet uses in a year. This is due to several factors, including how much land is required for solar panels to capture enough energy for a population of people to use, how unreliable it is in bad weather and at night, and how expensive the technology is to install. If two pieces of the same type of metal touch in space, they will bond and be permanently stuck together. This amazing effect is called cold welding. It happens because the atoms of the individual pieces of metal have no way of knowing that they are different pieces of metal, so the lumps join together. The effect has a lot of implication for spacecraft construction and the future of metal-based construction in vacuums. The largest asteroid ever recorded is a mammoth piece of space rock named Ceres. The asteroid is almost miles in diameter. The surface area is approximately equal to the land area of India or Argentina. Ceres piques our interest specifically, as water in the form of ice has been spotted on its surface. An unmanned spacecraft named Dawn is due to be orbiting the space rock by

Chapter 2 : Paramahansa Tewari: Space Energy Generator

Harvesting renewable energy from the sun and outer space at the same time Date: November 8, Source: Cell Press Summary: Scientists have demonstrated for the first time that heat from the sun.

A piece of sheet metal was folded to make the fins and welded to the rear of the projectile. These were dumped from aircraft onto enemy troops and had the same effect as a machine gun fired vertically. Bodies had been penetrated longitudinally from shoulder to lower abdomen. Jerry Pournelle originated the concept while working in operations research at Boeing in the s before becoming a science-fiction writer. There would be no need to deploy missiles, aircraft or other vehicles. The idea is that the weapon would naturally contain a large kinetic energy because it moves at orbital velocities , at least 8 kilometers per second. As the rod would approach Earth it would necessarily lose most of the velocity, but the remaining energy would cause considerable damage. Some systems are quoted as having the yield of a small tactical nuclear bomb. With 6â€”8 satellites on a given orbit, a target could be hit within 12â€”15 minutes from any given time, less than half the time taken by an ICBM and without the launch warning. Such a system could also be equipped with sensors to detect incoming anti-ballistic missile -type threats and relatively light protective measures to use against them e. Hit-To-Kill Missiles or megawatt-class chemical laser. In the case of the system mentioned in the Air Force report above, a 6. The highly elongated shape and high mass are to enhance sectional density and therefore minimize kinetic energy loss due to air friction and maximize penetration of hard or buried targets. The larger device is expected to be quite effective at penetrating deeply buried bunkers and other command and control targets. It has a very high closing velocity and small radar cross-section. Launch is difficult to detect. Any infrared launch signature occurs in orbit, at no fixed position. The infrared launch signature also has a much smaller magnitude compared to a ballistic missile launch. The system would also have to cope with atmospheric heating from re-entry, which could melt non-tungsten components of the weapon. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed. January Learn how and when to remove this template message In the mids, popular science interest in orbital mechanics led to a number of science fiction stories which explored their implications. Heinlein in which the citizens of the Moon bombard the Earth with rocks wrapped in iron containers which are in turn fired from an electromagnetic launch system at Earth-based targets. In the s and s this idea was refined in science fiction novels such as Footfall by Larry Niven and Jerry Pournelle the same Pournelle that first proposed the idea for military use in a non-fiction context , in which aliens use a Thor-type system. The re-purposing of space colonies for use in kinetic bombardment referred as a "colony drop" is a frequent element of the Gundam franchise and is central to the plots of Mobile Suit Gundam: The orbital kinetic bombardment system is used first to destroy the Soviet tank armies that have invaded Europe and then to take out Soviet ICBM silos prior to a nuclear strike. From the mids, kinetic weapons as science fiction plot devices appeared in video games. Ghosts , to name some. The Warren Ellis comic Global Frequency issue 12, "Harpoon", August featured the threat of kinetic spears, weapons designed to be dropped from satellites, heat up on re-entry, and strike the ground with the force of a tactical nuke, and as hot as the edge of the sun. In a kinetic weapon bombardment system consisting of tungsten rods in an orbiting platform, codenamed Project: Zeus, was featured in the movie G. Retaliation , where it destroys London. However, the movie misrepresented physics by claiming the rod would not be "launched" or "fired" but merely "dropped". If it were released without force it would orbit the Earth in the same manner as the platform itself. In order for a rod to fall straight toward the center of Earth, it would need to be launched away from the station with a tangential velocity equal in magnitude and opposite in direction from the orbiting station. The version used by the Royal Manticoran Navy is a six-hundred-kilogram iron slug equipped with a small gravitic drive, capable of variable yields ranging from that of a large artillery shell to an intermediate-yield nuclear device, and packaged in six-shot satellites that are deployed from starship counter-missile tubes. The book in which the event occurs also specifies how the staggering of the harpoons impact caused the shockwaves from the impacts to resonate and result in an artificial earthquake.

Chapter 3 : DSpace@MIT: The Physics of Energy, Fall

Daily Sun, Earth and Space Science Welcome to the Observers: theinnatdunvilla.com theinnatdunvilla.com theinnatdunvilla.com

