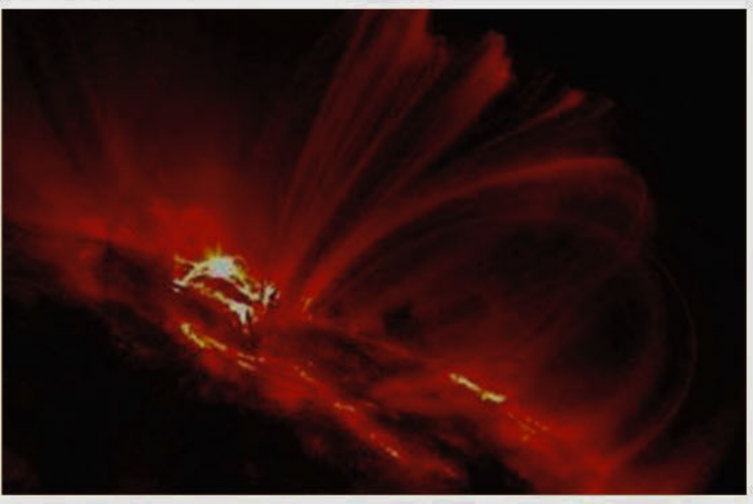
The Daily Star

SCIENCE & LIFE

DHAKA TUESDAY JULY 6, 2010, E-MAIL: science&life@thedailystar.net

Music from the Sun



Magnetic coronal loops form a solar harmonica with temperature over a million degrees. The average length of these loops are a few 100,000 km

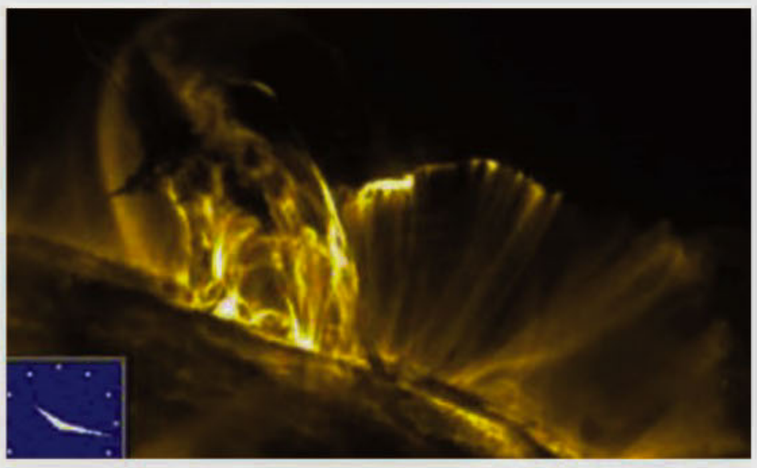
OBAIDUR RAHMAN

WHO knew that the Sun was so musical? For the very first time, harmonious sounds that were created by longitudinal vibrations within the Sun's atmosphere have been recorded and studied by the experts at the University of Sheffield (U of S). With the aid of the mathematical theory, combined with steadfast satellite observations, a team of distinguished solar physicists from the U of S has captured this distinct solar music on tape which many are hoping would shed some light on the Sun's magnetic atmosphere as well as into the physics of solar corona. It is believed that the harmonious sounds in the Sun are caused by the movement of giant magnetic loops in the solar corona, the outermost, mysterious and least understood layer of the Sun's atmosphere. But what is the process of this mysterious yet melodic solar auditory composition? It's been found, after studying high-resolution satellite images of the sun, that the solar corona is filled with large banana-shaped magnetic structures which are known as coronal loops. And it is believed that these giant magnetic loops (some of which are over a few 100,000 km long), play a crucial role in governing the physics of the corona and are also responsible for huge atmospheric explosions that occur in the solar atmosphere, which are traditionally known as solar flares. And it is these giant coronal loops that have been observed to undergo periodic (oscillatory) motion, which can be thought of as someone plucking a guitar string (transversal oscillations) or blowing the wind-pipe instrument (longitudinal oscillations). And in these ways, the solar atmosphere is constantly encompassed by the music of the coronal loops.

