PSC
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Planetarium Science Center
Science For All!

2nd School Semester 2011/12

In this edition...

the Big Questions

By: Maissa Azab

"It was the best of times, it was the worst of times; it was the age of wisdom, it was the age of foolishness; it was the epoch of belief, it was the epoch of incredulity; it was the season of light, it was the season of darkness; it was the spring of hope, it was the winter of despair…"—Charles Dickens, *A Tale of Two Cities*

For some reason, writing about the times we are living these days, whether 2011, exhausting as it has been, or the highly anticipated and somehow dreaded 2012, I am reminded of this opening passage from my favorite novel, which I first read in school some twenty years ago. It is, indeed, the strangest of times; the highest of the high and the lowest of the low. We live an age of unprecedented freedom, knowledge and technology, yet we relive the dark ages of confinement, ignorance and primitiveness.

As 2011, with all its might, comes to an end, we can only marvel at so much that has transpired throughout it. Yet, it also somehow makes us wonder even more about 2012; will it herald the end of civilization as we know it? Or, will it mark the commencement of a new and better future for humanity?

In this issue, we examine the truth behind myths; why and how they evolve, develop and spread. More importantly, we focus on the science that proves them right or wrong. But that is not all; we also tap into the excitement that is New Year's resolutions, which reminds me of another wise quote by the exceptional Albert Einstein:

"One should not pursue goals that are easily achieved. One must develop an instinct for what one can just barely achieve through one's greatest efforts."

Myths and Facts about GMOs

By: Nina Fedoroff
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There is an old saying that goes: "I've made up my mind, don't confuse me with the facts." Well, I am here to confuse you with the facts about genetically modified organisms, aka GMOs.

Myth 1: GMOs are untested

Fact: GMOs are the most extensively tested foods in our food supply ever! The EU alone has spent more than €300M on biosafety testing of GMOs over a quarter of a century. The unequivocal conclusion is that GM techniques are no more dangerous than older techniques of crop modification we now consider conventional. Moreover, before a GM crop is introduced into the food chain, it must be shown to be the same as the original crop and proteins encoded by added genes have to be shown to be neither toxic nor allergenic.

Myth 2: GMOs are dangerous to your health

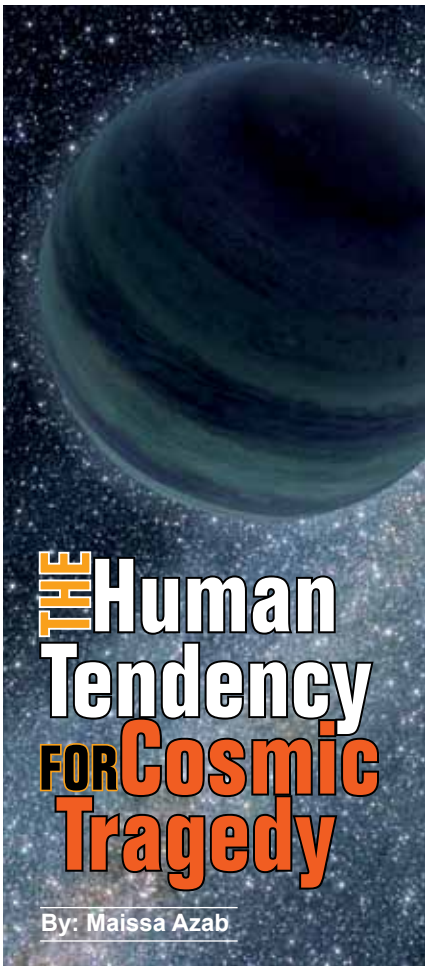
Fact: GM corn, soybeans, papaya and other foods have been grown and consumed by millions of people starting in 1996. There is not a single, credible report of as much as a headache caused by GM food, of which literally trillions of meals have been eaten. Indeed, GM pesticide-resistant corn is better for you than non-GM corn, because the GM corn has much lower levels of toxins produced by the fungi that follow boring insects into the plants: no insect holes, no fungi, no toxins.

Myth 3: GM crops damage the environment

Fact: GM pest-resistant crops, to give just one example, require much less pesticide than non-GM crops. Pesticides kill insects indiscriminately, while GM crops only affect the insects that attack them. Pesticides run off into water, killing fish, as well as birds that drink from infected water. Less pesticide, more insects, more birds, more fish.

Decades ago, when molecular approaches to plant improvement were relatively new, caution was justified. Fearing the unknown, we wove a complex thicket of regulations; but there is now ample evidence that GM modification techniques cause less genetic damage than traditional modification methods and can contribute to better agricultural and environmental outcomes. The concern today is that excessive regulation is preventing GM methods from increasing yields, improving nutritional value, and reducing the environmental footprint of agriculture.

In the end, as the human population continues to swell from 7 to 9 billion, the losers will be the poorest among us, not the well-off, for whom food is just a quick stop at the supermarket.



THE Human Tendency FOR Cosmic Tragedy

By: Maissa Azab

"There apparently is a great deal of interest in celestial bodies, and their locations and trajectories at the end of the calendar year 2012. I love a good book or movie as much as the next guy; but the stuff flying around through cyberspace, TV and movies is not based on science. There is even a fake NASA news release out there..." says NASA Senior Research Scientist, Don Yeomans.

In 2011, planet Earth was hit by a series of escalated natural disasters all around the globe, not to mention an avalanche of human activity. This has fueled the curiosity and apprehension over the latest, and one of the most notorious and outrageous "end of the world" myths, heralding 2012 a game-changing year for life on Earth according to some interpretations of an ancient Mayan calendar.

What has intrigued me most have been the theories that evolve around "mysterious" and/or "rogue" celestial visitors, including an apparently infamous "Planet X", also known as "Nibiru". Personally, I find this particular idea too farfetched, if not absurd, to even consider. I mean, how can anyone imagine that an object as big as a planet, or even a dwarf planet, within the Solar System realm or neighborhood would not have been detected years ago?

(Read about lone planets in the *Planetarium Scoop* on page 19.)

Another implausible theory spreading fear is the existence of an undetected black or brown dwarf[1] in the outer Solar System, which has the potential of violently disrupting our System. When asked about the feasibility of such scenario, David Morrison of the NASA Astrobiology Institute replied: "If we had a brown dwarf star in the outer Solar System, we could see it, detect its infrared energy and measure its perturbing effect on other objects. There is no brown dwarf in the Solar System, otherwise we would have detected it. And there is no such thing as a black dwarf".

Elenin the Alien

I have especially been bemused by the "Comet Elenin" phenomenon and the mayhem it caused even among well-educated people I know. The formerly 3-5 km wide Comet Elenin was claimed on 10 December 2010 by Russian amateur astronomer Leonid Elenin. In what has become a tradition, a dizzying collection of doomsday predictions were linked to the deceptive comet. The hysteria was inevitably amplified as anxiety grew over the approach of the dreaded 2012.

If you would believe what numerous, not necessarily trustworthy, websites and YouTube videos, Elenin was claimed a "renegade comet" that just could not wait for 2012 to mess with Earth. Despite its scientifically-expected uneventful distant passage, comet Elenin was blamed for triggering earthquakes and shifting Earth's rotation axis; it was also accused of melting ice on Mars and stirring a storm on Saturn.

"Often, comets are portrayed as harbingers of gloom and doom in movies and on television, but most pose no threat to Earth. Comet Elenin, the latest comet to visit our inner Solar System, is no exception," NASA announced over and over again since the comet's discovery. Nonetheless, that did not deter the manic media from wreaking havoc in the minds of people from all walks of life.

In the months prior to the day when the comet would be closest to Earth, theorists had gone so far as suggesting everything from a several-day eclipse of the Sun, a flip in Earth's magnetic field, to a life-obliterating impact similar to what happened to the dinosaurs as possible consequences of the visiting comet.

In response, NASA's Don Yeomans made it very clear in his article dated 4 May 2011 that "Any approximate alignments of comet Elenin with other celestial bodies are meaningless; Comet Elenin will not encounter any dark bodies that could perturb its orbit, nor will it influence us in any way here on Earth. Not only will it be far away—it will get no closer to Earth than 35 million km—it is also on the small side for comets. It will thus have an immeasurably miniscule influence on our planet."

Those convinced by the tragic theories associated with Elenin went so far as to accuse NASA of purposefully playing down the Comet. NASA's reply was that the comet did not receive much press [from its part] because it is small and faint: "Several new comets are discovered each year, and you do not normally hear about them either. The truth is that Elenin has received much more attention than it deserves due to a variety of Internet postings that are untrue."

NASA's last entry about the annoying comet dates 25 October 2011, a month after the date it was claimed to bring doom to the Earth, 26 September, which ironically was not the date it came closest to Earth; 16 October. I must admit that I am especially fond of the title of that news piece: *NASA Says Comet Elenin Gone and Should Be Forgotten*.

According to the article, latest indications are this relatively small comet has broken into even smaller, less significant, chunks of dust and ice. "Elenin did as new comets passing close by the Sun do about 2% of the time; it broke apart," said Yeomans. "Elenin's remnants will act as other broken-up comets act; they will trail along in a debris cloud that will follow a well-understood path out of the inner Solar System. After that, we will not see the scraps of comet Elenin around these parts for almost 12 millennia."

Yeomans knows that while Elenin may be gone, there will always be Internet rumors that will attempt to conjure some form of interplanetary bogeyman out of Elenin, or some equally obscure and scientifically uninteresting near-Earth object.

Scientifically Speaking

A comet is a small object made of ice, dust and gas that orbits the Sun; jets of gas and dust form long tails that can be seen from Earth.

Discovering a comet is a practice of patience; the process has not changed much since astronomy studies began. For a span of several nights, an observer charts a specific section of sky and searches for change among the fixed objects. If a "star" has shifted relative to the other stars and is determined not to be a planet or other known entity, it stands a good chance of being an undiscovered comet or meteor.

Comet Elenin came as close as 72 million km to the Sun, but it arrived from the outer Solar System's Oort Cloud[2]. Elenin's first journey into our inner Solar System was not gentle; the comet was hit by a coronal mass ejection (solar flare) on 20 August, accelerating its disintegration shortly before its closest approach to the Sun on 10 September.

Elenin's orbital period is long and eccentric, anywhere from 12,000 to 600,000 years; its modest size and rate of disintegration means it is likely that it will not survive long enough to make a return trip. In fact, the jury is still out on whether Elenin is a periodic comet at all.

NEO

No, I do not mean Keanu Reeves' character in the "Matrix" trilogy. Near-Earth Objects (NEOs) are comets and asteroids that have been nudged by the gravitational attraction of nearby planets into orbits that allow them to enter the Earth's neighborhood.

Composed mostly of ice and dust, comets originally formed in the cold outer planetary system, while most of the rocky asteroids formed in the warmer inner Solar System between the orbits of Mars and Jupiter.

The scientific interest in comets and asteroids is due largely to their status as the relatively unchanged remnant debris from the Solar System formation process some 4.6 billion years ago. The four giant outer planets formed from an agglomeration of billions of comets; leftover bits and pieces from this formation process are the comets we see today. Likewise, today's asteroids are the bits and pieces left over from the agglomeration of the four inner planets.

The Earth has always been subject to impacts by comets and asteroids, although big hits are very rare; the last big impact was 65 million years ago, theoretically leading to the extinction of dinosaurs. Today, NASA regularly detects, tracks and characterizes asteroids and comets passing relatively close to Earth using both ground- and space-based telescopes.

The Near-Earth Object Observations Program, commonly called Spaceguard, discovers and characterizes these objects, and predicts their paths to determine if any could be potentially hazardous to our planet. They have already determined that there are no threatening asteroids as large as the one that killed the dinosaurs.

"The risk of a really large asteroid impacting the Earth before we could find and warn of it has been substantially reduced," said Tim Spahr, the Director of the Minor Planet Center at the Harvard Smithsonian Center for Astrophysics in Cambridge, Massachusetts. The situation is different for the mid-size asteroids, which could destroy a metropolitan area if they were to impact in the wrong place.

New observations by NASA's Wide-field Infrared Survey Explorer, or WISE, show there are significantly fewer near-Earth asteroids in the mid-size range than previously thought. The results of the survey project called NEOWISE find a larger decline in the estimated population for mid-size asteroids than what was observed for the largest asteroids. Astronomers now estimate there are roughly 19,500, not 35,000, mid-size near-Earth asteroids; they say this improved understanding of the population may indicate the hazard to Earth could be less than previously thought.

I, for one, am a believer in scientific thinking and in researching any propagated news through qualified and credible sources rather than blindly spreading rumors that might cause unnecessary panic, or at least waste my or someone else's time; time that we cannot have back.

I am also a believer in the fact that the world will end when it is time for it to end, which we cannot necessarily predict through science or otherwise. It is thus my ultimate belief to live life to the best of our capabilities, making every day of it count, and to aspire to do what is best for the whole world.

Glossary

(1) **Brown dwarfs** are objects that are less massive than stars but larger than planets.

(2) **The Oort cloud** is an immense cloud surrounding the Solar System, extending about 3 light years from the Sun; this vast distance is considered the edge of the Sun's orb of physical, gravitational, or dynamical influence. Within the cloud, comets are typically tens of millions of kilometers apart; they are weakly bound to the Sun and passing stars so other forces can readily change their orbits, sending them into the inner Solar System or out to interstellar space.

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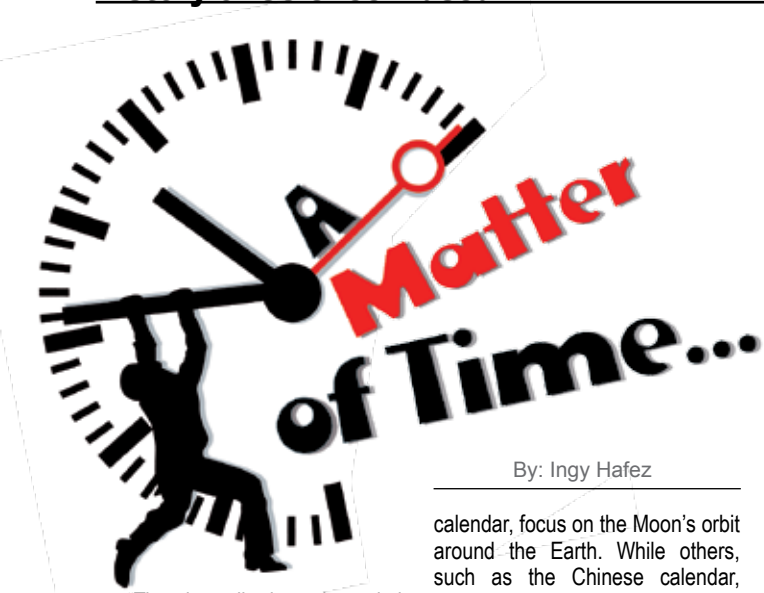

By: Ingy Hafez

"Time is really the only capital that any human being has, and the only thing he cannot afford to lose", Thomas Edison once said, highlighting an essential element of our life, without which we would be lost, TIME!

