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You can contact us (questions, comments, article ideas, submissions, etc.) by email at: blscatapulta@gmail.com

SLEEP

**BY RAISHA LAFOND
CLASS II**

I'm pretty sure you're thinking that the kid who sleeps next to you in class everyday is probably doing something horrible. Chances are you're right but then again there's a chance are you could be wrong. There's more to sleep than meets the eye. Some of you deprive yourselves of the basic necessity that the body needs. I'm not saying don't do your homework just to get in a few extra hours of sleep. But which is better, those few extra hours or turning your homework in while getting sick because you were deprived of sleep.

Sleep is more than just lying down and closing your eyes. While you sleep the body does a number of things. One of these things is restoring cells, which happens during NREM or non rapid eye-movement.

Sleep helps in the rejuvenating of one's nervous, muscular, skeletal, and immune systems. These systems help us function day to day and if we let them deteriorate because we want to watch a late night show or talk to a friend until the wee hours of the morning; we take the fall all by ourselves. Sleep helps our memory. When we get longer hours of sleep, we can

retain information better so that the reason why you got an A on that test might have been because you had more sleeping time. Sleep improves your reasoning, decision making and episodic memory. So not only will sleep help you feel better, but it will also help you remember things better and make a better decision.

In the stated ontogenetic hypothesis, sleep helps with the growth and development of the human body. This happens during REM or rapid eye-movement or



active sleep. Studies have shown that deprivation of sleep in early development can result in behavioral problems, permanent sleep disruption, decreased brain mass, and the abnormal amount of neuronal cell death. When sleep is deprived from the body the body falls into sleep debt. A large sleep debt causes mental, emotional, and physical fatigue. Lack of sleep may cause irritability and this may be due to the fact that the body may produce an insufficient amount of cortisol.

There are various stages of sleep that fall under NREM and REM sleep. NREM has three stages of sleep. In stage one of sleep there is slow eye movement. People awakened from this stage believe that they have been awake the whole time as this is

and less memorable than if they occur in REM sleep. However dreaming in this stage is more common than in any other stage of NREM but not as common as REM. REM sleep is when most dreaming occurs. A person may experience about 5 to 6 periods of 90-120 minutes of REM sleep.

During REM sleep the breathing and heart rate are irregular as if you were awake. During this period of sleep the motor senses are not stimulated and the body's muscles do not move. If this stage of sleep is interrupted the person will have longer periods of REM to compensate for the loss. Each period of sleep is essential to the body's development. Whether its NREM or REM sleep the body is still functioning, so the illusion that a person is doing nothing if they have their head down and eyes closed is technically speaking, a lie.

Whether you get enough sleep or don't is your decision. But do remember that getting a good night's rest is beneficial and good. Sleep does many things for your body and should be welcomed with open arms. The more sleep you get, the better.

WIMPS AND THE THEORY OF DARK MATTER

**BY SALLY GAO
CLASS II**

The search for the properties of dark matter began all the way in 1933, when a far-seeing scientist from the California Institute of Technology, Fritz Zwicky, encountered an incongruity in the theory of matter in the universe. The conventional belief was that the majority of the mass in the universe could be found in the stars. But Zwicky's calculations proved that there was far more mass in the universe than the sum of the stars.

The idea is that there must naturally be enough mass around to keep everything from

zooming around and drifting away at random. And this necessary amount of mass can be calculated in terms of entire galaxies. By measuring the speeds of galaxies being drawn towards each other in groupings, it is possible to measure exactly how much mass there is in a particular galaxy in order to have that type of pulling force.

But when such measurements were compared to the calculations of galactic mass based on the amount of light emitted, and thus the number and size of stars in the galaxies, it was discovered that there was about ten times more mass within the galaxies than expected based solely

on the mass calculations of the stars. The only possible conclusion that could be drawn was that some other form of matter must exist, something both invisible and intangible to humans. This matter, which emits no light and interacts in incredible ways with solid matter, is called 'dark matter' and accounts for about 85 percent of the mass in the universe.

The science of dark matter is still very much unknown today, although the concept has been somewhat advanced. One theory is that the most basic components of dark matter are WIMPS, or weakly interacting massive particles, because their existence would

explain some of the qualities of dark matter.

These particles, as postulated by scientists, would be gathered in huge quantities and pass through normal matter without any kind of noticeable reaction. However, they have yet to be detected by the most sophisticated scientific instruments, so there is a degree of uncertainty in this theory. But no matter what the constituents of dark matter are, their collective existence has been shown to hold together the systems of the universe.