May 31, The snapshot includes galaxies of various ages, sizes, shapes, and colors. The smallest, reddest galaxies, about , may be among the most distant known, existing when the universe was just million years old. The nearest galaxies--the larger, brighter, well-defined spirals and ellipticals--thrived about 1 billion years ago, when the cosmos was 13 billion years old. To round up some of the most enduring mysteries in the field of astronomy, the journal Science enlisted help from science writers and members of the Board of Reviewing Editors to choose eight puzzling questions being asked by leading astronomers today. As Robert Coontz, deputy news editor at Science, writes in his introduction to the series, the participants decided that, "true mysteries must have staying power," rather than being questions that might be resolved by research in the near future. In fact, while some of the topics discussed may one day be solved through astronomical observations, others may never be solved, he added. In no particular order, here are eight of the most compelling mysteries of astronomy , as presented by the journal Science: The galaxy cluster Abell is famous for the way it bends light in a phenomenon called gravitational lensing. Study of the cluster has revealed secrets about how dark energy shapes the universe. Natarajan Yale and J-P. Kneib LAM What is dark energy? In the s, astronomer Edwin Hubble discovered that the universe is not static, but rather is expanding. In , the Hubble Space Telescope, named for the astronomer, studied distant supernovas and found that the universe was expanding more slowly a long time ago compared with the pace of its expansion today. While dark energy is thought to make up approximately 73 percent of the universe, the force remains elusive and has yet to be directly detected. Jee University of California, Davis , and A. In the s and s, astronomers hypothesized that there might be more mass in the universe than what is visible. Vera Rubin, an astronomer at the Carnegie Institution of Washington, studied the speeds of stars at various locations in galaxies. These results seemed to go against basic Newtonian physics, which implies that stars on the outskirts of a galaxy would orbit more slowly. Astronomers explained this curious phenomenon with an invisible mass that became known as dark matter. Even though it cannot be seen, dark matter has mass, so researchers infer its presence based on the gravitational pull it exerts on regular matter. Dark matter is thought to make up about 23 percent of the universe, while only 4 percent of the universe is composed of regular matter, which includes stars, planets and humans. This discovery is the strongest evidence yet that the "missing matter" in the nearby Universe is located in an enormous web of hot, diffuse gas. Weiss Where are the missing baryons? If dark energy and dark matter combine to make up roughly 95 percent of the universe, regular matter makes up about 5 percent of the cosmos. Yet, more than half of this regular matter is missing. This so-called baryonic matter is composed of particles such as protons and electrons that make up most of the mass of the visible matter in the universe. According to Bhattacharjee, astrophysicist suspect the missing baryonic matter may exist between galaxies, as material that is known as warm-hot intergalactic medium , or WHIM. Locating the missing baryons in the universe continues to be a priority in the field of astronomy, because these observations should help researchers understand how cosmic structure and galaxies have evolved over time. An image of a laser-produced shock wave. Brighter colors corresponds to regions of higher density or temperature i. A simulation of a collapsing shock wave arising during the pre-galactic phase. Meinecke Oxford and C. How do stars explode? When a massive star runs out of fuel and dies, it triggers a spectacular explosion called a supernova that can briefly shine more brightly than an entire galaxy. Over the years, scientists have studied supernovas and recreated them using sophisticated computer models, but how these gigantic explosions occur is an enduring astronomical puzzle. Supernova Explosions] "In recent years, advances in supercomputing have enabled astronomers to simulate the internal conditions of stars with increasing sophistication, helping them to better understand the mechanics of stellar explosions," Bhattacharjee wrote. Kornmesser What re-ionized the universe? The broadly accepted theory for the origin and evolution of the universe is the Big Bang model, which states that the cosmos began as an incredibly hot, dense point roughly A dynamic phase

in the history of the early universe, approximately 13 billion years ago, is known as the age of re-ionization. During this period, the fog of hydrogen gas in the early universe was clearing and becoming transparent to ultraviolet light for the first time. Recent IceCube results challenge one of the leading theories, that they come from gamma ray bursts. The source of cosmic rays has long perplexed astronomers, who have spent a century investigating the origins of these energetic particles. Cosmic rays are charged subatomic particles â€" predominantly protons, electrons and charged nuclei of basic elements â€" that flow into our solar system from deep in outer space. As cosmic rays flow into the solar system from elsewhere in the galaxy, their paths are bent by the magnetic fields of the sun and Earth. The strongest cosmic rays are extraordinarily powerful, with energies up to million times greater than particles from manmade colliders. Still, the origin of these strange particles has been an enduring mystery. Why is the solar system so bizarre? As astronomers and space observatories discover alien planets around other stars, researchers have been keen to understand the unique characteristics of our solar system. For instance, while extremely varied, the four innermost planets have rocky outer shells and metallic cores. The four outermost planets are vastly different and each possess their own identifiable features. Scientists have studied the process of planetary formation in hopes of grasping how our solar system came to be, but the answers have not been simple. Perhaps patterns will emerge from inchoate diversity. This sunspot spouted four solar flares and three coronal mass ejections from Sept. But the detailed mechanics of coronal heating are currently unknown.

Chapter 4 : Vacuum energy - Wikipedia

A new theory on space, energy and matter, Space Vortex Theory (SVT) which posits the concept of dynamic space as the most fundamental substratum of reality, and electrons as 'vortices of space' explains the principles behind SPG phenomenon.