Time measurement, clocks and calendars, are all essential tools of our everyday life; without them, our lives would be pure chaos. Today, however, we take the presence of calendars for granted, unaware of the long and complicated tale leading to this luxury.

The Roots of Time

The schedule of our lives is shaped by the movements of the Earth, Moon, and Sun, which is why their cycles are very important in understanding the many different calendars developed over the millennia to help people organize their lives.

The calendar is based on three main astronomical events. The first is the day; one complete rotation of the Earth around its axis. The second event is the month; one complete orbit of the Moon around the Earth, which is approximately 29.53 days. The third is the year; one complete orbit of the Earth around the Sun, which is approximately 365.24 days.

As these durations are not easily divided, calendars were often flawed. Some were rooted in tradition, while others evolved as Man better understood science and astronomy. Some calendars, such as the Gregorian calendar, which is the primary calendar in use today, focus on the Earth's orbit around the Sun. Others, such as the Hijri calendar, focus on the Moon's orbit around the Earth. While others, such as the Chinese calendar, combine both.

A New Year around the World

The Egyptian Calendar

The earliest Egyptian calendar was based on the lunar cycle, which failed to predict critical events, such as the annual flooding of the Nile. The Egyptians soon adopted a solar calendar; based on this knowledge, they devised a 365-day calendar. They eventually ended up with three different calendars working simultaneously: a stellar calendar for agriculture, a solar year of 365 days, and a lunar calendar for festivals.

The Gregorian Calendar

The Christian calendar is the most widely used today. It developed from the earlier Julian calendar, named after Julius Caesar. This ancient Roman calendar was improved in 47 BCE by changing the number of days in a month to make the total 365 days with a leap day every four years.

In 1582, the system of leap years turned out to be imperfect. It was then fine-tuned by dropping three leap years every 400 years, producing a calendar year of precisely 365.2422 days.

The Hijri Calendar

The Islamic calendar is a purely lunar calendar; it consists of 12 months, each starting with the first visible thread of the lunar crescent. It is the official calendar in countries around the Arabian Gulf; however, some Muslim countries use the Gregorian calendar for civil purposes and only turn to the Hijri calendar for religious purposes.

Years are counted since the *Hijra*; that is, Prophet Muhammad's migration to Medina in 622; on 16 July of that year, the *Anno Hegirae* (AH) year started. Surprisingly, although only 1389 years have passed in the Christian calendar (2011-622=1389), 1432 years have passed in the Islamic calendar, because its lunar year is constantly shorter than the solar year used by the Christian calendar by about 11 days. The two calendars will eventually coincide on 1 May 20874, which will also be 1 Jumādā I, the fifth month of the Islamic calendar, of 20874 AH.

The Chinese Calendar

Although the People's Republic of China uses the Gregorian calendar for civil purposes, a special Chinese calendar is used for determining festivals. The beginnings of this calendar date back to the 14th century BCE. It is based on exact astronomical observations of the longitude of the Sun and the phases of the Moon.

An ordinary Chinese year has 12 months, consisting of 353, 354 or 355 days; while a leap year has 13 months with 383, 384 or 385 days. To figure out the Chinese year, one must make several complicated astronomical calculations.

As the Chinese calendar is based on the cycles of the moon, a complete cycle takes 60 years and is made up of five 12-year intervals, where each year is named after an animal. The Chinese believe the animal ruling the year in which a person is born influences his personality.

According to the Chinese Zodiac, the Year 2012 is the Year of the Dragon, which begins on 23 January 2012 and ends on 9 February 2013. In ancient China, the dragon represented power; today, it symbolizes success and happiness.

The Mayan Calendar

The Mayan civilization is one that extended throughout Mexico, the Yucatán Peninsula, and Central America. This Empire flourished during the Classic Period[(1)]; the arrival of the Spanish and Europeans to the Americas led to its destruction.

The cycles of time were essential to Mayan life; they used three calendars in parallel with remarkable accuracy and

complexity. The Mayan calendars were of different dating systems; the *Long Count*, the *Tzolkin*, and the *Haab*. The Haab was the only system related directly to the astronomical year with 365 days. The Tzolkin was shorter with only 260 days; it was associated with rituals. As for the Long Count, it was used to track longer periods of time, as well as identify events in relation to one another.

Mayan scholars have been attempting to correlate the Long Count with the Gregorian calendar, since the beginning of the 20th century. There has been a huge variation in the suggested correlations, but as early as 1905, a correlation known as the GMT correlation has been suggested. It stands for Goodman-Martinez-Thompson; the three early scholars who provided evidence of the correlation. Finalized in 1950, it suggested the start of the Great Cycle on 11 August 3114 BCE and the end-date as 21 December 2012.

For some reason, the Mayan calendar 2012 deadline has gripped the imagination of the world. With a surplus of clues and theories, there has been so much speculation about what will happen on that day. Does the Mayan prophecy truly indicate the end of the world? You might figure out the answer if you read on to find out about the myth behind THE END.

Glossary

(1) The Classic Period (c. 250–900) witnessed the peak of large-scale construction and urbanism; it was period of significant intellectual and artistic development.

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When & Where?

Time and Direction in History

Adapted from www.bbc.co.uk
By: Ingy Hafez

The movements of stars and planets have been studied in many cultures to develop calendars and divide time into meaningful units. Knowledge of the regularly repeating cycles of the Sun and stars similarly also provided a means of determining direction.

Accurate knowledge of time and direction is crucial in many cultures, and this need has driven people to harness their knowledge of the skies to invent precise instruments to measure and record it. Let us take a glimpse into history and discover how people learned where they stood in time and place.

Syrian Astrolabe

The Syrian astrolabe was created around the year 1230 (628 AH), for the use of the *muezzin*, the person who calls Muslims to prayer. It is both an observing and a calculating tool; at its simplest, the astrolabe is used to calculate the time by determining the height of the Sun or a star, and to find their rising and setting times. Many astrolabes, however, include tables for making many other astronomical and mathematical calculations.

Although the astrolabe was known to the ancient Greeks, it was within the Islamic world that it developed into a calculating instrument and essential tool for any astronomer. The astrolabe was used in the Islamic world, and later in Europe for many centuries and for many uses.

From the 17th century onwards, the telescope, the theodolite (an instrument for measuring angles in the horizontal and vertical planes), the pendulum clock, and other such instruments gradually replaced the astrolabe in Europe. However, it is still regarded as an icon of Islamic craftsmanship and ingenuity.

Iranian Astrolabe

Made in Iran during 1793 (1208 AH), this astrolabe revived an earlier tradition of beautiful craftsmanship in Iranian history. It was made up of a number of plates, each designed to be used in a specific latitude, with a marked grid to help find the direction of Mecca from a range of different locations. It also featured a grid for working out trigonometric problems, a shadow square for finding the height of buildings, as well as tables to make astrological calculations and predictions.

As the Islamic world expanded, people needed to know the times of sunrise and sunset during Ramadan, prayer times and the direction of Mecca; the portable astrolabe made this possible.

Persian Qibla Indicator

Qibla means "the direction of Mecca". The only purpose for designing the Qibla indicator is to find the direction of Mecca from anywhere. There were many devices for the purpose; however, the compass found its way into the Islamic world around the 13th century, becoming one of the most popular.

On the top section of the instrument, there is a circular grid called a gazetteer, which lists all the possible places to find Mecca from. Another section provides an approximate direction for Mecca in relation to where you are. The bottom section contains a compass, which you align with your location to find Mecca.

European Globe with Arabic Constellations

This globe was made in the 16th century by Willem J. Blaeu, a map and instrument maker. As Islamic science started to reach Europe, Islamic astronomical instruments became greatly valued. Some were bought and copied, with translated names of stars and constellations, while others were bought and used straight away, as many astronomers could read Arabic. On this globe, constellations have their names in Arabic, Greek and Latin.

As a matter of fact, many Arabic words in astronomy were adopted in Europe without translation. For instance, "Altair" in the constellation Aquila (the Eagle) means "the flyer"; while "Rigel" in Orion means "the foot".

Chinese Geomancer's Compass

Geomancy is a method of forecast that interprets markings on the ground, or the patterns formed by soil, rock or sand. It is used in China to determine the most favourable positions for burial sites or buildings; it is also used to select the best times and locations for important events.

The earliest compasses originated in China around the 2nd century BCE, and were used for geomancy long before they were ever used for navigation. This instrument has a compass needle at the center and concentric tables expanding out from the middle, containing data related to all various factors thought to help in deciding the best orientation for a building, such as astrology, time of day, the elements, directions and landscape.

"*Mortal as I am, I know that I am born for a day. But when I follow at my pleasure the serried multitude of the stars in their circular course, my feet no longer touch the Earth,*" Ptolemy.

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VISITORS INFO

History of Science Museum

Opening Hours
Saturday to Thursday
[from 10:00 to 15:00]

Guided Tours Schedule
Saturday to Thursday
[10:30 + 11:30 + 12:30 + 13:30 + 14:30]

- Museum entry fees are included in all Planetarium show tickets.
- For non-audience of the Planetarium, Museum entry fees are 0.50 EGP.
- Museum Tours are free for ticket holders.

Talking Earth

By: Sara Khattab

One of the most interesting interactive exhibits housed by the ALEXploratorium, the Center's hands-on facility, is the "Talking Earth"; where visitors are able to explore the geography of the world and listen to its talking continents, oceans and seas introducing their main characteristics and features.

As 2011, such an exceptionally explosive year, comes to an end, let us imagine what some of the world's continents would tell us if we asked them about their experience during 2011.

Africa

I am the Dark Continent, the second largest of all continents. My year was literally rebellious as a revolutionary wave of demonstrations and protests broke out in my North, soon spreading towards my neighbor Asia where the rest of the Arab countries are located.

Thundering demonstrations resulted in the overthrow of three long-ruling Heads of State. Numerous factors led to the outbreak of the Arab Spring in Tunisia, Egypt and Libya; primarily long-existing dictatorship accompanied with a range of human rights violation, corruption across the board, economic decline, extreme poverty, among several other consequences of autocratic rule.

News of the Arab Spring has certainly eclipsed much of the year's media; however, that does not mean that this was all that happened to me in 2011. My Eastern region was gravely struck by one of the worst droughts in the past 60 years. This drought led to a severe food crisis across Ethiopia, Kenya and Somalia, which threatened the livelihood of more than 13.3 million people to the point that, on 20 July, the United Nations declared famine in two regions of southern Somalia; the famine then spread across all regions of the country. Tragically, tens of thousands have been afflicted, both before and after the declaration of famine due to the obstruction of aid groups at the hands of terrorist groups.

Asia

The year 2011 was a tough year for me, especially for Japan. At 2:46 pm (JST) on Friday, 11 March, a 9-magnitude earthquake hit the coast of Japan. With an epicenter located off Miyagi Prefecture, about 370 km northeast of Tokyo, this was the most powerful known earthquake ever to have hit Japan, and one of the five most powerful earthquakes in the world. The Great East Japan Earthquake triggered powerful tsunami waves that prompted the United States National Weather Service to issue tsunami warnings for at least 50 countries and territories.

Buildings shook, heaved and collapsed by the score, numerous fires flared; thousands of people died, thousands more were missing or injured, and tens of thousands were displaced. Around 4.4 million households were left without electricity and 1.5 million were left without water. Railway services were suspended, elevated highways were shut, and surface streets remained jammed as thousands tried to reach their homes. Scores of aftershocks continued to hit the country the following day, punctuated by strong earthquakes including one with a magnitude of 7.1 and another with a magnitude of 6.8.

In addition to loss of life and destruction of infrastructure, the tsunami led to a number of nuclear accidents, most notably in the three reactors of the Fukushima Nuclear Power Plant, which suffered explosions due to hydrogen gas that had built up within their outer containment buildings following cooling system failure. An evacuation order was extended to people who live within 10 km of the plant even though Japan's nuclear safety agency stated that the radiation amount posed no immediate threat to health of nearby residents.

Europe

I, too, had my share of political/socio-economic crisis and earthquakes this year. However, the more alarming event for me was the repetition of a familiar scene. During the month of May 2011, air travel over my skies was disrupted once again by an Icelandic volcanic eruption. Grimsvotn is the most active volcano in Iceland, usually producing large particles of ash that are too heavy to carry far by the wind. The eruption began with 12-km-high plumes accompanied by multiple earthquakes; the ash cloud from the eruption rose up to 20 km, which means that the ash was in the stratosphere where airlines cruise. This was thus considered the strongest Grimsvotn eruption in the last 100 years.

A thick cloud of ash blocked out the daylight in towns and villages at the foot of the glacier where the volcano lies, covering cars and buildings as well. Air travel was disrupted in Iceland once the eruption began, then the disruption spread to the neighboring countries on subsequent days. On 25 May, Iceland Meteorological Office confirmed that the eruption paused, however there were still pulsating explosions producing ash and steam clouds, some reaching a few kilometers in height, rising up from the vents.

North America

When it comes to bad weather, 2011 was definitely the deadliest year since 1936 for the United States, which forms 9.83 million km^2 of my total area, with 324 tornado-caused deaths that occurred during the 27 April outbreak across Southeastern United States and 159 tornado-caused deaths in the Joplin tornado. In August, the large and powerful Atlantic Hurricane named Irene left extensive flooding, wind damage, major power failures, and deaths along its path through the Caribbean, the United States East Coast and as far north as Atlantic Canada.

In addition to weather problems, I have had a rare earthquake strike my East Coast, shaking Washington, New York, and other cities. The 5.9–magnitude earthquake, one of the strongest to hit the region in modern history, disrupted flights, clogged cell phone networks, and cut grid power to one nuclear plant.