GLOBAL WARMING: THE BLANKET OF EARTH

BY JULIA PAN
CLASS VI

Around the world, countries are taking actions to reduce greenhouse emissions, because of a major issue called global warming. According to the fourth edition of the American Heritage® Dictionary of the English Language, global warming is an, “increase in the average temperature of the earth’s atmosphere, especially a sustained increase sufficient to cause climatic change.” This means that greenhouse gases like carbon dioxide and methane contribute to the warming of the Earth. These gases provide a layer around the Earth. Usually, the sun’s heat will hit the Earth’s surface and bounce back into space. With this new layer of gases, the sun’s heat is absorbed and then trapped in the Earth’s atmosphere. This causes temperatures to rise steadily. One might think that a few degrees might not hurt the Earth’s climate, since winter is so chilly in the Northern Hemisphere, especially in Boston. But, one degree can make a huge difference, from the freezing point to above the freezing point. The countries trying to change their environmental impact on the Earth are reducing their carbon footprints by encouraging new alternative energy discovery, protecting endangered animals from the heat, funding for public parks and zoos, etc.

There are skeptics on global warming everywhere. One might hear news that Antarctica is gaining ice or that it is very cold or even that Al Gore is wrong (no offense). Like that old adage, there are two sides to everything. However, science proves those skeptics wrong. Replying to Antarctica is gaining ice; science says *land* ice on this dreary continent is decreasing, yet *sea* ice is increasing.

There is a tremendous

distinction between those two. Sea ice forms on the top of the ocean’s surface while land ice is formed by the accretion of large masses of snow, soon to become a glacier. Although sea ice is helpful for providing animals to hunt, land ice can reflect more of the sun’s heat back into space, since it is whiter than sea ice. If one lives in Boston, one knows that it is very frosty here and that if global warming is really happening, we would have summer all long. That’s definitely an exaggeration. Global warming, or in this case climate change, can cause extremities in temperatures, from blistering summers to bitter winters.

Here’s a short comment for whoever says that Al Gore is wrong: Al Gore is always right. Okay, that’s not continuously true but in his book *An Inconvenient Truth* most of his facts are right. But one can’t expect him to be perfect since he is a politician and not a scientist. Skepticism of global warming is actually beneficial for the Earth, since we can see the pros and cons of everything, therefore helping scientists and politicians to come up with new solutions.

Go outside one day and take a look around. Notice the trees swaying with the rhythm of the winds, the exquisite patterns of leaves, and the tiny and big animals around you. Of course there is more to see than those in the environment. There are also some simple ways to help the Earth, by planting trees, riding a bike or the bus, switching from an incandescent light bulb to a compact fluorescent one, calculating one’s carbon footprint to improve on it, and spreading the word around. For the cherished Earth is our home; we need to care for it and love it. In a sense, we need the Earth and it needs us.

H1N1 AND ITS PROGRESSION

BY SALLY GAO
CLASS II

2009 was definitely an interesting year for Boston Latin School students, due on no small part to the Swine Flu break that occurred as a result of the sudden outbreak of the disease during the spring. The fact that a never-before-seen pandemic had emerged and spread rapidly beyond its initial borders soon affected the entire world.

The origin of the disease was in a factory farm of Mexico, where the virus was transmitted from pig to human. Although the original transmitter of the virus was a swine, it is not actually a strain completely derived from the common pig flu. Analysis of the virus reveals that it is actually a combination of genes from multiple viruses, including the human flu, the avian flu, and several variants of swine flu.

As reports on this new type of flu became available to the public, measures were taken to inform people about how to keep the virus from spreading and how to treat it. The disease was discovered to spread more easily than the normal seasonal flu, but in much the same manner: by coming into contact with surfaces

with the virus and allowing it to enter one’s body, and through coughing and sneezing. Thus the best way to avoid the swine flu, according to the CDC, is to wash hands regularly and avoid people who are ill. The symptoms were also found to be very similar to regular flu, with one relatively rare deviation: a serious respiratory illness could develop if the disease latched onto a2-3 receptors in the lungs.

Overall, the disease was not as bad as it was made out to be at the start of the panic. About 3,900 people in the United States have died of the disease, as opposed to the 39,000 per year that die of the seasonal flu. The worldwide death rate throughout the year was only 0.1%. There are also many available measures to treat the virus now, such as the vaccines released in October and several brands of medicine designed to treat the flu.

