

What if the Moon didn't exist?

QUAMRUL HAIDER

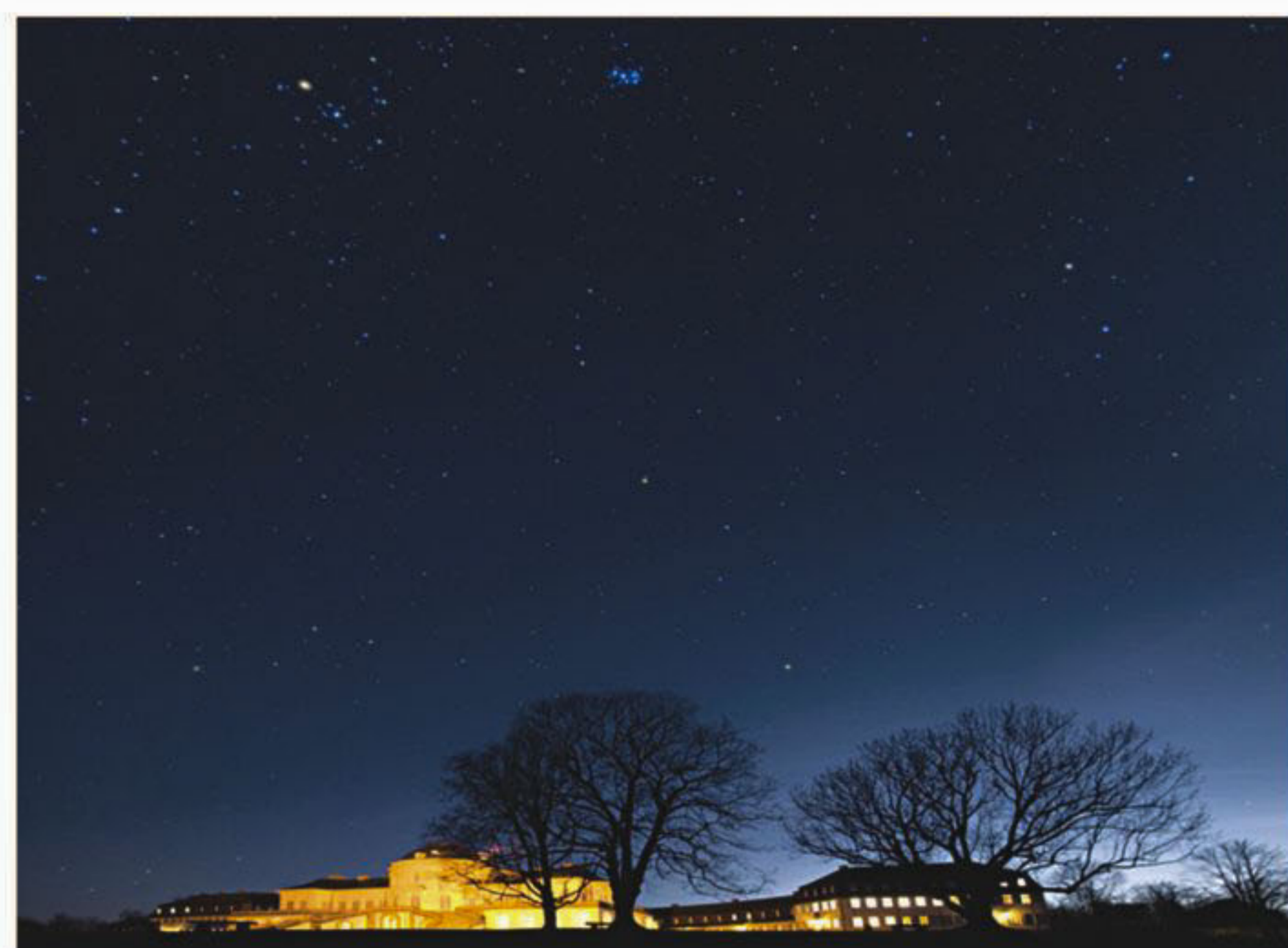
APPROXIMATELY 4.4 billion years ago, a Mars-sized object called Theia collided with the Earth, blowing out a huge chunk of matter that eventually became the Moon, our "light in the nocturnal sky." The glancing collision caused the Earth to spin faster about its axis and day-night cycle decreased from 8 hours to 5 hours.