South America

I was no luckier than my fellow continents in escaping the chain of disasters that seem to have hit the Planet in 2011. In January, a series of floods accompanied with mudslides took place in several towns of the Mountainous Region, in the Brazilian State of Rio de Janeiro. The combination of floods and mudslides was

considered the worst weather-related natural disaster in the Brazilian history. In a 24-hour period between 11 and 12 January, the local weather service registered more rainfall than what was expected for the entire month.

The disaster led to widespread property damage, and the supply of public utilities such as electricity, running water and phone lines were affected. Many buildings were directly exposed to landslide hazards because of the steep terrain; around 2960 people had their homes destroyed. It was reported that there were at least 903 deaths other than the missing.

In another area, after being dormant for more than 50 years, a volcano in the Puyehue-Cordon Caulle chain of south-central Chile erupted on 4 June. Authorities had already put the area around the volcano on alert after a flurry of earthquakes on the same day of eruption. Puyehue threw ash more than 10 km into the sky, pushing the plume toward neighboring Argentina. At its greatest extent, strong winds carried the ash cloud from Puyehue a great distance at high altitude; the ash remained for several days over New Zealand and southern Australia, disrupting flights.

Australia

I was not spared the bad fate either. As a matter of fact, my misfortune started way back in 2010 when a series of floods started hitting the state of Queensland including its capital city, Brisbane, from end-November 2010 to January 2011 with several separate rain events causing rivers to rise over a lengthy period. Three-quarters of the State of Queensland was declared a disaster zone. The floods forced the evacuation of thousands of people from towns and cities; 35 people perished and nine were missing.

The Queensland floods were followed by the Victorian floods, which were due to high intensity rainfall in January. Several follow-up heavy rainfall events including Tropical Low Yasi caused repeated flash floods in much of the western and central parts of the Australian State of Victoria. Tens of thousands of homes lost their electricity supply, hundreds of roads were closed, and train services were disrupted. The floods devastated farms and forced thousands of people to evacuate.

Antarctica

I am the Earth's coldest, driest and windiest continent. About 98% of my total area is covered in ice. According to satellite measurements, the ice in Antarctica, the Arctic Ocean and Greenland is melting faster than previously thought, sharply raising projections of global sea level rise.

A new study indicates that, by 2050, there will be a 32 cm sea level rise, 15 cm of which is attributed to the Antarctic melting. Strong ocean currents beneath the Western Pine Island Glacier Ice Shelf are eroding the ice from below, speeding the Glacier's melting; the growing cavity beneath the ice shelf is allowing more warm water to melt the ice.

The Arctic region's temperatures in the past six years were the highest since measurements began in 1880. The melt season in 2011 got off to a slow start but the ice loss pace quickened during June. Melting in 2011 was the third most extensive since 1979, lagging behind only 2010 and 2007. Studies predict that the Arctic Ocean will be nearly ice free in summer time within 30-40 years.

After having a look at the main events in the continents during 2011, we wonder what would be their New Year's Resolutions for 2012?

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Workshops, Programs & Events

Creativity is a talent we are born with; yet, it needs practice to blossom and stay vibrant. PSC workshops are meant to provide participants with tools of a lifetime. Through a unique diversity of exercises and hands-on activities, we aim to lead students to explore their creativity and find out how to use it in their life; all the while enriching their knowledge. In our workshops, students are able to interact with each other and with the world around them in an exciting and entertaining manner; they are guaranteed to have a blast!

Mid-year Workshops

1) Popcorn Science
- Target age group: 6-8 years

2) Power of Plant
- Target age group: 6-8 years

3) Nutrition; What to Eat?
- Target age group: 6-9 years

4) Design IT
- Target age group: 9-12 years

5) Natural Soap
- Target age group: 9-12 years

6) The Writing Tools in the Arab-Muslim World
- Target age group: 9-12 years

7) Pollution
- Target age group: 13-15 years

8) Black Gold
- Target age group: 13-15 years

9) Teamwork
- Target age group: 13-15 years

2nd School Semester Workshops

1) Matter
- Target age group: 8-10 years

2) Chemical Reactions
- Target age group: 9-12 years

3) Fish
- Target age group: 10-11 years

4) Volcanoes and Earthquakes
- Target age group: 10-12 years

5) Current and Voltage
- Target age group: 12-14 years

6) Starting Point
- Target age group: 12-14 years

7) Genetics
- Target age group: first year of secondary school

8) Chemical Mixtures
- Target age group: 13-15 years

9) Mechanics
- Target age group: 13-15 years

Programs

1) Science Olympiad Training
- Target age group: 12-14 years

2) Starting Point
- Target age group: 12-14 years

Save the Date!

Intel Bibliotheca Alexandrina Science and Engineering Fair 2012
8-12 March 2012

Science Festivity 2012
28-29 March 2012

New Year's Resolutions

1. To Make or Not to Make!

2.

By: Noha Rahhal

It is New Year time; time for big resolutions and life-altering decisions.

Haven't we all, at some point, made some kind of dreamy goals that might have sounded too ambitious for a while at the beginning of every year?

Whether resolutions are made at the beginning of the New Year, or at one's birthday as many people do, the point is that there is almost always a time in one's life when you would decide all of a sudden that your old self, habits or lifestyle are not working anymore, or at all for that matter; at that point emerges the resolution.

Good for you! How many decisions worked out eventually? Do you find difficulty in realizing your big goals? Why? It seems like a complicated process, doesn't it? I would rather say it is more of a methodical one.

As Simple As That… or Is It?

People tend to view New Year's resolutions as a mundane thing that will eventually pay off and that they will be able to achieve their goals no matter what. However, psychology has another outlook regarding this issue.

In a survey conducted by Richard Wiseman, a psychologist at the University of Hertfordshire in the United Kingdom, of over 3000 people who were asked about their strategies for achieving New Year's resolutions, it was found that almost 88% of all resolutions fail. Not only do many of us fail achieving our annual-set goals, but this also affects our psyche and well-being. When failing to achieve a certain goal, people feel demotivated and lose interest in their pursuit towards their goal(s).

For instance, weight loss is among the most frequent resolutions among different people. It is found that, in the first two weeks of the year, people are eager to fulfill their aims; by February, they tend to slow down; and by the end of the year, they are back to point zero or they could even be further behind, which can have damaging effects to their self-esteem.

Many scientists, especially psychologists, have carried out thorough studies on this issue; findings vary according to each study. However, there are some common points among those findings that we can pinpoint here. According to Timothy Pychyl, a Professor of Psychology at Carleton University in Canada, people are often unready to change their habits, particularly their bad ones. There is another theory by Psychology Professor Peter Herman who identified, along with his colleagues, what is called "False hope" syndrome, where people set unrealistic goals that are not aligned with their own readiness to tackle such dreams or work on certain decisions.

Untangling the Mystery

According to Wiseman's study on 3000 people, it was found that many of those who failed in fulfilling their resolutions usually focus on the downside of not fulfilling their wishes. It was also found that those who were able to carry out their decisions tend to break their resolutions and goals into smaller steps and rewarded themselves when they reached each milestone.

The core problem of New Year's resolutions is people's tendency to list more than one goal and decide all of a sudden to work on all of them at once. Thus, spreading resolutions over the entire year is a more adequate option that is harmonious with our self-control, which is the main key to fulfilling one's utmost potentials.

Psychologists believe that self-awareness and realization of one's own limitations are the first steps to fixing what is known as willpower flaws. It turns out that there is a physiological basis to this hypothesis. The brain area responsible for willpower is the prefrontal cortex, which is located just behind the forehead; it has many functions other than willpower, such as keeping us focused, handling short-term memory, and solving abstract problems. It is no surprise then that if we subject that area to multiple duties that demand strong will, it will become overloaded with too many activities. That is why, after a long stressful day at work, we find it hard to resist the temptation of a big fatty meal, even if we do not necessarily need to have it.

Do We Give Up Then?

Learning how stubborn our willpower or mind is does not mean that we give up. On the contrary, a better understanding of our psyche and how our minds process certain commands, and deal with our needs and wants, can significantly help us improve our strategies to fulfill our wants and needs.

Here are five tips that will help you carry out your New Year's resolutions:

1. Do not wait until New Year's Eve to make resolutions; whenever you want to make a change about yourself or your lifestyle, go ahead and do not postpone.
2. Set realistic, specific and measurable goals. If you want to lose weight, good for you, but this is not a specific goal. Instead, set your eyes upon losing 10 kilograms in 6 months.
3. Focus on one resolution at a time, and if any of your goals is too big or will extend over a very long period of time, take small steps and set milestones.
4. Once you achieve a little victory or meet a certain milestone, go ahead and celebrate; do not wait for the goal to be finally completed.
5. Finally, do not take your goals or resolutions too seriously; have fun and ease the stress that you may be feeling.

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Be Inspired!

We have asked the PSC editors about their resolutions for the New Year, their strategies to implement those big decisions, and whether or not resolutions have worked out for them before. Have a look at what they said:

My eternal personal resolution is, of course, to lose weight. A more objective goal would be to aim at eating healthily and exercising regularly.

Over the years, not just one, I have managed to achieve other important lifestyle-changing goals: getting to do something I love, getting my work organized to reduce stress and have more time to spend with friends and family and my other activities.

I think it is very important that one knows what one wants and focuses on dividing it into clear and achievable objectives; persistence is then the key to get these objectives accomplished.

I usually get about 75% of my goals achieved within the timeframe I first estimated; but my estimation is getting better with time.

Maissa Azab
Editor-in-Chief, PSC Newsletter

Honestly, I never persisted on making a resolution work out until now. However, I am hopeful this year will be better.

Now that I live in London, I am quite impressed with how people live here; most of them exercise and play sports, which I find to be the best way to live, to be honest. That is why I was encouraged to go running today

It is thus my personal resolution this year to maintain a healthier lifestyle. On the other hand, I would like to read more and maybe benefit from the possibilities here to start other activities I haven't had access to before, such as hip-hop dancing.

Ingy Hafez
Freelance Editor

I am a fan of fresh starts but I do not think I ever made a New Year's resolution. Like most of you, I usually make my resolutions on my birthday; but now that I am a mommy, I make them on my daughter's birthday since most of them revolve around parenting anyhow.

Nevertheless, I have decided to make a change. I plan on making an ultimate do-or-die New Year's resolution that I just HAVE to stick to; that is to finish my Master's this year.

On the personal front; I have many resolutions, but my first is to get back to my pre-summer exercise routine and actually stick to it all year long not just during winter; the heat is NOT an excuse!

Exercise really makes all the difference in the world for me, it does not just make me feel healthier and stronger; it is also the best mood booster!

Lamia Ghoneim
Freelance Editor

After much thought, I have realized that, like Ingy, I never really persisted on making a resolution work out except for the past year, 2011, as I finally managed to change my career from a KG teacher to a full-time Editor, which is something I worked towards for a couple of years or so.

My resolution for 2012 is to maintain the happiness I acquired in 2011 on both the professional and personal sides; thus, to never let anything affect me negatively or put me down.

Sara Khattab
PSC Editor

Hmm… I just realized that I had never set a plan for my life; but this year, now that I am doing something I believe in, I have a goal: to focus and concentrate. I also want to read more. I am doing my best to achieve my goals because they will help me change my life to the better; I feel there is a spark inside me that just needs to be ignited.

Shahenda Ayman
PSC Editor

If I were to make New Year's resolutions, they'd fall into two categories; one is to stop bad habits and the other to start good ones.

The computer I am using right now to write this has taken quite a big chunk of my time. I feel many people would share this sentiment, thinking back to the good old days when we spent more time reading, doing arts and crafts and other fun activities, not to mention physical activity.

For the coming New Year, I wish to reduce the time I spend on this little magic box, and read more, play sports, and definitely be a more proactive member of the society by doing some charity/social work, especially with our country in the throes of a new era.

May we all achieve our goals and dreams in this coming year, cheers!

Jailane Salem
Freelance Editor

New Year's resolutions never work! I cannot even remember the countless times I said "Tomorrow is going to be the first day of the rest of my life" because it never is; otherwise, I'd remember it!

The changes I've been able to achieve all had:

- A trigger, a profound moment of realization. It has to be a really profound and clear understanding of the problem, or whatever you need to change. Ask: Why am I like this? Really, WHY? And, how can I realistically change in a long-term.
- Realistic expectations; and
- Conviction of the achievability of your goal.

So, it does not have to be New Year; but, for me, these things are essential to actually realize any change.

Aisha Hassanein
Freelance Editor

Post-Revolution New Year's RESOLUTIONS

By: Lamia Ghoneim

Hypothetically speaking, with a New Year that promises to mark the dawn of Egypt's democratic age, if you were elected President of Post-Revolution Egypt, what would be your New Year's resolutions?

Commitments to embark upon issues such as political reform, economic growth, social justice and national security would probably top your list. Let us think broader; after all you will be the President of the New Egypt, hypothetically. Dealing with major global issues such as climate change, the food crisis, water scarcity, pollution, and energy depletion should definitely be part of your New Year's resolutions, don't you think?

To that end, Mr. Hypothetical President (and government, parliament and institutions), allow me to make a few suggestions of what I think should be on your New Year's resolutions list.

1. Build Us an Ark:

Better yet, save our lands from drowning

Climate changes over the last one-hundred years have led the Mediterranean Sea to rise over 15 cm. According to experts, the intrusion of saltwater on the lush terrain has created a major challenge, threatening Egypt's rich and agriculturally fertile Nile Delta.

While some farmers have been forced to abandon their lands due to the rising tides, others are fighting back by covering their land with sand beds to isolate it from seawater intrusion. Still, volatile and extreme weather patterns, now largely attributed to climate change are wreaking havoc with many harvests. Experts believe that if the situation continues to deteriorate in Egypt, it will lead to massive food shortages that could affect millions of people.

With the Nile Delta providing about one-third of the produce to Egypt's 80 million residents and a large portion of the crop being exported, which in turn provides an important source of revenue for the country, surely any issue affecting the Delta thus affects national security as well as economic growth, don't you agree?

Moreover, the rising tides will undoubtedly cause a snowball effect as people in areas affected by the rising sea migrate to find work elsewhere. This will lead to a rise in unemployment, which in turn will lead to crime, another threat to national security.