The one serious concern about the H1N1 virus is the possibility of mutation. Because the H1N1 is a relatively unstable virus, it has a higher chance of fusing with DNA from other viruses, which might cause changes in deadliness or transmission capability. If it were to mix with a deadlier strain of virus, such as the avian flu virus, it could become very dangerous.

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"And therein lies the problem."

GREY HAIR?

PHEROMONES AND ZOMBIES: ANTS BRING THE TWO TOGETHER

BY EMILY CHANG
CLASS III

A recent study conducted by scientists from the University of California focused on the interesting effects of ant pheromones for “life” and “death” on ant pupae.

The researchers at the university wanted to confirm if a pheromone, or chemical signal commonly excreted by bugs, exists and if it tells other ants whether it is dead or alive. If these pheromones do exist, they may help explain Darwin’s theory of evolution.

It would be beneficial for a species to have an effective way of disposing of their dead and their waste materials, and ants and other related organisms, which depend heavily on these chemical signals to communicate with each other, might logically possess such a pheromone.

The experiment was conducted by taking 20 live ant pupae, removing them from the anthill, then spraying them with the pheromone signaling death, taken from a freshly dead ant. Their decision to use pupae was that live pupae, when found displaced from their residence inside the anthill, were always retrieved by adult workers nearby and put back into their proper place. 18 out of the 20 ant pupae were

hauled away to the trash pile.

Next, the researchers sprayed “still alive” pheromones from living workers on the pupae, and discovered that it took longer for worker ants to haul the pupae away. After awhile, when the “still alive” chemicals evaporated, the pupae were brought back to the nest.

Thus, the researchers reached a general consensus that pheromones are involved in indicating to fellow ants whether an ant is dead or alive.

While more research is needed to confirm this, the conclusions of this experiment are certainly something for the scientific community to chew on.



YOUR TONGUE AND FREEZING METAL

BY SHERRY WU
CLASS I

These days, the freezing temperatures have gotten all of us bundled up in our coats, scarves, and gloves, but maybe, the greatest precaution we should take is keeping our tongues to ourselves.

Wednesday night of January 14, 2009, a 10-year old boy in Hammond, Ind. got his tongue stuck to a streetlight pole. After being found by police, the fourth grader mumbled around his bleeding tongue that he was dared by a friend – in the same way the character Flick in the movie “A Christmas Story” was triple-dog dared to lick a pole and had his tongue stuck.

If you are skeptical of this happening, here’s the science behind it. Your tongue is covered

with moisture (your saliva). When this moisture is in 10 degrees Fahrenheit, as was the temperature in Hammond at the time of this incident, as you would expect, your saliva freezes and unfortunately left this little boy in a mortifying situation.

To get your tongue unstuck from the pole – you could try to rip yourself away as this boy did, but you would probably lose some tongue and some blood that way. If you are in the right mind (which is doubtful considering that your tongue is stuck due to your own disbelief of the basic laws of science) you could pour some warm water to thaw your tongue from the pole. The best solution of all: take my advice and keep your tongue in cheek. Don’t take the dare, even if it’s a triple-dog dare.

WHY SO GREY?

BY JESSICA WU
CLASS I

You may have noticed a strand or two of your locks having a different sheen to them, a grey one perhaps? This should not be a cause for alarm because it is just the results of a hormonal imbalance experienced over time. Going grey is a gradual process and by no means does it make you albino, but your hair is simply lacking certain pigments in your hair follicles that give it its normal color. Hair is made of



GREY HAIR?

protein fibers, like your nails, and it gets its coloring from melanin. As one experiences a hormonal imbalance, whether from stress, certain medications and diseases, second hand smoke, or natural cycles, the amount of melanin, the same stuff that gives your skin its color, creates grey strands. Furthermore, if the pigment cells around your hair follicles die, your ability to produce melanin will be lost, rendering your hair to go grey, unless artificially baked, for the rest of your life. How early this starts for you, in particular, really depends on your genes. So, fairy dust will not save you this time, nor will surgery, and, as always, genetics gives you leave to blame your parents.