This image shows the apparatus that is proving the efficacy of a double-layered rooftop panel. The top layer uses the standard semiconductor materials that go into energy-harvesting solar cells, the Linda Cicero, Stanford News Scientists at Stanford University have demonstrated for the first time that heat from the sun and coldness from outer space can be collected simultaneously with a single device. Their research, published November 8 in the journal Joule, suggests that devices for harvesting solar and space energy will not compete for land space and can actually help each other function more efficiently. Renewable energy is increasingly popular as an economical and efficient alternative to fossil fuels, with solar energy topping charts as the worldwide favorite. But there is another powerful energy source overhead that can perform just the opposite function--outer space. Most of this radiation is reflected back to Earth by particles in the atmosphere, but some of it escapes into space, allowing surfaces that emit enough radiation within the infrared range to drop below the temperature of their surroundings. It may also help improve solar cell efficiency, which decreases the hotter solar cells become--if only the two technologies can coexist peacefully on one rooftop. Chen and his colleagues developed a device combining radiative cooling with solar absorption technology. The device consists of a germanium solar absorber on top of a radiative cooler with silicon nitride, silicon, and aluminum layers enclosed in a vacuum to minimize unwanted heat loss. Both the solar absorber and the atmosphere are transparent in the mid-infrared range of microns, offering a channel for infrared radiation from the radiative cooler to pass through to outer space. The team demonstrated that the combined device can simultaneously provide 24? C in solar heating and 29? While this technology appears promising, Chen believes there is still plenty of work to do before it can be scaled up for commercial use. While the vacuum enveloping the device could be scaled up with relative ease, the infrared-transparent window made from zinc selenide is still too costly, and the solar absorber and radiative cooler could be designed from cheaper high-performing materials as well. Chen thinks it is also important to test the use of photovoltaic cells in the place of a solar absorber--an idea which has yet to be demonstrated. But in spite of all these practical challenges, the team believes this research demonstrates that renewable energy has even more rooftop potential than previously thought. Joule, Chen et al.: A sister journal to Cell, Joule spans all scales of energy research, from fundamental laboratory research into energy conversion and storage up to impactful analysis at the global level. To receive Cell Press media alerts, contact press cell.

Chapter 5 : Kinetic bombardment - Wikipedia

On July 3, , eight spacecraft were lined up on the night side of Earth, enabling scientists to track how magnetic energy from the sun moved around Earth, reconnected at a point about half way to the moon, and then spread through the back end of Earth's magnetic environment, the magnetotail.

Check Price on Amazon In a small package, this Lasko product offers watts of heat. It stands sturdily on its base and oscillating the heat spreads it over the room. On the top it features temperature presets and various fan outputs. You can control the temperature level in the room and its distribution. It even has a timer that you can use up to 7 hours in advance to program the unit for shut off. Lasko is made in a unique design with a decorative base out of metal scrollwork. This heater is an engineered in the US model that features a dual heating system. It combines such heating elements as PTC and Quartz infrared and this produces a maximum heat transfer rate. As a result you save on your energy bills. With the included auto energy saving mode you can set the desired level of temperature in the room at F. Then the thermostat will regulate and cycle the unit on and off. The space heater is also equipped with a high velocity blower for quite operation that you will hardly notice it working. For faster and more efficient heating of the room, the Dyson AM04 features Air Multiplier technology. It projects the heat further by amplifying the surrounding air and providing oscillation for its distribution. With the long range of heat projection, you can feel direct heat everywhere throughout the room. On the intelligent thermostat you can select the target temperature and the unit will keep it at that precise degree Our Rating: Check Price on Amazon The unit provides smooth and constant flow of either warm or cool air. For energy saving it features a ComforTemp setting for maintain an optimal level of temperature in the room. This DeLonghi is very quiet and safe. Its light weight, caster wheels and a carry handle make it easy to move it. This unit can also be wall mounted for more efficient of room space. Check Price on Amazon To adjust it to your heating needs and energy consumption you can either use the thermostat or the 2 settings of low or high. It provides multidirectional heating for consistent and fast warming of all sections in the room. Check Price on Amazon The controls for this unit feature a climate control that automatically maintains a set temperature by adjusting the output of heat and fan speed. Alternatively you can choose one of the 2 heat settings or opt for the fan-only mode. It comes with the standard safety features, such as the tip-over protection and shut-off for overheating. Check Price on Amazon With its pre-heat timer you can program it to have the bathroom warm and ready for you in the morning. Its sleek design allows it to be either counter placed or wall mounted. The digital thermostat of the Holmes HFHWGL heater features a digital clock and timer which can be adjusted using the easy to use controls. The LED digital controls also offer 2 heating settings with the maximum of watts. So there are no safety worries, the heater is equipped with overheat protection. Also, to keep it safe with kids around, the unit features cool touch housing. Holmes backs up the quality of this product with a one year limited warranty. After you set a desired level of temperature, the heater automatically selects the suitable power level taking into consideration the desired temperature and the current one in the room. Other heating settings include Minimum and Boost. The heat is distributed side to side by a motorized oscillation. The unit can also be for hot summer days as a fan and it will provide good ventilation of cool air. Almost half of that amount are heating and cooling costs. The average energy expenditure of an average household is twice as much as the greenhouse gas emissions of an average car. By choosing the right heating option you can save on energy costs, improve the comfort level at home , and help fight against global warming. By choosing the right heating system and incorporating efficient operation, you can get your heating bills down by 30 percent. The tips below will help you keep the heating in your house on budget and energy efficient. Choose the appropriate type of heating. Depending on certain factors your might benefit more by using a certain type of space heater. One of the most popular heating options are electric heaters. They are suitable for you if you need to heat a small area or an area that does not require constant heating. They are usually quite small, which makes it easy to move them around the room or between different rooms of the house. So if you have a small room or will be fine with just sitting in front of the heater if you choose a smaller electric space heater , this will be the best energy efficient option. Also, for small and