In fact, a previous government study of the coast of Alexandria revealed that the waters are continuing to rise and many parts of the region will be flooded within a few decades. The Sea is expected to continue to rise another 30 cm in the next 15 years, which will flood a 200 km^2 area. "As a result, over half-a-million inhabitants may be displaced and approximately 70,000 jobs could be lost," the study revealed.

While some may dismiss the predictions as a bit too alarmist, you, Mr. Hypothetical President, should know better. Indications of serious changes in the world's climate have been evident over the past few decades, and it is apparent that global warming is indeed having a major impact on the Delta region, placing a huge strain on agriculture, and threatening the fabric of the Delta's already fragile ecosystem.

So you see Mr. President, your top New Year's resolutions are all majorly influenced by climate change. Before you commission the building of a new Noah's Ark, let me introduce you to some other, say more strategic, options.

The first thing you need to do to avert the potential crisis would be to seek the help of the experts; scientists who have been studying the situation for years and proposing solutions. The next step, as recommended by one report, is to prioritize funding for more research into the impacts of climate change on Egypt's Coastal Zone and how it will affect supplies of food and water. It adds that efforts should be made to evaluate technologies for mitigating and adapting to climate change.

Another recommendation is that Egypt improves its capacity for climate monitoring and forecasting, and implements schemes to conserve water, as well as develop crops that can tolerate environmental stresses such as drought and salty soil. Moreover, although, according to the State of Environment Report, Egypt contributes no more than 0.57% of the world's greenhouse gas emissions, it is important for Egypt to reduce emissions and raise public awareness about the threat of climate change.

One more simple, yet imperative, step is to preserve natural defenses by putting an end to the random extensive construction that has taken place on the Coast in the past few decades, some of which have been highly criticized by scientists. Some renovations, they claim, have led to the destruction of the defenses provided by the natural coastline of sandy beaches running up to a rocky elevation. Also, the practice of removing sand from the shore by construction companies is weakening nature's defenses and should be prohibited. Environmental laws should be firmly enforced and environmental assessments of projects must be made mandatory. National projects should take into consideration expected climate change effects.

Other more drastic measures proposed by several reports include the building of breakwaters and/or sea walls. The International Panel on Climate Change (IPCC) proposes the construction of an EGP 20 billion underground wall by the Shore, made of a substance known as plastic concrete, that will protect underground freshwater from seawater, as well as offer protection to land, to face the possibility that seawater may rise by up to 1.5 m by the end of the century.

Even though the cost of such megaprojects might discourage you, and you may think that now may not be the time to take such actions, but I assure you Mr. Hypothetical President that now is the time to consider such actions.

2. Gear Up for Water Wars:

Better yet, let us fight the impending drought and thirst

Since the year 2005, Egypt has been classified as a water scarce country with a water quota of less than 1000 m³ of fresh water per year and per capita, and is forecasted to fall under 600 m³ by the year 2025. Since we are also increasing by more than one million people a year, the ultimately limited supply of our main source of fresh water, the river Nile, is unlikely to cover our future needs. National security, as well as any hope for economic growth, is definitely on the line.

With global warming putting a strain on rain-fed agriculture, and other Nile Basin countries demanding a higher share of the Nile waters, the situation seems bleak. Before you start panicking and blowing war horns, let me remind you dear Mr. Hypothetical President, of some other more peaceful and wiser options.

Sensible and wise politicians and delegates of civil society institutions who have come before you have paved the way for co-operation and negotiations between our country and other Nile Basin countries. The first step for you to take thus is to follow in their footsteps by promoting more cooperation and effective utilization of the Nile waters between our countries. Projects such as the Jonglei Canal, which promises to deliver more water to us every year, should be immediately examined and resumed if proven worthy.

The second step that I strongly urge you to fully embrace is to apply scientific solutions for providing alternative water resources, such as desalination of seawater and brackish groundwater; especially using renewable energy, such as solar energy, which is present in abundance in Egypt. Such options must be intensively researched as they hold so much promise for us here in Egypt.

Last but not least, conservation and efficient management are of course essential steps for the preservation of any natural resource, especially water. And, need I remind you Mr. Hypothetical President of the need to prevent the pollution of the Nile waters, which is considered among the most serious factors contributing to water shortage.

3. Repaint the Black Cloud White:

Better yet, make it disappear altogether

If you live in Cairo or anywhere nearby, you must realize that mid-September to October is not the best time there. The heat is not the culprit though; the weather actually drops from deep fry to a mild simmer. It is the arrival of something far more dreaded than the heat; the infamous "black cloud".

Like clockwork, every Fall since 1999, the dark cloud settles over the city; its ominous inky haze of pollution poisoning the air, burning the eyes and throats, and smothering the Nile Delta. The 12-year old phenomenon has been mainly attributed to farmers burning rice straw after harvest; the smoke adds to Cairo's already heavy pollution, creating this gloomy dark shroud.

The cloud has been reported to bring pollution levels up to ten times the limits set by the World Health Organization, sending people to the hospital with exacerbated lung infections and asthma attacks at unusually high rates, and contributing to cancer and other long-term health problems.

Research has shown that the combination of industrial pollutants, car exhaust and, most notably, the sharp growth in rice production between 1990 and 2000 is to blame for the dangerous phenomenon.

Even on a good day, the Egyptian capital and its neighboring Nile Delta cities suffer from some of the worst air pollution on Earth. Industry is to blame, in part, the worst offenders being factories that burn mazut[1] for power. Exhaust fumes from 2 million cars, which include some 100,000 beat-up taxis, are also accountable. The air is further contaminated by the burning of some 12,000 tons of domestic waste, as well as mountains of litter dumped in open fields in the suburbs. Air pollution is so bad in Cairo that living in the sprawling city of 18 million residents is said to be akin to smoking 20 cigarettes a day!

The surging pollution, according to hospital sources, takes the lives of 5,000 annually in the capital alone. The risk of developing respiratory diseases and cancers have also reached an all time high; "according to risk calculations, 500,000 Cairenes[2] will develop serious respiratory problems and fatal cancers, in a period of 5-25 years," says Salah Hassanein, an environment professor at Cairo University.

As if that is not enough, a 2002 World Bank report estimates that pollution causes USD 2.42 billion worth of environmental damage each year, about 5% of Egypt's annual gross domestic product.

As you can see, Mr. Hypothetical President, pollution is a matter of serious concern. It does not only affect economic growth and productivity, but I would go as far as to say it affects national security as well. The question is: What can you do? Of course re-painting the clouds was never a serious option!

Regarding the black cloud, I think the solution is quite simple really. Instead of banning the burning of rice husks, why not provide an incentive for farmers to dispose of the waste in a different way.

Scientists suggest collecting the waste from the farmers and reusing it as biofuel, which would make up for the cost of transport while also creating an alternative source of energy, which as you know Mr. Hypothetical President, is another issue we need to tackle. Some factories have actually been buying the waste from farmers for this reason, but the idea needs to be practiced on a larger scale, and thus needs your endorsement.

As for the surging pollution, the solution may not be as simple. However, it starts with the implementation and actual application of the environmental laws that control industries and vehicles, and fine those who violate. That is not the end of it, alternative and more innovative options need to be considered, such as providing less polluting public transportation methods, encouraging industries and farmers to recycle and reduce emissions, converting factories to natural gas, and many other ideas you may find lurking in reports and research papers conducted by our esteemed scientists and professors.

Dear Mr. Hypothetical President, I hope that my suggestions for your New Year's resolutions serve, rather than overwhelm, you; I trust you agree that by having big ideas and big plans, you can only achieve greater results.

Glossary

1. **Mazut:** a heavy, low quality fuel oil.
2. **Cairenes:** a native or inhabitant of Cairo.

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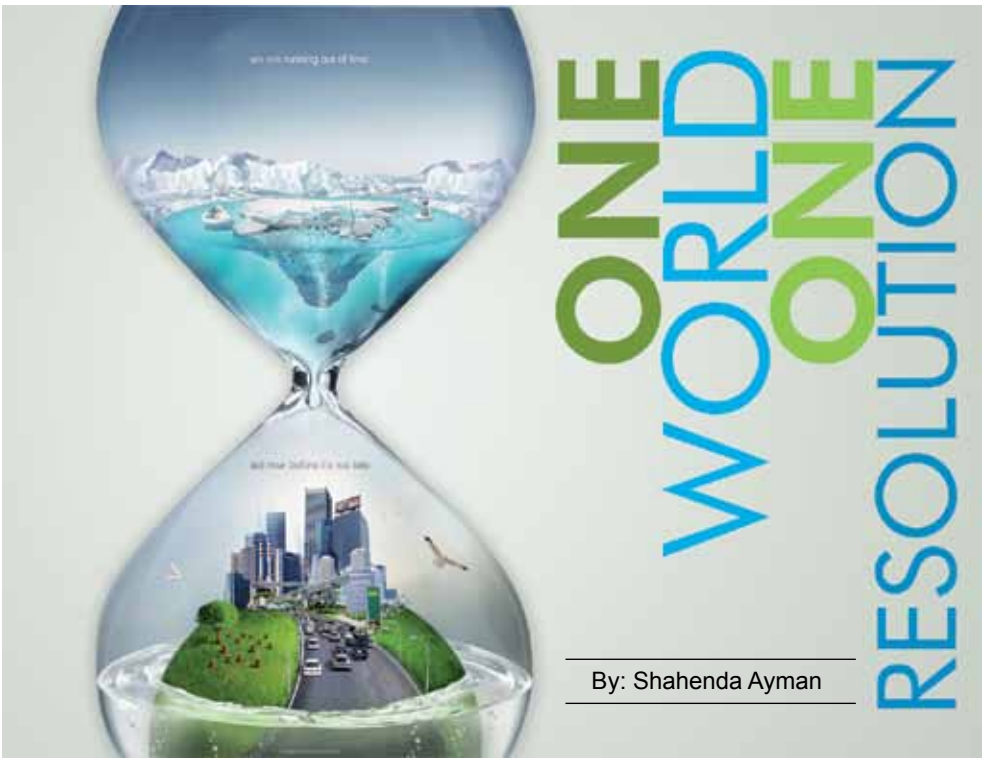

ONE WORLD ONE RESOLUTION

By: Shahenda Ayman

Global climate change has already had evident effects on the environment. Glaciers have shrunk, ice on rivers and lakes is breaking up earlier, the sea level is rising, plant and animal ranges have shifted, trees are flowering sooner, and heat waves are getting more intense.

Scientists have high confidence that global temperatures will continue to rise for decades to come, largely due to greenhouse gases produced by human activities. The Intergovernmental Panel on Climate Change (IPCC), which includes more than 1,300 scientists from the United States and other countries, forecasts a temperature rise of 2.5 to 10 ºF over the next century.

The effects could be enormous. Relative to the hectic pace of our daily life, global warming is a slow-moving problem. But that does not mean we "wait and see". If we wait, we may be creating an unsolvable problem, an unstoppable climatic shift that could have devastating impacts in years to come.

The Downfall of Mother Earth

Global warming is affecting many parts of the world in many devastating ways. However, the primary global outcome of this phenomenon is the rise in sea level, which triggers a chain reaction. When the sea rises, water covers low lands, forming a massive problem for plants, animals, and people. When inundated, plants die and animals lose their food and their habitats. Although animals have a better ability to adapt to what happens than plants do, they may also die. When the plants and animals perish, people lose their main sources of food; they may also lose their homes.

Oceans are affected by global warming in other ways, as well. To name one, warm water—caused by global warming—kills algae, which is a producer of food for many consumers in the ocean. Global warming is also behind dryness-caused fires that are wiping out huge forests; another alarming crisis since the more trees are destroyed, the less CO_2 is absorbed and converted into Oxygen.

Global warming is caused by several things, many of which are man-made. However, there are also natural causes for global warming. One natural cause is the release of methane, one of the most dangerous greenhouse gases, from the arctic tundra and wetlands. Another natural cause is the Earth's cycle of climate change, which usually lasts about 40,000 years.

Man-made causes, however, probably do the most damage to our planet; pollution being one of the biggest. A primary cause of pollution is burning of fossil fuels, giving off CO_2. Moreover, mining coal and oil allows methane to escape. Another major man-made cause of global warming is population. More people means more CO_2 is released into the atmosphere; more food is raised, producing and using more manure, and releasing more methane; more houses are built, leading to destruction of more forests and natural habitats; and, of course, more fuel-using means of transportation.

Think Locally, Act Globally!

For many years, environmental activists have called upon the masses to "Think Globally, Act Locally". Many people, particularly in developed countries, have thus mobilized—sometimes to the point of extremism—towards a green lifestyle. Reducing, reusing, recycling, saving energy, eating local produce, cycling, car pooling, traveling by train, to the end of it; sadly, the collective impact of all these commendable individual efforts is not causing enough of a dent to slow down the otherwise snowballing global disaster-in-the-making.

Leaving it to the elective will of the individual citizen is no longer an option; laws and regulations must be reinforced nationwide and worldwide now, not later. The one and only way out of this complex peril is in fact in the hands of the global community as it stands united in the face of this calamity.

The solution thus starts and rests with the nations, not the individuals. For one thing, a good forestry department can have a huge impact. CO_2 that is one cause of global warming is eaten up by trees. If a country fosters the growth of its forests and does not allow them to be cut down indiscriminately, global warming will be slowed down.

Another thing nations can do is focus on energy efficiency. The less energy used, the less global warming has a chance to take hold. A country can place efficiency standards on appliances and cars; even better, they can redesign cities so that walking and cycling can become an option instead of people having to drive everywhere.

Alternative sources of energy emit little or no greenhouse gases; using them will help curb global warming. Hydro-power, solar energy, and windmills can be used to take the place of burning gas, or coal for electricity. Windmills, in fact, are already being set up by the scores in many fields in out-of-the-way places. This is a good step to prevent global warming.

Nations can and must be quick to adjust their policies to the climatic changes of the times. When one type of crop will no longer grow well because it needs a cooler climate, that crop can be replaced in that area with a different kind that will. Aqueducts can also be built to transport water to drought-ridden areas.

There are different ways that nations can get their message about global warming across. But first of all, they need to make the now essential laws; they can and must require people to use environmentally-friendly appliances, fuel sources, and vehicles. They must also make it a legal requirement for auto makers to reduce harmful emissions given off by their cars.