Led by Prof. Robertus von Fay-Siebenburgen of Dept. of Applied Mathematics, U of S, the scientists believe that this coronal music will usher further breakthrough into the understanding of one of the crucial yet unresolved problem of modern astrophysics. And that is the heating process of solar and tellar coronal plasmas. Scientists are also hoping that this discovery will pave the way towards the understanding of this following crucial question. Are there millions of localized magnetic explosions releasing the energy necessary to maintain the corona at millions of degrees or is the physics related to the numerous waves propagating from the internal regions of the Sun toward its outer regions, reaching even space around the Earth's atmosphere?

It is important to note here that this is second solar related breakthrough made by the scientists from U of S. The way the solar corona is heated to the temperatures of over a million degrees, until very recently, remained an ancient puzzle of astrophysics, since this particular regions of the Sun is much further away from the centre of energy production than the underlying solar surface. But Prof. Siebenburgen's team solved this mystery and revealed that Transition Region Quakes, described by the experts as "mega tsunamis" actually power the lower base of the solar corona. And this month's discovery which was presented in front of an audience comprised of MP's from both House of the Commons as well as House of the Lords along with senior scientists from Royal Society is hailed as a pioneering one. In his own words, Prof. Siebenburgen said, "The results of our latest coronal research, presented in the Parliament at Westminster, allow us to gain a fundamentally new insight into the fascinating but at the same time very mysterious solar atmosphere". Now, the next stop for the scientists is to develop cutting edge numerical modeling that will be able to give further insight into the sub-resolution properties of coronal loops.

The contributor is a freelance science writer.



Still image from a video from the Transitional Region and Coronal Explorer (TRACE), showing eruptions from the solar corona

ACT OF DISCOVER

The creative flash

The following makes the sixth instalment of Dr. M Ali Asgar's original article titled "Establishment of an Interactive science discovery centre in Asia-Pacific region."

An understanding of the factors which favour creativity is essential for the success in discovery by a group in a country. Most discussions on creativity focus on the individual and his mental processes, because creative insight is attainable only by individuals. But scientists receive stimulus information and help in making Judgments from other scientists in the present world of big science, where gigantic research programmers involves thousands of scientists and tens of millions of dollars are being organized. The interaction between scientists are very important and with time it is becoming more so.

We have mentioned about the creative flashes as an important phenomenon in scientific discovery, however, there are other steps that are equally essential for our completion of the discovery process.

A scientist must decide upon an area of investigation what approach to take. Once he begins the experiment the scientist faces more Judgments whether he should change his method or build a new apparatus or turn to a new problem?

He thus has to go through crucial judgments in a creative way using deep thought and every available aid of consultation. To overcome the possible disappointments and frustrations that often occur in research, self-discipline, courage and strong motivations must be there and the researcher must pass through the different steps which consists of preparation stage and the incubation process involving assimilation of all pertinent information acquired. Then luckily comes the creative flash as an illumination. Finally, flash there must be rigorous formulation of the creative idea to be refuted or verified.

The importance of new discovery

Science and technological developments are central factors in determining national and regional economic competitiveness. Beyond the direct influences like new energy source, new materials, machines and medicines, scientific new discoveries profoundly affect the values, institutions and patterns of decision making of the society as a whole.

Whilst the stock of world scientific knowledge is doubling in about every ten years now, the developing countries contribution to this new knowledge is nearly one part in hundred in respect of their population. This disparity between the developed and the developing nations is research and development is even larger than the economic disparity and in facts the origin of the increasing gap between the rich and the poor countires

To be continued

EDGING BACK

Life's older than thought

RESEARCHERS have found what may be the earliest evidence of multicellular life on Earth. Large fossils uncovered in 2.1 billion-year-old rock from Gabon, in western Africa, appear to be incipient examples of macroscopic life in what was then a sea of single-celled microbes.