For centuries, many myths have been woven about the Moon. She is an Arctic Sea Demon to the Inuit, a Changing Woman to the Navajo, "Chand Mama" to a Bangali, and "a friend for the lonesome to talk to." Women appeal to the Moon for fertility and calendars follow her motion. Lovers court each other under a full moon while others are believed to morph into werewolves.

What if Theia did not collide with the Earth? What would Earth be like without the Moon? What would life be like on a moonless Earth?

The most obvious effect of the Moon is tides – a consequence of the gravitational pull exerted on Earth by the Moon. A moonless Earth would still have tides due to the Sun's gravitational pull. But the Sun being 390 times farther away from us than the Moon is, tides will at most be one-third as high.

Tidal friction slowed down Earth's rotational period from 5 hours 4.4 billion years ago to 24 hours today (TDS 5-21-13). Without the Moon, the Sun-induced tidal friction would not be strong enough to slow down the Earth to its present rate of rotation. Instead, a day now would be 8



hours long and a year will have 1,095 days.

Our biological clock that regulates sleeping, walking, eating, and other cyclic activities is based on a 24-hour day. Faced with an 8-hour day, these circadian rhythms would be hopelessly out of sync with the natural world.

Due to moonless Earth's rapid rotation, we will be subjected daily to gale force winds with speed in excess of 100 miles per hour. Hurricanes and tornadoes would have even higher wind speeds. Trees with shallow root systems will be easily knocked down by the strong winds. Tree-dwelling

life would have a difficult time surviving, since tall trees would sway more wildly. Clearly, birds battling the ever present winds do not seem to be a likely bet on a moonless Earth, nor do naked apes.

With continuous high winds, ocean waves would be enormous and perpetual. Under these circumstances, amphibians would certainly be pulverized to a pulp rather than being able to sedately walk onto land and then back into the water.

Obviously without the Moon there will be no eclipses or moonlight. Cloudless nights will be dark and star-filled.

Nocturnal animals would, therefore, be less successful in hunting, foraging, and traveling.

The Moon acts as a stabilizing force keeping the tilt of the Earth's rotational axis to 23.5 degrees with respect to the perpendicular to its orbital plane. The tilt makes the Earth habitable with moderate seasons and prevents temperature extremes. Without the Moon, the tilt would wobble between 85 and 90 degrees. This would make the Sun shine almost directly above one of the poles for half of the year, making the length of a day and the summer season almost equal.

Additionally, the rapidly rotating Earth will be unstable to the extent that the poles would periodically flip. This flipping would create enormous stress on the Earth's geology leading to catastrophic earthquakes, volcanic activity, and tsunamis. Such a planet would be incomparably inhospitable to life.

We are what we are today because of the challenges faced by our progenitors. An Earth without a Moon would clearly provide challenges of its own. But given enough time, complex form of life would probably evolve.

What would be different about life on a moonless Earth compared to life on Earth today? Since creatures evolving there would have to withstand the perpetual pounding from winds and debris they carry, animals including humans with turtle-like shells or rhino-like skins are perhaps one solution.

The writer is a Professor of Physics at Fordham University, New York.

SMART ANGLE

Novel way to boost solar panel's output

MAYESHA TASHNIL

LIKE many nations worldwide, a booming population and continuously depleting natural resources has seen Bangladesh struggle to meet the energy needs of its 160 million people. Encouragement from the government in the form of policy support and implementation programmes such as IDCOL's (Infrastructure Development Company Limited) Solar Home System has seen solar power become the most reliable source of alternative energy, particularly in rural areas of the country.



Driven by demand and policy support, the energy-deprived people have found solar power an affordable and suitable option compared to the out-of-reach national grid. Nowadays, many houses in the rural areas have rooftop solar panels. These panels are mainly for illuminating solar light bulbs, running small fans and operating small televisions.