A NEW APPROACH TO TARGETING CANCER

BY YUNWEI SUN
CLASS I

Cancer is one of the most virulent diseases of humankind, contributing towards the deaths of over 8 million people around the world as of 2008. In fact, by 2010, cancer will surpass heart disease as the number one cause of deaths worldwide. Conventional clinical approaches used to treat cancers include a combination of radiotherapy and chemotherapy after a local excision of the tumor. These methods are relatively successful for patients in the earlier stages of cancer. However, as with many cases of patients in later stages of cancer, after initial shrinkage, the tumor regenerates, causing disease relapse. To explain this phenom-

enon, the cancer stem cell theory has been proposed. In contrast to the traditional theory which indicates that most cancer cells have the potential of forming new tumors, this theory hypothesizes that tumorigenesis and metastasis are driven by a small population of multi-potent cells, termed “cancer stem cells” (CSCs).

CSCs possess stem cell-like properties such as high DNA repair rate, unlimited self-renewal through asymmetrical division, quiescence and expression of increased levels of efflux transporters to pump out toxins, rendering them insensitive to the existing anti-tumor drugs. In most cases, chemotherapy and radiation only eliminate the non-tumor initiating components, the differentiated

daughter cells of CSCs that make up the bulk of the tumor. Unfortunately, these treatments spare the resistant CSCs, which remain in patients after conventional therapies and eventually repopulates the tumor, causing disease relapse.

Therefore, it is believed that targeting CSCs would allow effective tumor degeneration and, consequently, full recovery from the cancer. Despite the initial excitement of this approach, it is difficult to specifically eradicate CSCs without destroying normal stem cells due to their similar properties. A well-known characteristic of normal stem cells is their dependence upon their microenvironment (surrounding tissue components) to sustain their quiescent state and maintain their prolifera-

tion and differentiation potentials. It is believed that, like normal stem cells, the functional integrity of CSCs also requires support from the surrounding stromal factors, including inflammatory cells, fibroblasts and vascular endothelial cells, which nurture the CSCs and provides the essential signals for their survival and proliferation. Therefore, the CSC microenvironment directly influences the initiation, progression and maintenance of cancer. Identification of the CSC microenvironment may provide important insights into novel strategies to eliminate CSCs without adversely affecting normal stem cells.

A HOPEFUL BREAKTHROUGH FOR TYPES OF CANCER

BY CECILIA KWONG
CLASS II

Cancer treatments have always been one of the top concerns in this world. Recently, two research groups from the Western Australian Institute for Medical Research, led by Associate Professor Evan Ingley and Director Professor Peter Klinken, found a molecule within blood cells that may help pave the way to breakthroughs for prostate cancer, breast cancer, and possibly even leukemia.

This type of molecule, called Liar, is found in a blood cell. Liar’s role in the body is to allow certain molecules to enter into a blood cell’s nucleus, which in turn accepts signals that cause the cell to start dividing and developing. The enzyme associated with Liar is called Lyn.

A Lyn triggers further blood cell development. Lyn modifies proteins within a cell; its interactions with other cells determines how that

associated cell would behave. The research teams are trying to find a way to control Liar so that they can possibly switch off cancerous cells, which may lead to a breakthrough in the treatments of different types of cancer.



PROFESSOR EVAN INGLEY

ANOTHER SNACKER ON CO₂ PRODUCES POTENTIAL FUEL

BY QUENTIN LI
CLASS II

Increasing global carbon dioxide emissions, produced by burning fossil fuels, has been the forefront of many scientific discussions lately. Now, a new genetically engineered bacterium by researchers from the UCLA Henry Samueli School of Engineering and Applied Science has been able to engineer a bacterium that “eats” carbon dioxide and outputs a liquid fuel called isobutanol – a potential alternative for gasoline. The bacterium, *Synechococcus elongatus*, acquires its energy from sunlight, through photosynthesis.

The compound produced, isobutanol, is identified as a possible replacement for gasoline, with companies such as Gevo researching applications for such

a fuel. The method described by the team leader, James C. Laio, is claimed to be more efficient than previously demonstrated techniques with algae and other bacteria in producing fuel.

Although the bacterium has not been developed for industrial use yet, it reportedly can produce¹ over 6,000 micrograms per hour of isobutylaldehyde, an intermediate for the liquid fuel isobutanol. Such developments show promise in potential future applications in areas with high concentrations of carbon dioxide, such as smokestacks, where the fuel produced could potentially be put to use immediately.

¹ Productivity: total product divided by volume and time

SCIENCE JOKES

Biology is the only science in which multiplication means the same thing as division.

Why did the chicken cross the road?

Darwin1: It was the logical next step after coming down from the trees.

Darwin2: The fittest chickens cross the road.

Did you hear about the biologist who had twins? She baptized one and kept the other as a control.