medium sized areas you can consider a gas heater. If you will have the heater running all day, then choosing a gas heater can be a cheaper and more efficient option. However, gas prices are on the rise and many homes have solar power which makes electricity much cheaper. Look for a heater that has an adjustable thermostat. Once it reaches the set temperature, the heater will start cycling off and on to keep the temperature at that level. This eliminated inefficient operation and waste of energy. Some of the space heaters offer an energy saving mode that provides maximum heat transfer rate. After you set the desired temperature, the space heater programs itself for operation with the appropriate power level, taking into consideration both the temperature you set and the temperature of the room. Some people prefer oil filled heaters as they still retain some of the heat after shut off. So you can warm up the room to a comfortable level and then lower the setting and you will still be getting enough convection warmth from the heater. Its also important to use the thermostat correctly. Setting it to about degrees for a living area should be enough. If you want tropical temperatures in the room, even increasing the temperature by just several degrees can lead to an increase of your energy bill to as much as 10 percent. Keep your thermostat protected from draughts, direct sunlight and heating outlets. Its not advisable to keep the thermostat on external walls. When you go out turn the heater off. Its cheaper to turn it on when you return. Also, you can turn the heater off overnight while you sleep. Look for a heater that comes with a timer or you can install one yourself. You can use it to turn the heater on and off automatically. For example, you can program it to turn the heater on 20 or 30 minutes before you rise in the morning or half an hour before you return home in the evening. Minimize the area that you want to be heated. While you are heating a certain room, close the doors to prevent the heat from escaping. At one time heat only the area that is currently in use. Insufficient insulation can be the cause for your rooms being too hot or too cold. Or it will have to work harder to get it to that level. Old age or poor condition can cause the heating system to work less efficiently. So its advised to follow proper maintenance of the equipment. If your heating is over 10 years old, its probably time to make a change. Conclusion In this article we tried to showcase the energy efficient space heaters. The units we picked for this review feature not just good energy efficiency, but also combine good price, small size and safe operation. These models have also received positive feedback by multiple users. Read more related products reviews:

Chapter 6 : 8 Modern Astronomy Mysteries Scientists Still Can't Explain

Plan B for Energy: 8 Revolutionary Energy Sources. Until it rises, space-based solar will never match the price of other renewable energy sources, even accounting for the energy storage.

Cupertino, California â€" Apple today announced a new generation of iPhone: The new iPhone features a new glass and aluminum design in three beautiful colors made out of the most durable glass ever in a smartphone, Retina HD displays and A11 Bionic chip, and is designed for the ultimate augmented reality experience. Both devices will be available for pre-order beginning Friday, September 15 in more than 25 countries and territories, and in stores beginning Friday, September Packed with more advanced cameras with Portrait mode and Portrait Lighting, and the highest quality video capture in a smartphone, iPhone 8 and iPhone 8 Plus enable the freedom of wireless charging, all with AR optimization like no phone ever before. The glass finish is made using a seven-layer color process for precise hue and opacity, delivering a rich depth of color with a color-matched aerospace-grade aluminum bezel, and is water and dust resistant. The vibrant wide color gamut Retina HD display offers the best color accuracy in the industry. Redesigned stereo speakers are up to 25 percent louder and deliver deeper bass, enabling richer-sounding music, videos and speakerphone calls. A11 Bionic, the most powerful and smartest chip ever in a smartphone, features a six-core CPU design with two performance cores that are 25 percent faster and four efficiency cores that are 70 percent faster than the A10 Fusion, offering industry-leading performance and energy efficiency. A new, second-generation performance controller can harness all six cores simultaneously, delivering up to 70 percent greater performance for multi-threaded workloads, giving customers more power while providing the same great battery life. A11 Bionic also integrates an Apple-designed GPU with a three-core design that delivers up to 30 percent faster graphics performance than the previous generation. All this power enables incredible new machine learning, AR apps and immersive 3D games. Designed for AR iPhone 8 and iPhone 8 Plus are engineered for the ultimate augmented reality experience. The cameras on iPhone 8 Plus are custom tuned for the ultimate AR experience. Each camera is individually calibrated, with new gyroscopes and accelerometers for accurate motion tracking. AR benefits from A11 Bionic, which handles world tracking, scene recognition and incredible graphics at 60fps, while the image signal processor does real-time lighting estimation. A new Apple-designed image signal processor delivers advanced pixel processing, wide color capture, faster autofocus in low light and better HDR photos, while a new quad LED True Tone Flash with Slow Sync results in more uniformly lit backgrounds and foregrounds. All this adds up to outstanding photos with vibrant, realistic colors and more detail. The new camera features a larger and faster sensor, new color filter, deeper pixels and OIS for capturing vibrant photos and videos with more detail. The new camera also delivers the highest quality video capture ever in a smartphone with better video stabilization, 4K video up to 60fps and p slo-mo up to fps. The Apple-designed video encoder provides real-time image and motion analysis for optimal quality video. Dramatic shadows with highlights and lowlights. Like Stage Light, but in classic black and white.

Chapter 7 : iPhone 8 and iPhone 8 Plus: A new generation of iPhone - Apple

The vastness of space and the puzzling nature of the cosmic objects that occupy it provides no shortage of material for astronomers to ponder.