Pulling Together

The truth of the matter is that international agreement on a long-term global framework that facilitates, and puts in action, a global act is crucial for a sustainable future. Hence, the 2009 United Nations Summit on Climate Change in Copenhagen was a unique opportunity to agree on a global treaty that will help achieve this transformation. It was a historic chance to ensure that humanity can harvest the

potential of low carbon technology both in the short-term and the long-term.

The Copenhagen Climate Change Conference raised climate change policy to the highest political level. Close to 115 world leaders attended the high-level segment, making it one of the largest gatherings of world leaders. More than 40,000 people, representing governments, nongovernmental organizations, intergovernmental organizations, faith-based organizations, media and UN agencies applied for accreditation.

The Copenhagen Accord contained several key elements on which there was strong convergence of the views of governments. This included the long-term goal of limiting the maximum global average temperature increase to no more than 2ºC about pre-industrial levels, subject to a review in 2015. There was, however, no agreement on how to do this in practical terms. It also included a reference to consider limiting the temperature increase to below 1.5 ºC, a key demand made by vulnerable developing countries.

"If only developing countries would take action to reduce their global warming pollution," is the refrain that was heard in capitals around the world for years. This was mainly driven by the reality that global emissions in both developed and developing countries need to decline if we are going to solve this challenge. While developed countries need to take the lead in making deep emissions cuts, we need to find a way for developing countries to pull millions/billions of people out of poverty while reducing global warming pollution.

The next key element of international agreement thus is the willingness of developing countries to undertake significant emission reductions on their own that tangibly reduce the growth of their emissions in the near-term and lay the foundation for even deeper cuts in the medium-term. Major emerging economies have outlined specific efforts that they will undertake to curb their global warming pollution:

China announced it will cut its greenhouse gas emissions intensity per unit of GDP by 40-45% by 2020. They also announced that they would have non-fossil fuels account for 15% of their primary energy consumption, and increase forest cover by 400 billion m^2 by 2020.

Brazil pledged to cut its deforestation rate by 80% by 2020; they have been making pretty good progress on addressing their deforestation rates over the past couple of years. Brazil has also announced that it will reduce emissions by 36-39% below the projected level; a level estimated to cut their emissions to their levels in 1994.

India announced they are "voluntarily ready to reduce emission intensity by 20-25% within 2020". This target is based upon a new estimate of the impact of a number of measures that are part of a comprehensive National Action Plan on Climate Change, where they outlined commitments to national mitigation actions, including plans to generate 20GW of solar capacity by 2020 and cut energy consumption by 5% by 2015.

Indonesia announced they were devising an energy policy including land use and forestry, which will reduce emissions by 26% by 2020 from business as usual levels, eventually reducing emissions by as much as 41% with help from the international community.

South Korea announced they would cut their economy-wide global warming pollution to 30% below the projected 2020 levels; an estimated 4% cut from 2005 levels.

Mexico is developing an emissions trading system to cut emissions from the electricity, oil, cement, and possibly steel sectors. Moreover, President Calderon has committed to cut Mexico's emissions by 50% in 2050.

South Africa has outlined that their emissions "must peak, plateau, and decline". This would mean that South Africa's emissions must stop growing no later than 2025 and must begin declining in absolute terms around 2030-2035.

If you would have asked anyone just two years ago, or even one year ago, most probably no one could have foretold that all these countries would have come forward with such signs of actions. So Copenhagen has been an important driver in encouraging major emerging economies to bring forward commitments to curb their global warming pollution.

These are very positive signs that less global warming pollution will be going into the atmosphere from these key countries. More can and has to be done for sure, but let us not lose focus on the progress that has occurred on this front.

2012 New Year's Global Resolution

Preparations for Earth Summit 2012, aka Rio+20, are heating up. The international summit to be held in May of 2012 in Rio de Janeiro is anticipated to draw leaders from around the world for a meeting on the future of sustainable development, and the emerging concept of "Green Economy".

The goal of a green economy has powerful backing. Witness the declarations of the most powerful policymakers in the world; the leaders of the G20, the world's twenty largest developed and emerging economies, accounting for almost 80% of the world's population and 90% of its GDP. They have restated their commitment to a "green recovery and to sustainable global growth," following up on their statement in 2009: "We will make the transition towards clean, innovative, resource efficient, low carbon technologies and infrastructure".

The purpose of the Rio+20 is to provide a channel for policymakers and other interested stakeholders to discuss and review issues relevant to the objective and themes of the conference, including a green economy in the context of sustainable development and poverty eradication, as well as the institutional framework for sustainable development.

Will all these efforts have fruitful results? Will the global warming stop? No one individual can answer these questions for certain; the answers are in the hands of the nations, and it is up to them to come together and unite on this one global resolution to save Mother Earth and her offsprings of every specie.

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THE GREENEST CITY ON EARTH

By Ingy Hafez

Legend has it that the ancient Olympic Games were founded by Hercules. The first Olympic Games recorded were held in 776 BCE, though it is believed that the Games were held for many years before. A series of competitions between representatives of city-states and kingdoms from Ancient Greece were played every four years for ages.

With the Olympics 2012 a few months away, London, the capital of the United Kingdom (UK) and host of the event, is taking quick, yet serious, steps towards becoming the world's greenest city in 2012. In fact, London is the first host city to embed sustainability in its plan for the preparation of an event, even as big as the Olympics. It aims to set new standards that create positive, long-term change for the environment and communities all the same.

One Planet Living

This approach is based on the WWF/BioRegional concept of One Planet Living, with the goal of living within the world's available resources rather than consuming resources that should suffice two Earths, which is the situation nowadays. To that end, the London 2012 sustainability plan highlights five key themes:

1. **Climate Change:** minimizing greenhouse gas emissions and ensuring all facilities cope with the impacts of climate change.
2. **Waste:** minimizing waste at every stage of the project, ensuring no waste is sent to landfills during Games, and encouraging new waste processing.
3. **Biodiversity:** minimizing the impact of the Games on wildlife and their habitats in and around Games' venues, leaving enhanced habitats where possible, such as the Olympic Park.
4. **Inclusion:** promoting access to everyone, and celebrating the diversity of London and the UK, creating new employment, training and business opportunities.
5. **Healthy living:** inspiring people across the country to take up sport; and develop active, healthy and sustainable lifestyles.

To ensure that London sticks to these promises, the Commission for a Sustainable London 2012 has been set up to monitor the progress of the project and report back to the public.

Much More than "Green"

For London 2012, "sustainability" is far more than being "green". It is deep-rooted into the way of thinking, planning, building, working, buying, and even playing, socializing and traveling. The Games will be a catalyst for change, for the regeneration and improvement of the quality of life in the UK. By 2025, London has committed to reduce carbon emissions by 60%. This will not happen naturally; it can only occur with years of determination and hard work.

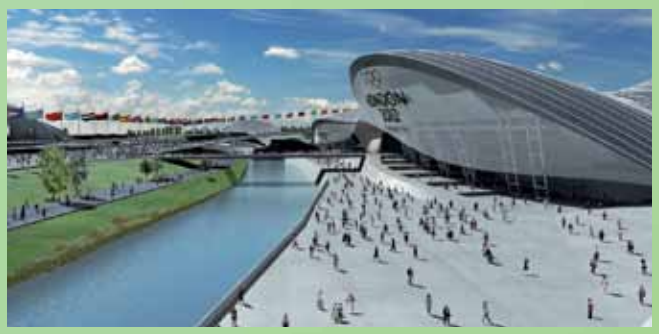
Of course, large, major energy-consuming cities such as London have a responsibility to reduce their carbon emissions. London Mayor, Boris Johnson, said that domestic and commercial buildings, responsible for 70% of CO_2 emissions in London, must be "retrofitted", and that he wanted to create cycle super-highways around the city. "That is one of the things we are hoping to achieve in the Korean summit in Seoul," he said. The Summit will be attended by mayors from 80 cities in 41 countries, including Tokyo, Toronto, Sydney, Jakarta and Sao Paulo, giving them an opportunity to spread the notion of electric vehicles within the public. Moreover, London plans to replace 8,300 outdated diesel buses with low-carbon vehicles. In the next few years, London will embark on a project to produce "a cleaner, greener bus", Johnson said.

Get Ready for Some Sustainable Games!

As sustainability was embedded in the 2012 Games proposal, decisions have been made to use venues already existing in the UK where possible, to rely on permanent structures that will have long-term uses after the Games, with as little temporary structures as possible.

Before working on the Olympic Park site, a report entitled the Environment Statement was produced, focusing on the significant effects of the project on the environment and the necessary measures to manage them. The report considered issues such as air quality, noise, ecology, water quality, flooding and transport.

Before and during construction, measures have been taken to reduce the possible negative effects on the environment and the local community. This includes minimizing noise and dust, protecting waterways from the effects of construction, as well as protecting wildlife by relocating animals and birds to new habitats so they are not affected by construction; these will be returned to the area after construction ends.



And the Journey Continues

Not only does London think of achieving a successful event; the mission does not simply end there. After the Games, the Olympic Park will be transformed into one of the largest urban parks created in Europe for more than 150 years.

The new park will be connected to the tidal Thames Estuary. The canals and waterways of the River Lea will be cleaned and widened, and the natural floodplains of the area will be restored to provide a new wetland habitat for wildlife. The park will be planted with oak, ash, willow, birch, hazel, holly, blackthorn and hawthorn, providing a home for wildlife in mid city.

The world-class sports facilities will be adapted for use by sports clubs and the local community as well as athletes. New playing fields alongside these facilities will be adapted for community use as well. The Athletes' Village, where athletes and officials will stay during the Games, will be converted into homes, mainly for key workers such as teachers and nurses.

Not just that; there will also be further housing built within the Olympic Park site after the Games. Moreover, a range of transport improvements serving the Park are already underway, making access to the open space through a network of canal towpaths, footpaths and cycleways. Economically, the area will be transformed as job and training opportunities will be created for local residents.

The bottom line is the Games will leave the UK a wealthy inheritance of benefits in culture, sport, volunteering, business and tourism. I wonder, will Egypt be able to take by this example one day? Let us look forward to waking up one day to an Egypt that is "the Greenest Country on Earth!"

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Great Expectations

By: Jailane Salem

What will life be like in the future? Over the years, many movies have delved into this subject, exposing the public to other people's vision of what the future might be like. Some have been bleak and ominous visions that showed the disintegration of civilization and the collapse of the pillars of morality or scientific advancement that uphold it. Others, on the other hand, show a future filled with fascinating robots and technological gadgets that have such practical uses that would definitely make life even more interesting than it already is.

Amazingly enough, many futuristic visions of the past have come true over the years in some way or another. As each year brings us new inventions and discoveries, thus taking us one more step closer to the future, let us take a look at new technologies in the making that can eventually lead to the realization of some futuristic vision we have recently seen in some movie.

The Transformers come to Life

When we watch movies such as "Transformers" and see cars turning into big robots, we would never believe that this could actually happen in real life. It is just science fiction, right? Well, the advancement and research that is going on in the field of programmable matter could bring such fictitious scenes to life.

Many scientists are hard at work trying to develop a new technology known as "claytronics". This concept combines nanoscale robotics and computer science to create individual nanometer-scale computers known as claytronic atoms or catoms. These millions of microscopic robots will work together to build 3D objects that can change shape and color, and which the user will be able to interact with.

In the existing design, catoms are only able to move in two dimensions relative to each other. However, in the future, catoms will be required to move in three dimensions relative to each other. This is how it will be able to organize and regroup itself to form 3D objects. The goal of the researchers is to develop a millimeter scale catom with no moving parts; these microrobots will be able to emit variable color and intensity of light, allowing for realistic physical rendering.

Claytronics will offer a more realistic way of communication over long distance known as Pario. Similar to how audio and video provide aural and visual stimulation; pario provides an aural, visual and physical sensation. A user will be able to hear, see and touch the one they are communicating with in a realistic way. Imagine getting a call from a friend in France while you are in Egypt, and being able to spend the evening together watching a movie and chitchatting!

The advancements in nanotechnology and computing necessary for claytronics to become a reality are feasible, but the challenges to overcome are many and difficult; it will require great innovation and perseverance. In December 2008, Jason Campbell, a lead researcher from Intel Labs Pittsburgh said in an interview: "My estimates of how long it is going to take have gone from 50 years down to just a couple more years. That has changed over the four years I have been working on the project".

There is a Sixth Sense After All

In today's world information is abundant and very accessible. Imagine a new technology that selects and provides the relevant information to everything you do during your day. Imagine going to the supermarket and picking up a carton of milk and having all sorts of nutritional comparisons about that brand appear at the mere touch of it.

MIT's Media Lab unveiled a futuristic prototype along those lines known as "Sixth Sense", which combined a webcam and small projector with a wirelessly connected mobile phone. A Sixth Sense demonstration video showed MIT student Pranav Mistry flipping through a book, and then having Sixth Sense automatically search online and project book information onto the cover. Such wearable devices would work together with embedded "smart" systems and tags to create an augmented reality, where staring at a street might bring up GPS coordinates and a local map.

The Good Side of Vampires

One of the unusual powers vampires have is the ability to self-heal, but they are supernatural creatures who only exist in fiction. The human race is prone to being physically sick at one point or another in their life, and the ability to regenerate organs is as of yet impossible. However, new advancements in medicine will soon provide patients with a growing number of different therapies to repair or entirely replace organs in the human body.

A British team grew the world's first artificial liver from umbilical cord stem cells. The resulting "mini-liver" was the size of a small coin; the same technique could be further developed to create a full-size liver. The mini-liver can come in handy as it can be used to test new drugs; thus reducing the number of animal experiments as well as providing results based on a human, rather than an animal, liver. These breakthroughs are the precedents of a future where individually-tailored organs and therapies is quite possible.

Can the Future be Greener?

Some people think that there will be no future for us with the rate of global warming and toxins being dumped into nature. However, for those who have not lost hope and believe in a better tomorrow, scientists are working on new technologies that can turn all our trash into reusable materials.

Food scraps, sewage and other wastes has already begun to fuel some power plants; perhaps in the future we will be able to use all our waste to provide us with power instead of fossil fuels. Moreover, chicken feathers and other agricultural castoffs could become the future of plastics; biodegradable plastics that dissolve harmlessly in seawater might actually encourage people to throw their garbage into the ocean.