One day on the Tonight Show, Jay Leno showed a classified ad that read: "Do you have mole problems? If so, call Avogadro at 602-1023."

Q: What do chemists call a benzene ring with iron atoms replacing the carbon atoms?

A: A ferrous wheel:

Fe - Fe

/ \

Fe Fe

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Fe - Fe

Q: Why do chemists like nitrates so much?

A: They're cheaper than day rates.

Mom and Dad Volcano:

What did the dad volcano say to the mom volcano?

Do you lava me like I lava you?

All the physicists are playing hide and seek. Einstein is the 'den' and stands against the wall with his eyes closed and counts till 100 to enable all the physicists to run and hide. At the count of 100 Einstein turns around and finds Newton standing there.

He screams, "Newton, you are out!" Newton says, "No, I'm not!"

Einstein says, "Yes, you are. I can see you here in front of me".

Newton says, "I'm not out. Pascal is."

Einstein is a bit confused and starts to scratch his head and beard.

Newton says "Here, Let me explain"

He draws a square one meter by one meter on the floor and stands in the middle of it and says,

"Newton per meter square is a Pascal, so it's Pascal who's out not me"

Gravity is a law. Lawbreakers will be brought down!

TIMELINE!

BY BRYAN ZULUAGA

CLASS II

The year 2009 was an exciting time in Science. From discovering exoplanets to proving the standard model of elementary physics, true leaps and bounds have been made this year. Listed below, are some of the most notable scientific achievements!

Yearlong - International Year of Planet Earth, the International Year of Astronomy, and the National Year of Science. Each of these sought to make 2009 the year to fill people in on their respective topics, and to move forward in their fields in terms of research, promotion, or awareness.

Notable Anniversaries -

- = 400th Anniversary of Galileo's first use of the telescope (1609)
- = 400th Anniversary of Johannes Kepler's First two Laws of Planetary Motion
- = 200th Anniversary of the birth of Abraham Lincoln, (1809) founder of the Academy of Sciences (Est. 1863)
- = 200th Anniversary birth of Charles Darwin (1809)
- = 150th Anniversary publication of *On The Origin of Species* (1859)

February 10 - A Russian and an American satellite collide over Siberia, creating a large amount of space debris. Satellites have collided in space before, but they have been controlled, or innocuous incidents. The American satellite was fully functional and very expensive.

March 7 - NASA launches a space photometer in its Kepler Mission from Cape Canaveral. The space probe is intended to search of extra solar planets (planets not orbiting our sun) in the Milky Way Galaxy.

April 21 - UNESCO (United Nations Educational, Scientific, and Cultural Organization) launches The World Digital Library. It was established for the purpose of promoting understanding and idea sharing between people around the world.

May 18 - The third C40 Large Cities Climate Leadership Group meets in Seoul, Korea. The group consists of the leader of prominent cities around the world that meet to discuss how make the cities of the world more eco-friendly.

June 11 - The H1N1 influenza strain reaches global pandemic level. The Hong-Kong flu of 1968-1969, which killed one million people worldwide was the last disease to receive this designation. The H1N1 or swine influenza strain began spreading around April.

June 18 - NASA launches the Lunar Reconnaissance Orbiter/LCROSS probes to the Moon, the first American lunar mission since Lunar Prospector in 1998. This mission's objective was to search for water on the moon.

July 22 - The longest total solar eclipse of the 21st century, lasting up to 6 minutes and 38.8 seconds, happened over parts of Asia and the Pacific Ocean. Experts believe it to be the most viewed solar eclipse in world history.

October 20 - European astronomers discover 32 exoplanets. A new instrument attached to a Chilean telescope facilitated the confirmation of 32 exoplanets, although many more are known.

November 13 - Having analyzed the data from the LCROSS lunar impact, NASA announced that it had found a "significant" amount of water on the moon. Evidence points specifically at the Cabeus Crater

November 20 - CERN restarts the Large Hadron Collider particle accelerator in Geneva, Switzerland; they had shut it down on September 19, 2008. Following over a year of painstaking repairs and upgrades, the LHC is only going to be run at a fraction of its capabilities, to ensure that it is in working condition.

December 7 - December 18 - The UNFCCC's (United Nation's Framework Convention on Climate Change) United Nations Climate Change Conference 2009 conference is held in Copenhagen, Denmark. The purpose of the Treaty is to control, regulate and reduce greenhouse gas emissions around the world. It was held for the first time in Rio de Janeiro in 1992.

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