To keep this world tolerable for life as we like it, humanity must complete a marathon of technological change whose finish line lies far over the horizon. Socolow and Stephen W. Pacala of Princeton University have compared the feat to a multigenerational relay race. They outline a strategy to win the first year leg by reining back carbon dioxide emissions from a century of unbridled acceleration. Existing technologies, applied both wisely and promptly, should carry us to this first milestone without trampling the global economy. That is a sound plan A. The plan is far from foolproof, however. Any slow starts or early plateaus will pull us off track. And some scientists worry that stabilizing greenhouse gas emissions will require up to 18 wedges by , not the seven that Socolow and Pacala forecast in their most widely cited model. It is a mistake to assume that carbon releases will rise more slowly than will economic output and energy use, argues Martin I. Hoffert, a physicist at New York University. The baton will then pass in to a new generation for the next and possibly harder part of the marathon: Sooner or later the world is thus going to need a plan B: Energy buffs have been kicking around many such wild ideas since the s. It is time to get serious about them. The survey that follows sizes up some of the most promising options , as well as a couple that are popular yet implausible. None of them is a sure thing. But from one of these ideas might emerge a new engine of human civilization. Nuclear Fusion -- Reality Factor: By harnessing the same strong thermonuclear force that fires the sun, a fusion plant could extract a gigawatt of electricity from just a few kilograms of fuel a day. Its hydrogen-isotope fuel would come from seawater and lithium, a common metal. The reactor would produce no greenhouse gases and relatively small amounts of low-level radioactive waste, which would become harmless within a century. The question is whether fusion can make a large contribution to the 21st century or is a 22nd-century solution. Baldwin, who as head of the energy group at General Atomics oversees the largest fusion reactor in the U. But the past 20 years have seen dramatic improvements in tokamaks, machines that use giant electromagnetic coils to confine the ionized fuel within a doughnut-shaped chamber as it heats the plasma to more than million degrees Celsius. So far political leaders have chosen to push fusion along much more slowly. Meanwhile an intermediate generation of tokamaks now nearing completion in India, China and Korea will test whether coils made of superconducting materials can swirl the burning plasma within its magnetic bottle for minutes at a time. Current reactors manage a few dozen seconds at best before their power supplies give out. ITER aims for three principal goals. First it must demonstrate that a large tokamak can control the fusion of the hydrogen isotopes deuterium and tritium into helium long enough to generate 10 times the energy it consumes. A secondary aim is to test ways to use the high-speed neutrons created by the reaction to breed tritium fuelâ€”for example, by shooting them into a surrounding blanket of lithium. The third goal is to integrate the wide range of technologies needed for a commercial fusion plant. If ITER succeeds, it will not add a single watt to the grid. But it will carry fusion past a milestone that nuclear fission energy reached in , when Enrico Fermi oversaw the first self-sustaining nuclear chain reaction. Fission reactors were powering submarines 11 years later. Fusion is an incomparably harder problem, however, and some veterans in the field predict that 20 to 30 years of experiments with ITER will be needed to refine designs for a production plant. Najmabadi is more optimistic. He leads a working group that has already produced three rough designs for commercial fusion reactors. If work on a commercial plant began in parallel with ITER, rather than decades after it goes online, fusion might be ready to scale up for production by midcentury, Najmabadi argues. Fusion would be even more cost-competitive, Hoffert suggests, if the fast neutrons produced by tokamaks were used to transmute thorium which is relatively abundant into uranium which may be scarce 50 years hence to use as fuel in nuclear fission plants. High-Altitude Wind -- Reality Factor: New designs would rise higherâ€”perhaps even to the jet stream Wind is solar energy in motion. Fortunately, that energy is not distributed evenly but concentrated into strong currents. Unfortunately, the largest, most powerful and most consistent currents are all at high altitude. Ken Caldeira of the Carnegie Institution of Washington once calculated how wind power

varies with altitude, latitude and season. The mother lode is the jet stream, about 10, meters 33, feet up between 20 and 40 degrees latitude in the Northern Hemisphere. In the skies over the U. The jet stream does wander. But it never stops. If wind is ever to contribute terawatts to the global energy budget, engineers will have to invent affordable ways to mine the mother lode. Three high-flying designs are in active development. Magenn Power in Ottawa, Ontario, plans to begin selling next year a rotating, helium-filled generator that exploits the Magnus effect best known for giving loft to spinning golf balls to float on a tether up to meters above the ground. The company aims to produce higher-flying, 1. Rising to 10, meters, the machines could realize 90 percent of their peak capacity. The inconstancy of surface winds limits ground turbines to about half that. Ockels and his students at the Delft University of Technology in the Netherlands. Ockels envisions a series of computer-controlled kites connected by a long tether. The ladder of kites rises and descends, turning a generator on the ground as it yo-yos up and down. Simulations of the system suggest that a single laddermill reaching to the jet stream could produce up to 50 megawatts of energy. Until high-altitude machines are fielded, no one can be certain how well they will hold up under turbulence, gusts and lightning strikes. Steep maintenance costs could be their downfall. There are regulatory hurdles to clear as well. Airborne wind farms need less land than their terrestrial counterparts, but their operators must persuade national aviation agencies to restrict aircraft traffic in the vicinity. There is precedent for this, Grenier points out: By the standards of revolutionary technologies, however, high-altitude wind looks relatively straightforward and benign. Sci-Fi Solutions -- Reality Factor: Too bad about the physics 3-A: Cold Fusion and Bubble Fusion B. Stanley Pons and Martin Fleischmann spun a tempest in a teacup in with their claim of room-temperature fusion in a bottle. The idea drew a coterie of die-hard supporters, but mainstream scientists have roundly rejected that variety of cold fusion. Theoretically more plausibleâ€”but still experimentally contentiousâ€”is sonofusion. In Rusi Taleyarkhan, a physicist then at Oak Ridge National Laboratory, reported in Science that beaming high-intensity ultrasound and neutrons into a vat of acetone caused microscopic bubbles to form and then implode at hypersonic speeds. Another group at Oak Ridge replicated the experiment but saw no clear signs of fusion. Taleyarkhan moved to Purdue University and continued reporting success with sonic fusion even as others tried but failed. Purdue this year investigated allegations that Taleyarkhan had interfered with colleagues whose work seemed to contradict his own. The results of the inquiry were sealedâ€”and with them another chapter in the disappointing history of cold fusion. Other researchers hold out hope that different methods might someday turn a new page on sonofusion. The combination is undoubtedly powerful: But there are no known natural sources of antimatter, so we would have to synthesize it. And the most efficient antimatter maker in the world, the particle accelerator at CERN near Geneva, would have to run nonstop for trillion years to make a kilogram of antiprotons. Collins; Scientific American, June], antimatter power plants will never materialize. Space-Based Solar -- Reality Factor: But after the oil crises of the s sent fuel prices skyrocketing, NASA engineers gave the scheme a long hard look. That was the end of that project. Solar and space technologies have made great strides since then, however, and space solar power SSP still has its champions. Hoffert cites two big advantages that high-flying arrays could lord over their earthbound brethren. And with the sun always in their sights, SSP stations could feed a reliable, fixed amount of electricity into the grid. The designs took advantage of thin-film photovoltaics to create the electricity, high-temperature superconductors to carry it, and infrared lasers in place of microwave emitters to beam it to ground stations. Until it rises, space-based solar will never match the price of other renewable energy sources, even accounting for the energy storage systems that ground-based alternatives require to smooth over nighttime and poor-weather lulls. Technical advances could change the game rapidly, however. Lighter or more efficient photovoltaic materials are in the works]. Although that is encouraging, says John C. JAXA, the Japanese space agency, last year announced plans to launch by a satellite that will unfurl a large solar array and beam kilowatts of microwave or laser power to a receiving station on the earth. NASA once had similarly grand designs, but the agency largely halted work on SSP when its priorities shifted to space exploration two years ago. Nanotech Solar Cells -- Reality Factor: That, roughly, is the cumulative capacity of all photovoltaic PV power systems installed in the world, half a century after solar cells were first commercialized. In the category of greatest unfulfilled potential, solar-electric power is a technology without rival. Even if orbiting arrays