Some scientists are even attempting to control the climate and halt global warming. These include releasing reflective particles up into the atmosphere to divert sunlight and cool the planet. Even billionaire Bill Gates joined a patent filing on an idea to slow or stop hurricanes, by deploying a fleet of ships to churn the ocean and cool the warm surface water that fuels such storms.

Who knows what the future truly holds; the pace of change is rapidly increasing over the centuries, and perhaps in the coming decades life will change beyond recognition with all the technological advances taking place nowadays. It seems that science fiction can come true, so why not dream big and maybe, just maybe, our dreams will come true.

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Science on the Big

Science has not always been confined to laboratories and textbooks; it has been a source of interest and inspiration for fiction authors, as well as film makers. Even though science fiction literary works and movie blockbusters have not been accepted by mainstream scientists, writers and artists are always preoccupied with using science as an element in creating their imaginative settings for entertainment purposes or to shed light on a certain philosophical, political or even social issue.

Starting from *Le Voyage Dans La Lune* (A Trip to the Moon), created in 1902 by Georges Méliès, and ending with *Contagion*, an American medical thriller released in 2011, there has been a wide range of science fiction, aka Sci-Fi, movies that have dazzled critics and audiences alike with mind-boggling topics, settings and visions. Throughout this long history of scientific cinematography, most of, if not all, those movies, have shared some characteristics that hallmarked the Sci-Fi movie genre.

Science and Technology, of course!

As in any form of art, cinema in general is meant to reflect what is happening in the world; it would thus be hard to imagine movies, especially Sci-Fi, devoid of advanced machinery and gadgets with all the technological advances going on in the real world.

But when it comes to science, movie makers unleash their creativity and imagination to the extent that they sometimes go beyond the real and accepted mainstream science. Such a need to wow the audiences or desire to draw people's attention to a certain hypothetical threat is sometimes seen as ways of ignoring science in favor of art.

An example of such cases is *Armageddon*; a 1998 American Sci-Fi disaster movie directed by Michael Bay and starring Ben Affleck and Liv Tyler. In *Armageddon*, a team of drillers are sent to an asteroid on its way to strike Earth to split it into two parts they say will fly safely past the planet, completely ignoring Newton's First Law of Motion, which states that "an object will remain at rest or in uniform motion in a straight line unless acted upon by an external force;" meaning the actual result would have been creating two asteroids that would hit Earth instead of just one.

Space Travel and, of course, Aliens

Space movies are quite abundant and are more often than not a huge success at the box office. It seems that outer space has been preoccupying humanity for quite a long time, not just the question of life on other planets but also human life in outer space. Perhaps the most memorable movies of that genre are the likes of *E.T. the Extra-Terrestrial*, the *Alien* series, and *Independence Day*, among many others, where we have seen aliens come to Earth or humans encounter them on space explorations. In some movies, as in *E.T.*, the aliens are friendly, while in other movies aliens are portrayed as vicious enemies who want to rule or destroy Earth.

In reality, there have been simple discoveries in outer space that have made scientists from various fields come up with different hypothesis and speculations about life out there to the extent that some British astronomers believe that intelligent extra-terrestrials almost certainly exist on distant planets beyond our Solar System. These discoveries and speculations have started when scientists started to study other Solar Systems and detect explosions and other significant incidents happening there. In 2015, the European Space Agency intends to launch a mission called Darwin, which will roam around the heavens for life-bearing planets.

The Eternal Time Travel Fantasy

Whether it is a classic, such as the *Planet of the Apes* series, or a box-office hit, such as the *Back to the Future* trilogy, time travel has also been one of the trending themes in Sci-Fi movies.

On the big screen, time travel is a two-way street. Some movies, like the *Back to the Future* trilogy, bring in time travel as a way to change the past, which would consequently have significant changes over the present or even the future. Other movies, such as the *Time Machine*, focus on advanced technological machinery that enables us to see the, ironically often bleak, future. But not all time travel movies depict the use of machinery for travel through time though; there are others that show time travel as attained through an inner source or personal power, such as the 2000s-era films *Donnie Darko* and *The Butterfly Effect*.

In reality, time travel has not been supported yet by sound scientific theories. Whether the laws of physics allow time travel or not, is still an ongoing debate.

Dystopian Vision

As its name entails, "Dystopian Vision" is the complete opposite of "Utopia", which is the ideal or perfect society. In other words, dystopian Sci-Fi movies are those that depict a gloomy atmosphere where repressive controlled states are portrayed. Usually, that depressing view in Sci-Fi movies is used to shed light upon Man's abuse of technology. Sometimes, a dystopian vision is used to draw attention to some cultural, social, political or environmental issues.

One of those dystopian movies that have been praised by both the public and critics is *Children of Men*, which is an American British Sci-Fi movie adapted from a novel under the same name by P. D. James. The movie is set in 2027, when the world has had witnessed two decades of infertility, leaving the world on the "brink of collapse". Other dystopian movies include *Brave New World*, which is based on a novel under the same name by Aldous Huxley. The movie reflects on the ugly side of modern technology where values become meaningless.

The End and Beyond

Apocalyptic movies, which focus mainly on the end of civilization due to a potentially existential catastrophe, have recently been the most popular among this Sci-Fi genre. Post-apocalyptic fiction, on the other hand, is another Sci-Fi genre set in a world or civilization after such a proposed catastrophic disaster.

Since, we are now in 2012, the year with the gloomiest hypothesis about the end of the world, we are going to pinpoint some of the most well-known dystopian/apocalyptic movies, some of which have contributed to the propagation of some ideas and threats as we will see later on.

Deep Impact

A 1998 American movie directed by Mimi Leder, starring Robert Duvall, Elijah Wood and Morgan Freeman, portrays preparations to save Earth after discovering a comet is heading towards it, leading to a massive collision. Unlike so many Sci-Fi movies, *Deep Impact* was found scientifically plausible in theory, despite many follies that could be attributed to what is known as the "artistic license".

The threat embodied in comets hitting Earth can resonate in our minds with the recent 2011 Comet Elenin controversy still fresh in our memory. Comet Elenin was claimed to hit Earth later in the year causing massive destruction. Although such allegations and relative theories were throttled by NASA, panic spread; eventually for no reason.

The Day after Tomorrow

A 2004 American movie directed by Roland Emmerich, starring Dennis Quaid, Jake Gyllenhaal and Sela Ward, portrays the catastrophic effects of global warming, which lead to a new ice age. The movie was a big-budget mega production that paid off at the box-office, but when it came to critics and scientists, the movie was not highly appreciated. According to Yahoo movies, *The Day after Tomorrow* was listed among the 10 Most Scientifically Inaccurate Movies.

By: Noha Rahhal

Screen

The National Center for Atmospheric Research (NCAR), a federal American lab, has explored *The Day after Tomorrow* from a scientific point of view and has responded accordingly to the case scenarios that have been portrayed in the movie and might have stirred fear among the public. A case in point is the incredible decrease of temperature in New York City, which happened in a few hours time. NCAR states that temperatures do not decrease at a too quick rate as shown in the movie, it would take at least decades for such a dramatic event to happen in reality.

In another incident portrayed in the movie, New Delhi is struck by a snowstorm and witnesses an ice age. NCAR has stated that an "ice age" is an exaggerated notion, as research shows that greenhouse effects can lead to cooling the temperature of Earth, but cannot lead to a widespread ice age.

Sunshine

A 2007 British movie directed by Danny Boyle, starring Cillian Murphy, Chris Evans and Michelle Yeoh, suggests that, in 2057, the Sun is dying, plunging the Earth into deep freeze. As one last attempt to save the planet, a missionary crew heads to the Sun to save humanity. The movie was a hit at the box-office and gained critics' praise despite scientific pitfalls pinpointed by scientists.

It is true that scientists expect the Sun to die but not in 50 years from now; it would rather be in 5 billion years or so, when its supply of hydrogen, which acts as a fuel for the nuclear fusion on the Sun, is completely transformed into helium.

I am Legend

An American post-apocalyptic Sci-Fi movie, directed by Francis Lawrence and starring Will Smith, it is the third feature film adaptation of Richard Matheson's 1954 novel under the same title. The movie portrays Will Smith as the last man on Earth. Smith, who plays the role of a military virologist, is desperately trying to save humanity by finding a cure to a virus that was originally supposed to cure cancer but instead wiped out 90% of humanity. *I am Legend* was both a smash hit at the box office and acclaimed by critics.

In real life, there has been a number of pandemics that wiped out millions of people around the world. A case in point is the Black Death, or the Plague, which wiped out one third of Europe's population during the 14th century. The Spanish Flu also wiped out 25 million people worldwide from 1918 till 1919. It has been reported that the movie crew did a lot of scientific research to make their movie scientifically plausible. The movie director, Smith, as well as the movie producers visited the Centers for Disease Control & Prevention to learn about viruses, quarantines, and to vet possible scenarios with real credible experts.

2012

A 2009 American movie directed by Roland Emmerich and starring John Cusack and Danny Glover, suggests the Earth will implode with the end of the Mayan Calendar. The movie was a big hit at the box office worldwide dazzling its audiences with the mega production, sound effects and surely its topic. However, it seems that critics had another say; according to rottentomatoes.com, the movie "provides plenty of visual thrills, but lacks a strong enough script to support its massive scope and inflated length".

When it comes to science, the plot blames the planet-wrecking implosion on neutrinos from a solar flare that heat up the Earth's core, ignoring the fact that neutrinos pass straight through matter, even us, without doing much of anything. Moreover, in 2012, everything happens horrifically rapidly to be scientifically plausible. The truth is the "scientific" elements in the movie that have failed the movie makers are quite numerous.

To name one, there is the issue of huge sunspots shown to be linked to magnetic and electric disturbances, which is true; however, those sunspots could not induce tsunamis or earthquakes, as the movie suggests. Another striking example of failing science in 2012 is the scene where a plane attempts to flee a volcanic eruption and succeeds in the very end after a miraculous act. In reality, this cannot happen as the volcanic ash is made up of ultra-fine glass and pulverized rock pieces that are hazardous to engines and fuel supplies.

These are just a few examples of the scientific fallacies vividly painted by 2012 the movie; keep on reading, you are sure to learn some more.

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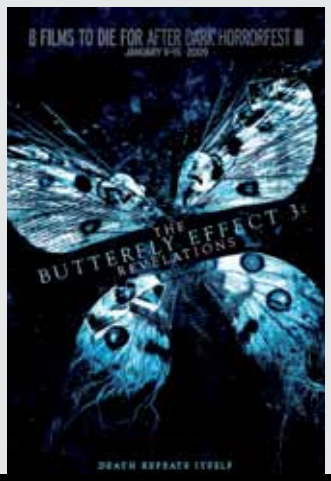

Anatomy of Myth

By: Shahenda Ayman and Sara Khattab

When you think of myth, what would probably pop into your head are ancient depictions of legendary gods and superheroes with fantastical powers. There is, however, much more to myth than heroic legends. As a matter of fact, in ancient times, humans did not have the technology to explain ideas scientifically so they created fictional stories and creatures to explain the mysteries of life and death, the course of the day and night, even creation.

Throughout time, there has been a wide range of myths. Ancient divine myths talked about gods and goddesses that ruled the world, usually featuring exaggerated human traits. Cosmogony myths described the making of the world and universe, while nature myths attempted to explain natural occurrences, such as weather and cosmology.

A myth is not an isolated tale but connects in some significant way with other similar stories within a culture, each having its own mythology. Myths are often entertaining; sometimes they can be morally instructive, and possibly inspirational.

It is no wonder then that the myths that are most communicated today, through books, movies and such, are prestige myths where a hero, king or god is described. One famous prestige myth is the Roman tale of Hercules; half-god and half-man, he possessed incredible strength. Another is that of Achilles, a hero of Homer's Iliad, one of the oldest works of literature.

What makes myths dangerous though is that they are usually developed through verbal tradition as in the telephone game; by the time the last person receives the message, it may be twisted and totally different than the actual story. Ironically enough, among the most commonly believed myths nowadays are scientific myths, some of which we bust here; to learn some more, keep an eye on our upcoming Online Science Magazine at www.bibalex.org/psc.

Scientific Myths Busted

Polaris is the Brightest Star in the Northern Night Sky

Sirius is actually brighter with a magnitude of −1.47 compared to Polaris's 1.97; the lower the number the brighter the star. Polaris is the brightest star in the constellation Ursa Minor; its importance for us is that its position in the sky marks north, hence the title "North Star". Polaris is only the North Star for the time being because stars exhibit a slow continuous drift with respect to the Earth's axis.

There is No Gravity in Space

As a matter of fact, there is gravity everywhere in the universe; without gravity everything would just fly apart. Naturally, the effect of Earth's gravity grows weaker the farther an object is from it; on the space shuttle, however, it is not that far away so the pull of Earth's gravity is about the same as on Earth. It certainly looks like astronauts float around in space shuttles; they even call it "zero gravity"; but the truth is the shuttle and the astronauts in it are in a constant state of free fall towards Earth, always missing it because they are moving forward so fast.

The Moon has a Dark Side

Actually, every part of the Moon is illuminated at sometime by the Sun. This misconception has come about because there is a side of the Moon that is never visible on Earth; this phenomenon is called "tidal locking". A tidally-locked body takes just as long to rotate around its axis as it does to revolve around its partner; this synchronous rotation causes one hemisphere to constantly face the partner.

Meteors are Heated by Friction with the Atmosphere

When a meteoroid enters Earth's atmosphere, becoming a meteor, it is actually the speed compressing the air in front of the object that causes it to heat up. It is the pressure on the air that generates a heat intense enough to make the rock so hot that it glows brilliantly for our viewing pleasure if we are lucky enough to be looking.

We should also dispel the myth about meteors being hot when they hit Earth, becoming meteorites. Meteorites are almost always cold when they hit; in fact, they are often found covered in frost. This is because they are so cold from their journey through space that the entry heat is not sufficient to do more than burn off the outer layers.

The Human Body Pops when Exposed to Space Vacuum

This myth is the result of science fiction movies, which use it to add excitement or drama to the plot. In fact, a human can survive for 15–30 seconds in outer space as long as they breathe out before exposure; this prevents the lungs from bursting and sending air into the bloodstream. After 15 or so seconds, the lack of oxygen leads to unconsciousness, which eventually leads to death by asphyxiation.