Scientists believe that multicellular life really took off much later, in the great expansion of animal body plans known as the Cambrian explosion 545 million years ago.

"The discovery is fantastic because it shows the existence of multicellular fauna 1.5 billion years earlier than what we know," says team leader Abderrazak El Albani, a sedimentologist and paleobiologist at the University of Poitiers in France. "This is important to understand the evolution of life on Earth."

Some researchers have suggested multicellular organisms arose as early as 1.6 billion years ago, but the evidence is controversial. El Albani and his colleagues were thus surprised to find large fossils in the newly excavated ancient Gabonese rocks. So far, the team has collected over 250 specimens that range in size from 1 to 12 centimeters.

Using detailed X-ray imaging called microtomography, the team created three-dimensional images of the fossils inside and out. The organisms had flat, round, soft bodies, with slits around the edges and complex, patterned folds inside. The creatures belong to new species that have never been described, the team reports in the July 1 Nature.

Other researchers agree that the large size, thickness, and three-dimensionality of the organisms suggest that they were, indeed, multicellular. "There does seem to be something more than just a clonal colony of bacteria," says paleobiologist Philip Donoghue of the University of Bristol in the United Kingdom.

El Albani and his team believe the complex patterns and folding mean that cells must have coordinated their growth through chemical signaling, like all multicellular organisms do. The fossils could even be the first examples of eukaryotes, cells with membrane-bound nuclei, according to the team.

Source: Science News

A three dimensional X-ray image of the outer (left) and inner (right) body of a fossil from the Gabonese site

Longevity Gene

Living past 100

Anti-aging researchers have figured out how to add about 5 years to the human lifespan

REACHING immortality is still in the realm of science fiction. But using clues from our genes, scientists are one step closer to understanding why some of us live to be centenarians while others don't.

Using a specific set of genetic markers, scientists predicted with 77-percent accuracy whether someone would live to a very old age.

The findings do not mean that lifestyle factors, such as healthy diet and exercise, are not important for long life. Indeed, 23 percent of the time the genetic markers didn't predict longevity. So those long-lifers without the centenarian genes might have practiced healthy habits that allowed them to lead a longer life. [Learn more facts about centenarians]

But they do suggest our genes play an important role when it comes to living well past the average lifespan. With more research, one day people might be able to determine whether they have the genetic potential to become a centenarian.

Additionally, learning more about how centenarians ward off diseases, including dementia, heart disease and cancer, well into their elder years, might help the rest of us delay disease.

"I'm very hopeful that understanding how and why centenarians are able to do that will lead to strategies and therapies, including screening and figuring out who could be helped by whatever therapies [there] are down the road," study researcher Tom Perls, of Boston University School of Medicine, said in a press briefing Wednesday about the study.

The results will be published this week in an early online edition of the journal Science.

The researchers compared the genomes of 1,055 centenarians (average age of 103) with those of non-centenarian controls.

They identified differences in the genetic code, known as genetic variants or markers, that were common in centenarians but not in the average population.

Using a computer model, they found 150 of these markers could predict 77 percent of the time whether a person lived into their late 90s and beyond.

Additionally, they saw 90 percent of the centenarians could be categorized into one of 19 groups based on which genetic variants they had. In other words, each group had a distinguishing "genetic signature" made up of certain genetic markers.

Differences in these genetic signatures may relate to differences in the way extreme longevity manifests itself. For instance, some genetic signatures were associated with extremely old age (living 110 years or more), while others were associated with a late onset of diseases such as dementia.

So can someone live to old age without these markers? Perhaps. About 30 of the centenarians had almost none of the longevity associated markers. In these cases, extreme old age might be influenced by other markers that have yet to be identified, or by the subject's lifestyle.

The researchers were also curious if centenarians had fewer markers that are known to be linked with diseases. However, in this respect, they found little difference between the centenarians and the control group.

This might mean that centenarians owe their exceptional lifespan not to less "bad genes," but to the presence of "good genes" that override the harmful ones.