never get off the ground, nanotechnology now looks set to rescue solar from its perennial irrelevance, however. Engineers are working on a wide range of materials that outshine the bulk silicon used in most PV cells today, improving both their efficiency and their cost.

Chapter 8 : Top 8 Most Energy Efficient Space Heater in Reviews

Vacuum energy is an underlying background energy that exists in space throughout the entire Universe. This behavior is codified in Heisenberg's energy-time uncertainty principle. Still, the exact effect of such fleeting bits of energy is difficult to quantify.

To remove this infinity, one may argue that only differences in energy are physically measurable, much as the concept of potential energy has been treated in classical mechanics for centuries. This argument is the underpinning of the theory of renormalization. In all practical calculations, this is how the infinity is handled. Vacuum energy can also be thought of in terms of virtual particles also known as vacuum fluctuations which are created and destroyed out of the vacuum. These particles are always created out of the vacuum in particleâ€" antiparticle pairs, which in most cases shortly annihilate each other and disappear. However, these particles and antiparticles may interact with others before disappearing, a process which can be mapped using Feynman diagrams. Note that this method of computing vacuum energy is mathematically equivalent to having a quantum harmonic oscillator at each point and, therefore, suffers the same renormalization problems. Implications[edit] Vacuum energy has a number of consequences. In , Dutch physicists Hendrik B. Casimir and Dirk Polder predicted the existence of a tiny attractive force between closely placed metal plates due to resonances in the vacuum energy in the space between them. This is now known as the Casimir effect and has since been extensively experimentally verified. It is therefore believed that the vacuum energy is "real" in the same sense that more familiar conceptual objects such as electrons, magnetic fields, etc. However, alternative explanations for the Casimir effect have since been proposed. Vacuum fluctuations are always created as particleâ€"antiparticle pairs. The creation of these virtual particles near the event horizon of a black hole has been hypothesized by physicist Stephen Hawking to be a mechanism for the eventual "evaporation" of black holes. The time required is dependent on the mass of the black hole the equations indicate that the smaller the black hole, the more rapidly it evaporates but could be on the order of years for large solar-mass black holes. General relativity predicts that energy is equivalent to mass, and therefore, if the vacuum energy is "really there", it should exert a gravitational force. Essentially, a non-zero vacuum energy is expected to contribute to the cosmological constant , which affects the expansion of the universe. If indeed the vacuum ground state has non-zero energy, the calculation implies a repulsive gravitational field, giving rise to acceleration of the expansion of the universe ,[citation needed]. However, the vacuum energy is mathematically infinite without renormalization , which is based on the assumption that we can only measure energy in a relative sense, which is not true if we can observe it indirectly via the cosmological constant. It has been argued that due to the broken symmetry in QED , free energy does not violate conservation of energy, since the laws of thermodynamics only apply to equilibrium systems. However, consensus amongst physicists is that this is unknown as the nature of vacuum energy remains an unsolved problem. The energy in such a wave field would seem to be accessible, e. In , the Casimir effect provided an experimental method for a verification of the existence of vacuum energy; in , however, Evgeny Lifshitz offered a different origin for the Casimir effect. In , Lee and Yang proved the concepts of broken symmetry and parity violation , for which they won the Nobel prize. In , Edward Tryon proposed the zero-energy universe hypothesis: During the s, there were many attempts to relate the fields that generate the vacuum energy to specific fields that were predicted by attempts at a Grand unification theory and to use observations of the Universe to confirm one or another version. However, the exact nature of the particles or fields that generate vacuum energy, with a density such as that required by inflation theory, remains a mystery.

Chapter 9 : 9 Most Energy Efficient Space Heater [Reviews] | #1 Comparison Guide

A kinetic bombardment or a kinetic orbital strike is the hypothetical act of attacking a planetary surface with an inert projectile, where the destructive force comes from the kinetic energy of the projectile impacting at very high velocities.