Brain Cells Cannot Regenerate

The reason for this myth being so common is that it was believed and taught by the science community for a very long time. It was not until 1998 when scientists discovered that brain cells in mature humans can regenerate. It had previously been long believed that complex brains would be severely disrupted by new cell growth, but the study revealed that the memory and learning center of the brain can create new cells, giving hope for an eventual cure for illnesses such as Alzheimer's.

Lightning never strikes the same place twice

Next time you see lightning strike and you consider running to the spot to protect yourself from the next bolt, don't! Lightning does strike the same place twice; in fact, it is very common. Lightning obviously favors certain areas such as high trees or buildings; in a large field, the tallest object is likely to be struck multiple times until the lightning moves away. The Empire State Building actually gets struck around 25 times a year.

Unfortunately, among the myths that are continuously being generated and propagated, even in this day in time of unprecedented knowledge, more often than not causing mass disturbance among the population, are eschatology myths, which are myths that revolve around the end of the world; the Apocalypse.

Apocalyptic Prophecies Exposed!

It is no secret that, most probably thanks to the 2009 fiction disaster blockbuster movie simply entitled "2012", the most popular myth nowadays is that the world will end in 2012. The new Apocalypse date coincides with the end of an ancient Mayan Calendar, according to which the grand cycle of evolution will culminate on 21 December 2012.

As a matter of fact, history is littered with "end of days" prophecies and theories. Just as some people today believe the Mayan Calendar to had pinpointed 2012 as the end of the world as we know it, some ancient Romans saw the year 79 eruption of Mount Vesuvius as a sign of a coming Apocalypse. It was because Roman philosopher Seneca had earlier predicted the Earth would go up in smoke: "All we see and admire today will burn in the universal fire that ushers in a new, just, happy world," he said, according to the 1999 book *Apocalypses*.

Much later, many Christian Europeans entered the year 1666 with trepidation because the Bible describes 666 as the ominous Number of the Beast. A prolonged plague that had wiped out much of London's populace in 1665 did not help assuage fears, and when the Great Fire of London occurred, many believed their time had come, considering the fire as "dreadful judgment—God's wrath visited at last on a sinful Earth," according to the 2002 book *The Great Fire of London: In That Apocalyptic Year, 1666*.

Among the incalculable notorious "end of days" prophecies of the recent past is that linked to the passing of Haley's comet on 18 May 1910. Though the comet had been visible many times before without any reported deaths, on that occasion, it was rumored to be a deathly threat courtesy of a "poisonous gas" coming from its tail. This may have been the first time science, or pseudoscience, not religious misapprehension, which led to apocalyptic panic.

Scientific prophecies became more common since. Respected meteorologist Albert Porta predicted that, on 17 December 1919, a conjunction of six planets would "cause a magnetic current that would pierce the Sun, and great explosions of flaming gas

that will eventually engulf the Earth." This prediction led to some mob violence and a few suicides; it caused Albert to lose his job as a "respected" meteorologist.

Later on, the "Jupiter Effect" theory came out in 1974; it was written by two astrophysicists, John Gribben and Stephen Plagemann, about all "nine" planets aligning on 10 March 1982 to create a gravitational pull that would cause a huge increase in sunspots, solar flares, and/or earthquakes. Many took this as a prediction, even though author Gribben said it was a theoretical "what if" without much of any real substance behind it; people believed it was going to happen and would not be deterred.

In the curious case of comet Hale-Bopp, the comet was visible to the naked eye for a record 18 months. Amateur astronomer, Chuck Shramek "observed" a companion object following the comet, leading many to believe a variety of "end of the world" theories. The Internet helped spread the word even faster and the "Heaven's Gate" cult felt this was their signal to commit mass suicide in March 1997, believing the companion object to be a spaceship coming to pick them up by leaving their Earthly vessels behind.

Borrowing from Nostradamus, the 16th-century French author Charles Berlitz predicted catastrophe in his 1981 book *Doomsday 1999*. Berlitz warned that 1999 could inflict flood, famine, pollution and a shift of Earth's magnetic poles. He also spotlighted the planetary alignment of 5 May 2000, and warned that it could bring solar flares, severe earthquakes, "land changes" and "seismic explosions".

However, the most widely spread scare of recent times where the world got all worked up over the mystical turning of a calendar was the false Millennium of 1 January 2000; never mind the actual Y2K computer-date bug. Scary and/or hopeful books were published about the moment's prophetic potential to catch an immense cosmic wave and change everything for either good or ill. In the 1990s, an entire "Earth Changes" movement swelled into being as the end of the century neared, with all sorts of Millennial expectations; earthquakes, plagues, polar axis shifts, continents sliding into the sea, Atlantis rising and more.

When 1 January 2000 came and went with nothing worse than ski-lift passes printing the date as 1900, the focus shifted to "5/5/2000" several months later. Most believers in the power of planetary alignments forgot the failure of earlier lineups, as in the case of the "Jupiter Effect", to induce disaster.

Arriving at the 2012 prophecy, what has added fuel to the fire is that the end of the Mayan Calendar coincides with a galactic alignment, in which the Sun aligns with the center of the Milky Way galaxy on the day of the winter solstice; 21 December 2012.

It is hypothesized that this galactic alignment has the potential to create a sudden shift in the Earth's poles where the North and South Poles of the Earth interchange, initiating the 2012 apocalypse, which would involve a series of disastrous environmental events. Not only that, but all sorts of predictions have been thrown into the lot, including stories predicting devastation by means of cosmic visitors; Planet X or Nibiru, a comet or an asteroid; even the Sun is a suspect.

Throughout history, people have believed in myths; repeating, spinning and spreading them so far that, at times, they are taken for granted and treated as truths. With the expansion of our knowledge and capabilities, we should at least attempt to find out the scientific truth behind hearsay, rather than blindly following it as most people do. Let us start by investigating the looming 2012 prophecy.

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Planetarium Scoop

Rogue Planets Revealed

By: Maissa Azab

"Free-floating planets had been predicted; they have finally been detected," said Mario Perez, Exoplanet Program Scientist, NASA Headquarters, Washington. "[This has] major implications for models of planetary formation and evolution".

Over the past two decades, astronomers have identified more than 500 planet-like objects outside our Solar System; most of these "exoplanets" orbit stars. The few that do not could be either free-floating planets or stars themselves; astronomers have not been sure because their mass is uncertain. Anything less massive than about 13 times the size of Jupiter is generally considered a planet, while anything between about 13 and 80 times the size of Jupiter is a small star known as a brown dwarf.

In May 2011, a team of astronomers announced the breakthrough discovery of a new class of Jupiter-sized planets floating alone in the dark of space, away from the light of a star. The team believes these lone worlds, also known as orphan planets, are probably outcasts from developing planetary systems; they are thought to be at least as common as planets that orbit stars, and could be twice as numerous as the stars themselves.

"It is not surprising that there are such free-floating planets," says Astrophysicist Takahiro Sumi of Osaka University in Japan and the leader of the team that made the discovery; "but it is surprising that they are so common".

According to astronomical convention, planets orbit a star or stellar remnant, so if these objects do not have a host star, then they are not technically planets, even if they may have formed in the same way as planets. Indeed, researchers hypothesize these objects were formed in a planetary disc, like the planets in our own Solar System, before gravitational forces ejected them from these systems.

Professor Joachim Wambsganss of the University of Heidelberg in Germany said this was the "most plausible theory"; however, he added there was a minority view that planets could form the same way that stars do, but fail to reach the critical point of thermonuclear ignition. He also agreed the most "shocking" element of the data was the projected frequency of such objects.

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2012 TRUTH, FICTION, and the POPULAR Imagination

By: Lamia Ghoneim

As the Earth's core gets cooked up by neutrinos, major cities will be crushed by a variety of natural disasters; giant waves will rush over the highest peaks of the Himalayas, volcanoes will erupt and explode, shattering earthquakes will wipe out city after city as the Earth's crust collapses and human kind is utterly wiped out. That is what happened in the movie.

Actually, there are several other possible scenarios. From a killer solar flare or a magnetic polar shift, to a flu pandemic or a nuclear accident; fiction and popular imagination have provided us with plenty "end of the world" predictions.

We have all heard these doomsday prophecies before, yet, we are still here, and the planet is still here; then why is 2012 generating that much attention? What makes the 2012 phenomenon much bigger than any other prediction, with thousands of people terrified and buying survival kits and building underground shelters?

Well, on 21 December 2012, the Mayan Long Count Calendar will end a cycle of more than 5,000 years, stirring up all sorts of scientific, astrological and historical claims by some as to why the end of this calendar, in their opinion, foretells the end of life as we know it.

Although the idea of any global event occurring during 2012 is largely rejected by the scientific community and by Mayanist scholars alike, the 2012 phenomenon remains very popular and appears to be worrying a significant amount of people who claim many "theories" to support it. A quick search on Google will show you the extreme number of sites (3,510,000,000) that are devoted to the 2012 prediction. Another on Amazon will show you how many books (130,133) have 2012 as their theme. And, of course, there is the infamous 2012 movie, the 2012 TV series, the 2012 documentaries, not to mention the hundreds of thousands of videos posted on the Internet to warn us of the impending doom of 2012.

Since the clock is ticking and panic must be on the rise, it is time to ease the fear by uncovering the truth, dispelling the myths, exposing the fiction, and dismissing the popular imagination. We shall thus visit each claimed "theory" and explain it, debunking it using critical thinking and actual scientific evidence.

Theory 1: The Mayan Prophecy

The "End of the World" forecast date of 2012 is mainly based on what is believed to be the end date of the Mesoamerican Long Count Calendar. The Long Count Calendar, famously known as the "Mayan Calendar", is actually only one of three calendars developed by the ancient Mayans.

The calendar begins with the identification of a day by counting the number of days since a mythical creation date. That date corresponds with 11 August 3114 BCE; there is no evidence that the day corresponds with any historical event.

As the Mayan Long Count Calendar is a base-20 calendar, it keeps time in units of 20. The smallest division on the calendar is called a *k'in*, which represents one day. One *winal* or 20 k'in represent 20 days, while one *tun* or 18 winal represent 360 days. The larger division of one *k'atun* equals 20 tuns or 7,200 days and one *b'ak'tun* equals 20 k'atun or 144,000 days. For example in Long Count representation, a date would look like 0.0.0.1.5, which corresponds to 25 days while the date 0.0.0.2.0 would represent 40 days.

This base-20 cycle is believed to continue until it reaches 13 b'ak'tuns, at which point the cycle ends and shifts to a higher order. This date appears as 13.0.0.0.0 and roughly corresponds to 21 December 2012, or approximately 5,125 years after the creation date. But, does that mean that the long count calendar ends on that date?

Mayan archeoastronomers are in debate as to whether the Long Count is designed to be reset to 0.0.0.0.1 after 13.0.0.0.0, or whether the calendar simply continues to 20.0.0.0.0 and then reset. As Karl Kruszelnicki brilliantly writes "… when a calendar comes to the end of a cycle, it just rolls over into the next cycle. In our Western society, every year, 31 December is followed, not by the End of the World, but by 1 January. So 13.0.0.0.0 in the Mayan calendar will be followed by 0.0.0.0.1, or good-ol' 22 December 2012, with only a few shopping days left to Christmas."—Excerpt from Dr. Karl's *Great Moments* in Science.

Although this date is believed to be significant in Mayan history, there is no evidence that the Maya ever predicted anything catastrophic to happen on this day. Many scholars who have relentlessly studied the scattered evidence on Maya monuments insist that the Empire did not leave a clear record predicting that anything specific would happen in 2012.

Contrary to the "doomsday" interpretation, many Mayan scholars claim that the Maya would have viewed the day as one to celebrate the end of one cycle and the beginning of another "For the ancient Maya, it was a huge celebration to make it to the end of a whole cycle" says Sandra Noble, Executive Director of the Foundation for the Advancement of Mesoamerican Studies in Crystal River. "To render 21 December 2012, as a doomsday or moment of cosmic shifting", she says, "is a complete fabrication and a chance for a lot of people to cash in."—USA Today

The "Mayan prophecy" is in fact considered news to the modern Maya in Guatemala and Mexico. Instead, they view the burgeoning end-of-the-world 2012 industry with a mixture of confusion, exasperation and anger at what is perceived as a Western distortion of their traditions and beliefs. Jesus Gomez, Head of the Guatemalan Confederation of Mayan Priests and Spiritual Guides tells *The Sunday Telegraph* "there is no concept of apocalypse in the Mayan culture."

Theory 2: Galactic Alignment Spells Doom

One major, and apparently catastrophic, event that people are predicting on 21 December 2012 is a rare "galactic alignment" that will expose Earth to powerful unknown galactic forces, hastening its doom, perhaps through a "pole shift" or the stirring of the super massive black hole at our galaxy's heart. A few researchers claim that the Maya set their calendar to end specifically on this event.

Just like the Earth orbits the Sun, the Sun itself orbits the center of the Milky Way; it also bobs up and down as it travels in its orbit, each oscillation taking 64 million years to complete. There is a moment when the Sun passes directly through the galactic disk and there is a perfect galactic alignment between the Sun and the center of the galaxy; however, the timescales are so long that astronomers could not calculate it. According to an article posted on NASA website by E. C. Krupp, Director of Griffith Observatory: "this alignment with the center of the galaxy does not have an effect on the Earth or the Solar System; it is just like crossing an imaginary line in space, like traveling from Canada to the United States by car."

The more common type of galactic alignment occurs when the Earth, Sun and the center of the galaxy are in perfect alignment from our perspective, which actually happens on 21 December, the winter solstice, every year. These types of alignments have absolutely no effect on our planet; they create no changes in gravitational pull, solar radiation, planetary orbits, or anything else that would impact life on Earth.

In a 1975 book, Dennis and Terence McKenna calculated the Baktun-13 end date right; they also noted that the date is the winter solstice, when the Sun will be "in the constellation Sagittarius, only about 3 degrees from the Galactic Center, which, also coincidentally, is within 2 degrees of the ecliptic." The McKennas continued, "Because the winter solstice node is precessing, it is moving closer and closer to the point on the ecliptic where it will eclipse the galactic center." In reality, this event will never happen, but it hardly matters; the McKennas linked the whole arrangement with the concept of renewal and called 2012 a moment of "potential transformative opportunity."