This results suggests "that what makes people live very long lives is not a lack of genetic predisposition to diseases, but rather an arrangement of longevity associated variants that may be protective, it may even cancel the negative effect of disease-associated variants," said study researcher Paola Sebastiani, of Boston University School of Public Health, who also spoke at the briefing.

Future outlook

The researchers caution that before a genetic test for longevity is developed, scientists need to have a better understanding of what kind of effect the information could have on society, such as in the context of health care.

They hope the study spurs additional research into these genetic markers and how they might biologically contribute to longevity.

"I think that we're quite a ways away still in understanding what pathways governed by these genes are involved, and how the interaction of these genes, not just with themselves, but with environmental factors, are all playing a role in this longevity puzzle," Perls said.

The study was funded by grants from the National Institute of Aging (NIA) and the National Heart Lung and Blood Institute (NHLBI) of the National Institutes of Health (NIH).

Source: LiveScience

MOON SHOT

This photo, provided by the National Federation of the Blind shows Addison Hugen, who is blind student participating in the 2009 YouthSlam, a science camp for blind students, in College Park, Md

Driving blind

THE National Federation of the Blind and Virginia Tech plan to demonstrate a prototype vehicle next year equipped with technology that helps a blind person drive a car independently.

The technology, called "nonvisual interfaces," uses sensors to let a blind driver maneuver a car based on information transmitted to him about his surroundings: whether another car or object is nearby, in front of him or in a neighboring lane.

Advocates for the blind consider it a "moon shot," a goal similar to President John F. Kennedy's pledge to land a man on the moon. For many blind people, driving a car long has been considered impossible. But researchers hope the project could revolutionize mobility and challenge long-held assumptions about limitations.

"We're exploring areas that have previously been regarded as unexplorable," said Dr. Marc Maurer, president of the National Federation of the Blind. "We're moving away from the theory that blindness ends the capacity of human beings to make contributions to society."

The Baltimore-based organization announced its plans for the vehicle demonstration at a news conference Friday in Daytona Beach, Fla.

A blind person, who has not yet been chosen, will drive the vehicle on a course near the famed Daytona race track and attempt to simulate a typical driving experience.

Maurer first talked about building an automobile that the blind could drive about a decade ago when he launched the organization's research institute.

"Some people thought I was crazy and they thought, 'Why do you want us to raise money for something that can't be done?' Others thought it was a great idea," Maurer said. "Some people were incredulous. Others thought the idea was incredible."

The vehicle has its roots in Virginia Tech's 2007 entry into the DARPA Grand Challenge, a competition for driverless vehicles funded by the Defense Department's research arm. The university's team won third place for a self-driving vehicle that used sensors to perceive traffic, avoid crashing into other cars and objects and run like any other vehicle.

AS BAD AS ITS BITE

Saber-toothed cats

A saber-toothed cat's pounce may have been as bad as its bite. These extinct animals had exceptionally strong forelimbs that probably held a victim still while razorlike teeth ripped out its throat, a new study shows.

Most carnivorous cats suffocate their victims with a long, crushing bite to the throat or nose. This wouldn't have worked for sabertooths because their formidable twin canines were surprisingly fragile. The teeth were oval-shaped when cross-sectioned like blades are rather than round like other cats'. That made saber-shaped teeth good for slicing through flesh, but easily snapped by writhing prey.

Saber-toothed cats may have pinned their prey with strong forelimbs.

DO YOU KNOW

What is gas flaring and why is it done?

In chemical factories, oil refineries, oil wells, rigs and landfills, gaseous waste products and sometimes even non-waste gases produced are routed to an elevated vertical chimney called a gas flare and burnt off at its tip. This is called gas flaring. Waste gases are subjected to such a process either because the gases are waste or it is difficult to store and transport them. Non-waste gases are burnt off to protect the processing equipment when unexpected high pressure develops within them. Gas flaring in oil rigs and wells contribute significantly to greenhouse gases in our atmosphere.