Generation of low dc voltage at high current and high efficiency is the field covered by this invention. History of the Invention: Bruce DePalma, erstwhile lecturer, MIT, USA, having learnt then on above theoretical works wrote to the writer in May and sent some details of his experiments on rotation of conducting disc magnets by which electrical power could be generated at high efficiency. Since then and more vigorously since , the writer performed many experiments to pinpoint the source of generation of additional power, and named the machines developed by the writer as "Space Power Generator". Bruce DePalma had named his own system of rotating magnets as "N-Generator" based on his discovery of "N-effect". Tewari of the Indian Atomic Board had developed a generalized theory of matter and energy, which showed that energy could be developed from the vacuum by positing a structure for electron. The German Association of Gravity Field Energy invited the writer to an International Conference held at Hannover in to deliver a lecture on his research on "Space Power Generation" and awarded the first prize for the demonstration of a working model of SPG. Also, on his new field of research, many papers by the writer have been published in the Proceedings of the International Conferences in USA and Italy where he was invited to deliver invited talks. The present patent application pertains to "High Efficiency Space Power Generator SPG " invented by the writer through his experiments given in the above published papers. In electromagnetic induction, which is the principle used in conventional dc generators, electromotive force EMF is induced when magnetic flux cuts a conductor due to motion of the conductor relative to the flux or vice-versa. Also, EMF is induced when flux linkage with the conductor changes with time. Faraday in rotated together a copper disc and a magnet with the magnetic field at right angles to the surface of the copper disc, and noticed the generation of EMF between the periphery of the disc and its axis, thought here was no relative motion between the copper disc and the magnetic field. The effect noticed by Faraday does not appear in engineering textbooks and therefore is not known to many. In this system the efficiency of electrical power produced as discovered by Bruce DePalma is at very high efficiency. The writer discovered through his experiments that in a rotating integral assembly of cylindrical iron core and electric coil mounted around it, EMF is induced also in radial conductors in the core and without being in contact with the core except at the central axis of rotation, despite the fact that it has no contact with the steady magnetic field in the core. This unique effect of magnetic induction was published by the write in an article entitled "Electromagnetic Induction of Space Substratum", page 16, Jan-Feb , Journal of Borderland Research, CA, USA, and is the basic concept utilized in the development of the present invention. Faraday discovered that electromagnetic induction, in a co-rotating assembly of conducting disc and disc magnet is possible. Bruce DePalma discovered the above effect of Faraday and also that electrical power produced through such a co-rotating magnet field-conductor system is at very high efficiency. The writer discovered that electromagnetic induction in such a co-rotating magnetic-conductor system can take place even when the radial conductor embedded in the conducting disc is neither in contact with the magnetic field nor is cut by the magnetic field. The development of this invention took place due to the above new phenomena of electromagnetic induction. Brief description of the Invention: Refer to Figure An electric coil 15 is rigidly mounted on a cylindrical iron core 17 and rotated with a drive motor. Radial non-magnetic stainless steel studs 7, 16 , welded to the shaft, pass through the inner cylindrical rotors 5, 17 without touching the same. The stainless steel studs are grouped in pairs, and each pair shares a common hole in the inner rotor. Fixed carbon brushes 12 slide on this ring and form one of the output terminals 10 of the SPG. The remaining stainless steel studs, also in one plane, terminate on another non-magnetic metal ring outer ring 11 encircling the inner core 17 and also the end cover 14 and mounted in between the air gap 28 created due to the two halves of the outer iron covers 9, Fixed brushes 29 on this outer ring form the other output terminal 13 of the SPG. The iron core is magnetized by feeding excitation power to the electrical coil through slip rings 18 on the shaft 3. Thought the steady magnetic field does not pass through the non-magnetic stainless steel studs and also does not