2012, the movie, envisions a Maya-predicted "pole shift", triggered by extreme gravitational pull on the planet—courtesy of a rare "galactic alignment"—and by massive solar radiation destabilizing the inner Earth by heating it. The hypothesized pole shift will allow the planet's crust and mantle to abruptly shift, spinning around the liquid-iron outer core like an orange peel spins around its fleshy fruit.

Scientists dismiss such drastic scenarios as impossible, except maybe if a large mass such as an asteroid or a planet hits the Earth, which would have been detected years ago. However, some researchers have speculated that a subtler shift could occur—for example, if the distribution of mass on or inside the planet changed radically, due to, say, the melting of ice caps.

Princeton University geologist Adam Maloof who has extensively studied pole shifts states that magnetic evidence in rocks confirm that continents have undergone such drastic rearrangement, but the process took millions of years—slow enough that humanity would not have felt the motion.

Theory 3: Cosmic Shockers Aim at Earth

Some say it is out there; a mysterious Planet X, aka Nibiru, on a collision course with Earth—or at least a disruptive flyby. A direct hit would obliterate Earth, it is said. Even a near miss, some fear, could shower Earth with deadly asteroid impacts hurled our way by the planet's gravitational wake. Since a lot of weight had been placed on the end the Long Count calendar, Planet X supporters seem to have calculated that this hypothetical, deadly planet will reach us on the same day the Mayan calendar ends in 2012.

Could such an unknown planet really be headed our way in 2012, even just a little bit? When NASA was asked, the answer was a definite "No". They even issued an official statement: "Nibiru and other stories about wayward planets are an Internet hoax. There is no factual basis for these claims. If Nibiru or Planet X were real and headed for an encounter with the Earth in 2012, astronomers would have been tracking it for at least the past decade, and it would be visible by now to the naked eye. Obviously, it does not exist".

The origins of this theory actually predate widespread interest in 2012. Popularized in part by a woman who claims to receive messages from extraterrestrials, the Nibiru doomsday was originally predicted for 2003; it obviously did not happen.

In other 2012 disaster scenarios, our own Sun is the enemy. It is rumored that the Sun will produce lethal eruptions of solar flares, turning up the heat on Earthlings. Surprisingly, this scenario is actually based on some science.

There may be some correlation between the 11-year solar cycle and the time cycles seen in the Mayan calendar, perhaps this ancient civilization understood how the Sun's magnetism undergoes polarity changes every decade or so. Fact is, solar activity waxes and wanes according to approximately 11-year cycles. Big flares can indeed damage communications and other Earthly systems, although engineers are learning how to build electronics that are protected against most solar storms.

Are we going to get roasted from the Sun this year? The short answer is, once again, "No". The longer answer is a little more complicated. Whilst a solar flare from our Sun, aimed directly at us, could lead to secondary problems, such as satellite damage and injury to unprotected astronauts and blackouts, the Earth is actually very well protected, and the flare itself is not powerful enough to destroy Earth, certainly not in 2012. The next solar maximum, as predicted by NASA, is in the 2012-2014 timeframe and is expected to be an average solar cycle, no different than previous cycles throughout history.

While we have proven that the 21 December 2012 prediction is rather a myth, this does not necessarily mean that the world will not end on this day, or on any other day for that matter. Indeed, the concept of doomsday and the apocalypse is a common belief of all religions; and, as we believe that that day will come, we also believe that only God holds the knowledge of Judgment Day.

"*Indeed, Allah [alone] has knowledge of the Hour and sends down the rain and knows what is in the wombs. And no soul perceives what it will earn tomorrow, and no soul perceives in what land it will die. Indeed, Allah is Knowing and Acquainted*" (Holy Quran, Surat Luqman, 31:34)

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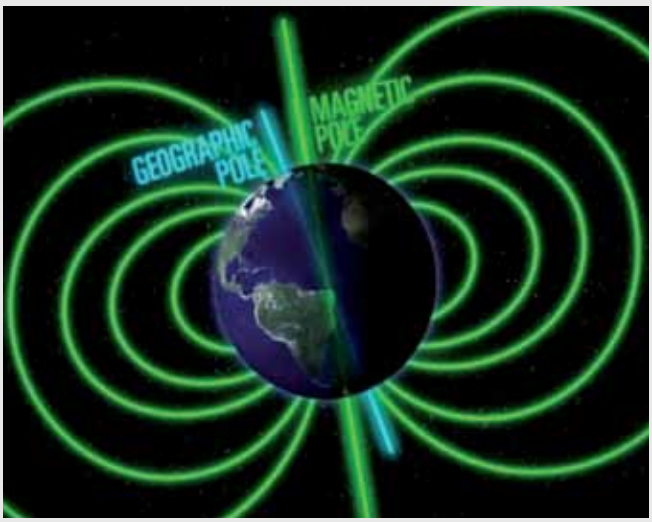


How does Science Trump Myth?

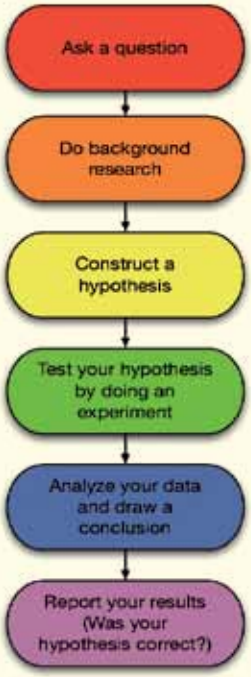
By: Aisha Hassanein

In April 2011, Bosnian scientist Dr. Mensur Omerbashich published a paper claiming that, when planetary bodies align with Earth, earthquake activity increases. To support his theory, he provided historical data showing that earthquakes of magnitude 6 and above have all occurred during such alignments. According to his theory, 26 September 2011 should have seen disastrous; devastating earthquakes, however, did not happen, which made me wonder where Dr. Omerbashich went wrong, and where Galileo on the other end of the spectrum, for instance, went right. As a matter of fact, how do scientists come up with valid theories at all?

The scientific method is the answer I found; it is the process by which scientists attempt to construct an accurate representation of the world we live in. Knowing that personal and cultural beliefs influence our perceptions and interpretations of natural phenomena, through the scientific method, scientists use standard procedures and criteria to minimize those influences when developing a theory.

Four Steps

1. Observation and description of a phenomenon or group of phenomena;
2. Formulation of a hypothesis to explain the phenomena;
3. Use of the hypothesis to predict the existence of other phenomena; then,
4. Testing the predictions through properly performed experiments conducted by several independent experimenters.



If the experiments support or confirm the hypothesis, it may come to be regarded as a theory or law of nature; if they do not, however, the hypothesis must be rejected or modified. No matter how elegant a theory is, its predictions must agree with experimental results if we are to believe that it is a valid description of nature.

It should also be noted that the necessity of experimentation implies that a theory must be testable. Theories that cannot be tested, because, for instance, they have no observable consequences, do not qualify as scientific theories.

It is often said that, in science, theories can never be proved, only disproved; there is always the possibility that a new observation or a new experiment will conflict with a long-standing theory.

Albert Einstein put it this way: "No amount of experimentation can ever prove me right; a single experiment can prove me wrong".

Einstein vs. Newton

If the predictions of a long-standing theory are found to be in disagreement with new experimental results, the theory may be discarded as a description of reality, but it may continue to be applicable within a limited range of measurable parameters.

For example, the laws of classical mechanics (Newton's Laws) are valid only when the velocities of interest are much smaller than the speed of light. Since this is the domain of a large portion of human experience, the laws of classical mechanics are widely, usefully and correctly applied in a large range of technological and scientific problems.

In nature, however, we observe a domain in which velocity is not small. The motions of objects in this domain, as well as motion in the "classical" domain, are accurately described through the equations of Einstein's theory of relativity. We believe, due to experimental tests, that relativistic theory provides a more general and, therefore, more accurate description of the principles governing our universe, than the earlier "classical" theory.

Ptolemy's Fallacy

We are all familiar with theories that had to be discarded in the face of experimental evidence. In the field of astronomy, the Earth-centered description of the planetary orbits was overthrown by the Copernican system, in which the Sun was placed at the center of a series of concentric, circular planetary orbits. Later, this theory was modified, as measurements of the planetary motions were found to be compatible with elliptical, not circular, orbits.

Error in experiments has several sources. There are errors inherent in instruments of measurement. Because this type of error has equal probability of producing a measurement higher or lower than the "true" value, it is called random error. On the other hand, there is non-random or systematic error due to factors that bias the result in one direction.

To Err is Human

When testing a hypothesis or a theory, the scientist may have a preference for one outcome or another. It is important that this preference not bias the results or their interpretation. The most fundamental error is to mistake the hypothesis for an explanation of a phenomenon, without performing experimental tests. Sometimes "common sense" and "logic" tempt us into believing that no test is needed.

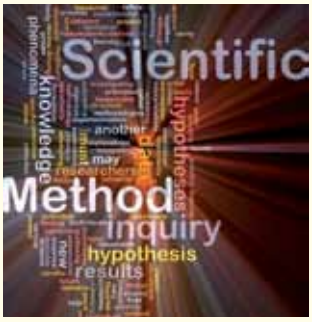
Another common mistake is to ignore or rule out data that does not support the hypothesis. Ideally, the experimenter is open to the possibility that the hypothesis is correct or incorrect. Sometimes, however, a

scientist may have a strong belief that the hypothesis is true (or false), or feels internal or external pressure to get a specific result. In that case, there may be a psychological tendency to find "something wrong" with data that does not support the scientist's expectations, while data that does agree with those expectations may not be checked as carefully. The lesson is that all data must be handled in the same way.

Another common mistake arises from the failure to estimate methodical errors. There are many examples of discoveries that were missed by experimenters whose data contained a new phenomenon, but who explained it away as a systematic background. Conversely, there are many examples of alleged "new discoveries" that later proved to be due to systematic errors not accounted for by the "discoverers".

In a field where there is active experimentation and open communication among members of the scientific community, the biases of individuals or groups may cancel each other out, because experimental tests are repeated by different scientists who may have different biases. In addition, different types of experimental setups have different sources of systematic errors. Over a period spanning a variety of experimental tests, a consensus develops in the community as to which experimental results have stood the test of time.

Hypotheses, Models, Theories and Laws



In physics and other science disciplines, the words "hypothesis", "model", "theory" and "law" have different connotations in relation to the stage of acceptance or knowledge about a group of phenomena.

A **hypothesis** is a limited statement regarding cause and effect in specific situations; it also refers to our state of knowledge before experimental work has been performed and perhaps even before new phenomena have been predicted.

To take an example from daily life, suppose you discover that your car will not start. You may say "My car does not start because the battery is low"; this is your first hypothesis. You may then check whether the lights were left on, or if the engine makes a particular sound when you turn the ignition key. You might actually check the voltage across the terminals of the battery. If you discover that the battery is not low, you might attempt another hypothesis: "The starter is broken", or "This is not my car!"

The word **model** is reserved for situations when it is known that the hypothesis has at least limited validity. An often-cited example of this is the Bohr model of the atom, in which, in an analogy to the solar system, the electrons are described as moving in circular orbits around the nucleus. This is not an accurate depiction of what an atom "looks like", but the model succeeds in mathematically representing the energies, of the quantum states of the electron in the simplest case, the hydrogen atom.

Another example is Hook's Law, which should be called Hook's principle or Hook's model; it states that the force exerted by a mass attached to a spring is proportional to the amount the spring is stretched. We know that this principle is only valid for small amounts of stretching; the "law" fails when the spring is stretched beyond its elastic limit. This principle, however, leads to the prediction of simple harmonic motion, and, as a model of the behavior of a spring, has been versatile in an extremely broad range of applications.

A scientific **theory** or **law** represents a hypothesis, or a group of related hypotheses, that has been confirmed through repeated experimental tests. Theories in physics are often formulated in terms of a few concepts and equations, which are identified with "laws of nature", suggesting their universal applicability. Accepted scientific theories and laws become part of our understanding of the universe and the basis for exploring less well-understood areas of knowledge.

Theories are not easily discarded; new discoveries are first assumed to fit into the existing theoretical framework. It is only when, after repeated experimental tests, the new phenomenon cannot be accommodated that scientists seriously question the theory and attempt to modify it.

The validity that we attach to scientific theories as representing realities of the physical world is to be contrasted with the crude invalidation implied by the expression "it is only a theory". For example, it is unlikely that a person will step off a tall building on the assumption that they will not fall, because "gravity is only a theory".

Changes in scientific thought and theories occur, of course, sometimes revolutionizing our view of the world. Again, the key force for change is the scientific method, and its emphasis on experiment.

When is the Scientific Method not applicable?

While the scientific method is necessary in developing scientific knowledge, it is also useful in everyday problem-solving. What do you do when your telephone does not work? Is the problem in the handset, the cabling inside your house, the hookup outside, or in the workings of the phone company? The process you might go through to solve this problem could involve scientific thinking, and the results might contradict your initial expectations.

Like any good scientist, you may question the range of situations outside science in which the scientific method may be applied. From what has been stated above, we determine that the scientific method works best in situations where one can isolate the phenomenon of interest, by eliminating or accounting for extraneous factors, and where one can repeatedly test the system under study after making limited, controlled changes in it.

There are, of course, circumstances when one cannot isolate the phenomena, or when one cannot repeat the measurement over and over again. In such cases the results may depend in part on the history of a situation; this often occurs in social interactions between people. For example, when a lawyer makes arguments in front of a jury in court, she or he cannot try other approaches by repeating the trial over and over again in front of the same jury. In a new trial, the jury composition will be different; even the same jury hearing a new set of arguments cannot be expected to forget what they heard before.

The scientific method is intricately associated with science, which is the process of human inquiry that encompasses the modern era on many levels. In this introduction, we have emphasized that the scientific method distinguishes science from other forms of explanation because of its requirement of systematic experimentation. We have also tried to point out some of the criteria and practices developed by scientists to reduce the influence of individual or social bias on scientific findings. Further investigations of the scientific method and other aspects of scientific practice may be found in the references listed below:

http://www.sciencebuddies.org/science-fair-projects/project_scientific_method.shtml
http://news.exopoliticsinstitute.org/index.php/will-comet-elenin-cause-major-earthquakes-as-it-approaches-earth/

Illustrations: Maha Sherin

Mother Earth: In 2012, i hope for an End to Global Warming, Biodiversity Salvation, Tolerance & Dialogue, World Peace, Understanding & Harmony among peoples.

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