While studying at the University of Calgary, Canada, I met two young inventors who have recently come up with a solution to the unfulfilled desire of solar power users. Bruce Gao and Matt Privman, two undeniable geniuses, have invented an application called SimplySolar, which is capable of increasing the efficiency of solar panels to produce up to 40% more electricity. The application does the same job as expensive solar panel trackers but at a fraction of the cost.

As a recipient of the inaugural Schulich Leadership Scholarship, Bruce is currently studying Honors Neuroscience, while Matt, like me, is a recipient of the Schulich Engineering scholarship – the largest scholarship of such category in Canada.

The idea and need for the app came during a vacation Bruce spent volunteering at an orphanage in China. "I noticed that the children around me were huddled together for warmth because the orphanage did not have adequate heating," Bruce explained. After discovering that the rooftop solar panels needed to be moved to trap more sunlight, Bruce went to a wifi hotspot, and created an algorithm which could move the panels.

"Using the algorithm, an angle was produced, which the orphans and I used to align the solar panels. After a while I noticed that the hot water faucet finally worked and the room was considerably warmer," he said.

Upon returning to Calgary, he approached his classmate, Matt, to help develop an application which would be able to help align solar panels by providing a step by step guide. "About a week later, we had an app that accepted GPS coordinates, date and time and ran the data through Bruce's code and output two angles which aligned a solar panel directly with the sun for the information given," Matt said.

The application launched is currently available in both Android and iOS. Using mobile phones, the application, when used with the provided scheduling tool, enables solar panels to manually track the sun by providing diagrams and visual instructions.

While juggling their academic obligations, the cofounders saw SimplySolar become associated with United Nations Practitioner's Network and Light Up The World Foundation. The app currently has 921 active installations in Africa and China.

The team believes that if the app were to be used here, users would not only be able to power more household appliances such as TVs and fridges, but it would also stimulate the work economy. If an entire area or village has just one person with a low-end smart phone, the owner will be able to charge others for using the app.

Matt suggests, the technicians of solar panel providers in Bangladesh can own the application and use it to set up solar panels or maybe even distribute it to clients. The link for downloading the application can be provided to companies affiliated with SimplySolar who can then give it to their clients.

Currently available for free on the respective app stores with no maintenance cost involved and the rising demand for clean energy, it is undoubtedly that, if used properly, the application can benefit the people of this country.

The writer is studying chemical engineering specializing in energy and environment at the University of Calgary. She can be contacted at mayesha@solarsquared.com

LONG BATTLE

Malaria vaccine tested

THE long, bumpy path to a malaria vaccine may have hit a smooth stretch as an early-stage study finds that multiple injections with inactivated malaria parasites can protect against the disease.

The findings are tantalizing but preliminary. The study was small, and the vaccine required five intravenously delivered doses to work, which would be an obstacle for teams attempting mass vaccination in developing countries. Also, the shots were tested in adults, not children, who are the prime victims of malaria.

Still, the study offers decidedly good news, says Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases in Bethesda, Md., which sponsored the research. "This is an important advance," he says, noting that the vaccine induces an immune onslaught that kills the malaria parasite in its infective sporozoite stage. That means uninfected mosquitoes that bite a vaccinated person wouldn't get infected, slowing the disease's spread, he says.

In the study, researchers gave four or five shots to 15 volunteers over several months. The volunteers were then bitten repeatedly by malarial mosquitoes. A few weeks afterward, 12 showed no disease, including all six who got five doses, the researchers report August 8 in Science. A control group of unvaccinated volunteers got the disease and received treatment promptly.



Scientists already knew that weakened versions of malaria sporozoites could induce immunity in people. To turn the sporozoites into a vaccine, scientists need to irradiate infected mosquitoes, and use the weakened parasites to elicit an immune response in people. In the new study, scientists mastered the delicate task of attenuating the parasites just enough so that they don't replicate and cause disease, but leaving them active enough to trigger an immune response that would kill any full-strength sporozoites introduced by subsequent mosquito bites. The researchers also effectively delivered the vaccine into volunteers — albeit with IV injections.

In earlier tests, this vaccine failed to gin up adequate immunity when given by shots into the skin, which are easier to deliver.

"This is the first step towards success with this approach," says Denise Doolan, a molecular immunologist at the Queensland Institute of Medical Research in Herston, Australia. "It has taken enormous dedication and perseverance to achieve this result, and [the researchers] should be congratulated."