change with time, yet the stainless steel studs 7, 16 develop dc voltage that appears between the inner and outer rings 8, When power is drawn between the above rings through fixed brushes on them, both the outgoing and incoming dc currents pass through the air gap 18 , thereby canceling the magnetic effect due to the load current to a good extent. Similarly, the pair of stainless steel studs in common holes in the inner core carry dc currents in opposite directions and thus cancel their magnetic effects within the core. The above cancellation of magnetic effects due to load current in the outer air gap and the slots in the inner core leads to high efficiency of power production in the SPG. Further description of the present invention is given now in the following specifications and the attached drawings. Brief Description of the Drawings: Figure 1 is the longitudinal section and end view of the shaft. Figure 2 shows the transverse section, end view and plan of the inner rotor Figure 3 shows the transverse section, end view and plan of the inner rotor Figure 4 shows the section and end view of the non-magnetic stainless steel outer ring. Figure 5 shows the end view and cross section of the non-magnetic stainless steel outer ring. Figure 6 and Figure 7 show the non-magnetic stainless steel studs elevation and end views. Figure 8 shows the end view and cross section of the end cover Figure 9 shows the end view and cross section of the end cover Figure 10 shows the cross section and end view of the brush assembly Figure 11 shows the cross section and end view of the brush assembly Figure 12 shows the transverse section of the assembled SPG. Detailed Description of the Drawings: Figure 1 shows the shaft of the SPG, which should preferably be made with non-magnetic material. The shaft has a central longitudinal hole to thread wires for the electromagnet. It also has eight numbers of radial tapped holes in which non-magnetic stainless steel studs are fixed. The shaft is stepped to accommodate the inner rotors as discussed below and also to accommodate bearings. Figure 2 and Figure 3 show details of the inner rotors that are made of high magnetic permeability mild steel and are shrunk fit on the aforesaid shaft. Inner rotor-2 in Figure 2 has provision of a slant hole for threading wires to the electric coil. Radial slots as shown in the end views of Figure 2 and Figure 3 are cut to accommodate four numbers of stainless steel studs in each inner rotor. The inner rotors mounted on the stainless steel shaft are so disposed with each other that four common holes are formed by eight numbers of slots to accommodate eight numbers of stainless steel studs, two studs falling in each hole. The assembly of inner rotors on the shaft is carried out after fixing the studs to the shaft. All the eight studs are so fixed that they do not touch the side of the slots in the inner rotors and make contacts only with the shaft to which they are tightly screwed. The studs after fixing to the shaft should be tack welded to the shaft for better electrical continuity between the pair of studs occupying a common hole. The rotors butt at each other and their mating surfaces should be smoothly finished so as to avoid any air gap in between. Four numbers of through bolts of mild steel and with good magnetic permeability hold the two inner rotors together to avoid splitting of the inner rotors during high-speed rotation. After heat shrunk fitting on the shaft, the inner rotors may be tack welded to the shaft to provide rigid mechanical connection between the shaft and the inner rotors. Figure 8 and Figure 9 show the details of two end covers that are made of high permeability mild steel and are threaded on to the inner rotors as shown in Figure The end covers are mounted in such a way that an air gap is left in between them for the current collecting system to be described below to pass through the air gap. The cross section of the end covers at the air gap and throughout should be not less than the cross section of the iron core. After assembly, the end covers are locked with suitable mild steel bolts 6 joining them with the respective inner rotors so as to avoid unscrewing the end covers during rotation. The electrical coil 15 wound with super enamel wire SWG number 14 or 16 and of suitable size to exactly fit tightly in the recess created by the inner rotor and end cover rigidly mounted on the inner rotor when energized magnetizes the iron core and end covers, setting up in the core an axial magnetic field that has a return path through the end covers and passes through the air gap The air gap should be just sufficient to accommodate the parts of the current collection system and yet large enough to avoid rubbing of the fixed brush assembly plate 10 with the rotating outer ring Figure 4 shows the stainless steel inner ring that is welded to the aforementioned stainless steel studs four numbers lying in one transverse plane and fixed to the shaft. Welded joints between the studs and the inner ring should provide good electrical conductivity. Copper-graphite brushes fixed to the brush-assembly plate-1 Figure 10 slide on the stainless steel inner ring. The brush-assembly plate made of aluminum and of good electrical conductivity and passing through the air gap is fixed to the foundation plate

27 of preferably non-magnetic material and is kept electrically insulated from it through the insulating brush Magnetic mild steel plate can also be used as a base plate. The remaining four numbers of stainless steel studs, also lying in a transverse plane, are welded to the stainless steel out ring Figure 5 that passes through the air gap and rotates with the rigid assembly of stainless steel studs, inner rotors, electrical coil, and end covers. The welded joints between stainless steel studs and the outer ring should provide good electrical conductivity. Fixed copper-graphite brushes in the outer brush-assembly-2 plate Figure 11 slide on the rotating outer ring 11 , Figure The outer brush-assembly plate 13 , Figure 12 , is made of aluminum with good electrical conductivity and fixed on to the foundation plate and kept insulated from it. Generation of Power in the SPG: In brief, the axial magnetic field B in the core during rotation of the inner rotors, electric coil and end covers, induces in the rotating studs dc voltage V1 with respect to the shaft. The voltage is given by: In all the eight studs, V1 is induced. The brush-assembly plate through sliding brushes is in contact with the inner ring jointed to the studs and therefore also has the voltage V1 on it. The dc voltage appearing on the rotating outer ring with respect to the shaft is given by V1 - V2. Thus the difference of dc potential between the two fixed brush-assemblies is V1 - V1 - V2 , that is, V2 which is the open circuit dc terminal voltage of the SPG. When load is connected between the terminals of the SPG, both the outgoing current and the return current pass through the air gap and also through the common holes in the inner rotor. The magnetic fields created by oppositely flowing load currents cancel each other to a good extent as the studs are closely spaced in the slotted holes. The outer ring with radial slots within the air gap has its current in a direction opposite to the current flowing in the brush-assembly plate in its close vicinity, and therefore appreciable nullification of magnetic effects takes place within the air gap also. In a conventional homopolar generator, unlike in the SPG, there is relative motion between the conductor and the magnetic field. Also, there is no nullification of the magnetic fields due to the outgoing and return load current, and hence the efficiency of the SPG is very high compared to a conventional homopolar generator. The dimensions in the drawings pertain to an existing SPG on which experiments have been conducted. However, if the diameter of the inner rotor is chosen to be nine inches and the electromagnet is excited to produce 1. Experiments show that the SPG produces steady dc current of about three kilo amperes at three volts dc with carbon-graphite brushes. The dc current produced at rpm will be about amps and therefore power produced by the SPG will be 36 kW at very high efficiency. Inner Rotor - 1 Part 5 Material: End Cover-1 Part 9 Material: End Cover-2 Part 14 Material: Brush Assmebly-1 Part 10 Material: Brush Assembly-2 Part 13 Material: Not to scale; All dimensions are in mm. Scientific debates on the nature of space absolute vacuum around the start of the 20th century took a general view that space serves to transmit fields electromagnetic, gravitational and, beyond that, it has no independent existence of its own as an entity that can generate energy in some form which enables it to be termed as a "real" physical entity.