Study coauthor Robert Seder, a physician and immunologist at NIAID, says the research team plans to test the vaccine in more people and find out how long the protection lasts. A field trial is planned in Tanzania.

Doolan says simpler and fewer shots are needed for far-reaching vaccination campaigns. If such a vaccine can be developed, she says, it should "have a dramatic impact on public health."

Meanwhile, Seder says, the IV vaccine — if fully tested and approved — might be useful for protecting health officials, military forces and travelers. Fauci cautions that while this vaccine showed effectiveness against one strain of Plasmodium falciparum, the parasite that causes the most severe kind of malaria, the vaccine will have to prove itself against other strains.

Source: Science News

SCIENCE BRIEF

LONY AZADI

Making chemicals:

Chemists use chemical reactions to make plastics, medicines, dyes, and many other materials that are important in everyday life. They also study what substances are made of and how they can be combined to make new materials. Chemicals are the raw materials used by a chemist. More than 4 million different chemicals have been made by chemists; there are about 35,000 chemicals in common use. These chemicals can be made by combining simple substances, called elements, into more complicated substances called compounds. Early chemists consid-

ered four elements—fire, water, air, and earth. Today, we know there are 92 that occur in nature, and a few others that can be made in laboratories. The most common element in the universe is hydrogen, which is the main component of stars.

Chemistry of water:

When different substances combine together to form new materials, a chemical reaction occurs. Some reactions need heat to start them off; others produce heat as the reaction proceeds.

Chemists use a shorthand to describe chemicals. H₂O is the symbol for water and shows that each water molecule contains two hydrogen atoms (H) and one oxygen atom (O).



QUOTABLE Quotes

"There are those who look at things the way they are, and ask why... I dream of things that never were, and ask why not?"

Robert Kennedy

ACROSS

1 "Grand" Ameche
 5 Letter-man's software network
 8 Out of control
 12 Suspend
 13 Weeding tool
 14 Wise one
 15 Killer whale
 16 Lineage
 18 Astronauts' descent to Earth
 20 Locations
 21 Comic DeLuxe
 22 Satchel
 23 "Forget it!"
 26 Nation
 30 Lawyers' org.
 31 Sly one
 32 Nay opponent
 33 Racism, e.g.
 36 Aden's land
 38 Bill and —

DOWN

1 Valhalla VIP
 2 Aesopian also-ran
 3 Formerly
 4 Land-locked African nation
 5 Amulet
 6 Skeletal
 7 Moment
 8 Delegate
 9 Dillon or Damon
 10 Shrek, for one
 11 Jailer's janglers
 17 Jacob's brother
 19 Plaything
 22 Carton
 23 Apprehend
 40 Soap brand
 41 Advantage
 42 Drill
 43 Front of a ship
 44 Snare
 45 Irritate
 46 New Haven campus
 48 Pair

Solution time: 21 mins.

USED ORB STOP
 TIVIO CHIT TRUIE
 AIEE TORITISE
 HOINSHU DILLER
 NANA NILL
 TIORITILLA DILSH
 INA RETIE OAR
 MOPE TORIEMENTS
 TOM SPUD
 STUCOE OSWALD
 TOREADOR ALOE
 ADEN ORT RAGE
 ROISE REIS DROP

Yesterday's answer 6-25

CRYPTOQUIP

H M R F S S F M Z K N W B M I F F D
 I T K I ' P S F P I H P B E H D V E
 W N K Z Z B V M I T B W V N B R I V F M
 F E P H M P B I : Q B P I Q K N W T F B .
 Yesterday's Cryptoquip: IS A GYM MACHINE USED TO HELP A BODYBUILDER TIGHTEN HIS MUSCLES A CONTRACTION CONTRACTION?
 Today's Cryptoquip Clue: E equals F

BEETLE BAILY by Mort Walker

I'VE ALWAYS WORRIED THAT THERE WAS SOME WEIRD LIFE IN OUTER SPACE

BUT I DON'T MIND TELLING YOU, HARVEY, I'M VERY RELIEVED

HENRY by Don Trachte

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by Mort Walker

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